



**Status and distribution of
Icelandic-breeding geese: results of
the 2009 international census**

Wildfowl & Wetlands Trust Report

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Summary

The 50th consecutive census of Greenland/Iceland Pink-footed Geese and Iceland Greylag Geese took place during autumn and early winter 2009. 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 in order to estimate the numbers of Greylag Geese from the Northwest Scotland and Re-established (collectively referred to as British Greylag Geese hereafter) populations 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 Norway, the Faroe Islands, Ireland and Iceland, the latter based on ground counts only. Weather conditions were generally considered favourable during the counts with very few sites reporting underestimated counts.

Maxima of 358,177 Pink-footed Geese and 120,971 Greylag Geese were counted in October and November 2009, 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 364,212 Pink-footed Geese and 109,496 Iceland Greylag Geese. Compared to population estimates in 2008, the 2009 figures represent an increase of 3.7% in the Pink-footed Goose population and an increase of 11.4% in the Greylag Goose population.

The breeding success of Pink-footed Geese was below the mean for the previous decade at 17.3% young (mean percent young 1999–2008: $19.3\% \pm 0.53$ s.e.). The mean brood size of successful pairs was 1.87 goslings, which was also lower than the mean recorded during the preceding ten years (2.16 ± 0.05 s.e.). The breeding success of Iceland Greylag Geese was similar to the mean for the previous decade with flocks containing 21.9% young (mean percent young 1999–2008: $20.9\% \pm 1.29$ s.e.), though the mean brood size of 2.26 goslings per successful pair was lower than that of the recent ten year mean (2.54 ± 0.09 s.e.).

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 south west Norway (Swann & Brockway 2002). Large concentrations of these species occur in autumn, particularly in East Central Scotland, Southwest Lancashire and Norfolk (Pink-footed Goose) and North Scotland (Greylag Goose). As winter progresses, redistribution to other parts of the wintering range is evident 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. The 2008 census was the first to adopt this methodology and it continued in 2009.

The 2008 census was the first to adopt this methodology. This report presents the 50th consecutive census and provides an update on the population size and breeding success of Pink-footed and Greylag Geese following the 2009 breeding season.

2 Methods

Counts were conducted by a network of volunteer observers and professional conservation staff over the weekends of 17/18 October, 14/15 November and 12/13 December 2009. 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 (4 October, 2 November and 2 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 2009 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 (2004–2008). 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 (*i.e.* birds from the Re-established or Northwest Scotland populations) 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 September to 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 2009 was good and 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 2009.

	October	November	December
Number of Pink-footed Goose sites counted	105	122	116
Number of sites holding Pink-footed Geese	57	69	57
Number of Greylag Goose sites counted	88	124	111
Number of sites holding Greylag Geese	42	70	65

Outside Britain and Ireland, counts were made at several sites in the Faroe Islands in October and November and estimates of the maximum numbers in Iceland were determined through ground counts and contact with local birdwatchers and hunters (but see Discussion). No aerial survey was undertaken in Iceland in autumn 2009. Data were also received from several sites in south west Norway. In Ireland, full coverage of sites was not possible (as had been carried out in autumn 2007) but counts from ten sites thought to hold Iceland Greylag Geese were provided for November.

Numbers at four sites met the criteria for the calculation of an estimated count due to lack of coverage. In Moray, Findhorn Bay was not counted in October and an estimate of 5,285 Pink-footed Geese was added. In Aberdeenshire, counts could not be undertaken at Middlemuir, although Pink-footed Geese were known to be roosting there. Based on the number of feeding geese seen during the day, an estimated 750 and 3,000 birds were added to the October and November IGC totals, respectively. In Ireland, ten sites were counted in November (fewer than in autumn 2007 when attempts to maximise coverage were made). No counts were undertaken there during the December count weekend and the November total count (2,795 birds) was therefore used as an estimated count in December. No count was made in Shetland during November and 1,250 Greylag Geese were added (but see Discussion).

An attempt was made to allow for the presence of British-breeding Greylag Geese in areas where Iceland Greylag Geese were also known to winter. In Orkney in July 2008, a comprehensive summer survey found *c.*10,000 birds (Mitchell *et al.* 2010) which, in the absence of a revised update from 2009, were subtracted from the Orkney IGC counts (but see Discussion). In Caithness (Highland), increasing numbers of Greylag Geese are breeding and, based on fieldwork carried out in August 2009, and allowing for some mortality through shooting in September, 1,000 birds were deducted from the IGC counts. Likewise, in Badenoch & Strathspey (Highland), the summer stock is increasing and 250 birds were deducted from the IGC counts. Discussion with local area organisers estimated the presence of *c.*1,200 British Greylag Geese in October, *c.*600 in November and *c.*500 in December in Lothians, and *c.*400 in both November and December in Northumberland. Despite the presence of small numbers of British Greylag Geese in parts of Borders, Perth & Kinross and Fife, the majority of sites included in the IGC counts were not thought to be used by British Greylag Geese.

Weather conditions were reported as good for most sites, with only one site reporting poor visibility due to failing light. Low counts, where counters felt they had underestimated the number of birds present, were received for one site in both November and December due to birds moving to and from the roost at the time they were being counted.

3.2 Total numbers

3.2.1 Pink-footed Goose

Totals of 358,177 and 284,108 Pink-footed Geese were counted in October and November, respectively (Figure 1, Table 2). These represent an increase of 5.1% and decrease of 9.3%, respectively, compared to the raw total counts in the same months in the preceding year. After the addition of estimated counts, the peak winter total in October 2009 was used to derive a population estimate of 364,212 geese. This represents a modest increase of 3.7% since 2008, when 351,188 individuals were estimated. In 2008, 91.9% of the total October count (unadjusted) was counted in November but in 2009 the corresponding figure was lower at 79.4% (Table 3).

3.2.2 Greylag Goose

Totals of 120,971 and 111,677 Greylag Geese were counted in November and December, respectively (Figure 1, Table 2). These represent increases of 9.5% and 12.9%, respectively, compared to the raw total counts in the same months in the preceding year. Following adjustments and the addition of estimated counts, the peak winter total in November 2009 was used to derive a population estimate of 109,496 Iceland Greylag Geese. This represents an increase of 11.4% since the previous estimate of 98,291 geese recorded in 2008 (see Section 4). In 2008, 89.5% of the total November count (unadjusted) was counted in December but in 2009 the corresponding figure was slightly higher at 93.0% (Table 3).

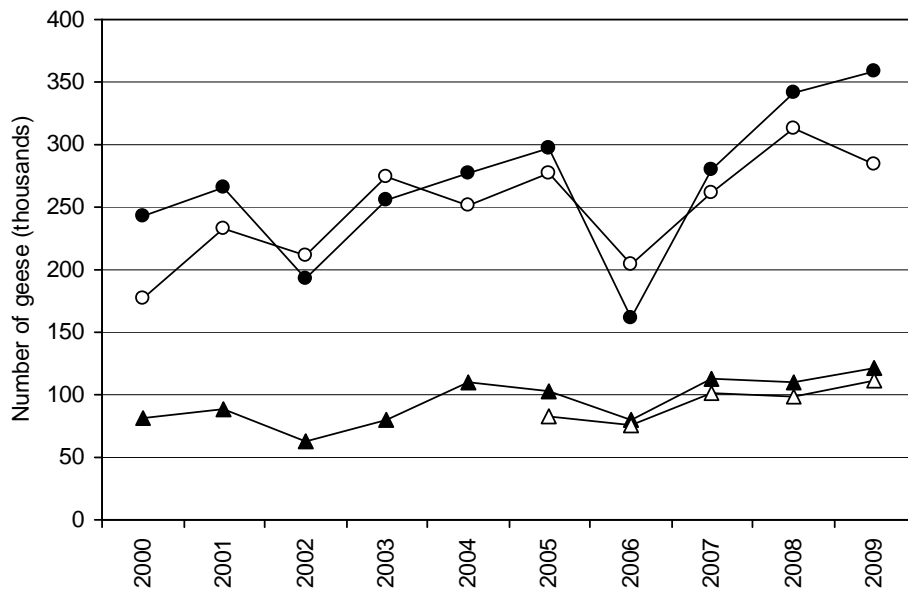


Figure 1. Peak (unadjusted) counts of Pink-footed Geese (circles) in October (filled) and November (open) and Iceland Greylag Geese (triangles) in November (filled) and December (open) counted during the Icelandic-breeding Goose Census, 2000 to 2009. Note, December counts of Iceland Greylag Geese began in 2005.

Table 2. Total of Pink-footed Geese and Iceland Greylag Geese by country and region in October, November and December 2009. 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	October		November		December	
	Pinkfoot	Greylag	Pinkfoot	Greylag	Pinkfoot	Greylag
Iceland*	3,000	nc	0	22,500	0	2,500
Norway*	0	nc	0	670	0	670
Faroe Islands*	6	1,467	0	574	0	0
Ireland	nc	nc	0 (10)	2,795 (10)	nc	nc [+2,795]
Shetland*	nc	nc	nc	nc [+1,275] [-500]	0	1,009 [-500]
Orkney*	1,150 (2)	nc	863	60,519 [-10,000]	1,038	80,538 [-10,000]
Caithness*	nc	nc	982	11,510 [-1,000]	0	8,514 [-1,000]
Highland	15,026 (13)	5,659 (14) [-250]	20,867 (15)	11,218 (16) [-250]	10,853 (16)	5,893 (16) [-250]
Moray	0 (1) [+5,285]	0 (1)	14,503 (2)	12 (2)	8,600 (2)	200 (2)
Aberdeenshire	77,109 (6) [+750]	55 (6)	33,187 (6) [+3,000]	1,443 (6)	30,378 (5)	743 (5)
Angus/Dundee	46,598 (3)	182 (2)	34,221 (3)	1,611 (2)	21,287 (3)	2,403 (2)
Perth & Kinross	38,773 (8)	323 (8)	29,273 (11)	2,572 (14)	18,662 (11)	2,126 (14)
Stirling/Falkirk/Clackmannan	6,936 (5)	322 (3)	9,133 (5)	174 (4)	1,312 (4)	30 (4)
Fife	12,640 (15)	142 (15)	4,325 (18)	872 (18)	2,291 (15)	1,019 (14)
Argyll & Bute	0 (1)	700 (1)	7 (1)	2,080 (1)	0 (2)	2,000 (2)
Clyde	142 (2)	784 (2)	570 (2)	355 (2)	2,580 (2)	934 (2)
Ayrshire	nc	nc	nc	nc	nc	nc
Dumfries & Galloway**	7,700 (6)	853 (6)	6,745 (6)	745 (7)	7,224 (3)	310 (5)
Lothians	25,664 (15)	626 (15) [-1,200]	9,957 (15)	1,010 (15) [-600]	2,128 (12)	967 (13) [-500]
Borders	38,364 (11)	142 (11)	3,572 (12)	207 (12)	3,039 (10)	643 (9)
Northumberland	7,350 (9)	301 (6)	1,215 (13)	987 (13) [-400]	155 (16)	1,259 (17) [-400]

Region	October		November		December	
	Pinkfoot	Greylag	Pinkfoot	Greylag	Pinkfoot	Greylag
Cumbria*	1,415 (2)	0 (1)	3,095 (3)	50 (2)	560 (12)	104 (2)
Lancashire & Merseyside*	69,790	0	59,920	0	54,215	0
N Wales/Dee Estuary	0 (1)	0 (1)	100 (1)	0 (1)	450 (1)	0 (1)
Humberside	6,360 (2)	0 (2)	3,607 (2)	0 (2)	2,950 (2)	0 (2)
Norfolk	34,212 (7)	0 (7)	60,035 (9)	0 (9)	86,596 (9)	0 (9)
<i>Raw total counts</i>	358,177	11,716	284,108	120,971	277,652	111,677
<i>Adjustment for non-Icelandic birds</i>	n/a	-1,450	n/a	-12,750	n/a	-12,650
<i>Estimated counts</i>	+6,035		+3,000	+1,275		+2,795
Population Estimate	364,212			109,496		

* 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 Southeast Scotland/Northeast England and West England (Table 3, Figure 2). By November, a large movement of birds into East England (Norfolk) had occurred, and by December many more had moved to East England, where 80,006 were counted. In the same month, birds had presumably moved south from North Scotland to Northeast Scotland, shown by an increase in numbers at Loch of Strathbeg.

3.3.2 Greylag Goose

The autumn distribution of Greylag Geese was typical, with a very low proportion present in Britain during October. This partly reflected the emphasis on November and December counts for this population and consequently fewer counts were submitted for October. By November, 16.8% of the population was still in Iceland and 71.1% 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 2,000–3,000 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 2009, 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	0.8	n/a	n/a	n/a	16.8	1.9
Faroe Islands	0	0	0	1.1	0.4	0
Southwest Norway	0	0	0	nc	0.5	0.5
Ireland	0	0	0	nc	2.1	nc
North Scotland	4.5	6.3	3.3	4.8	71.1	80.5
Northeast Scotland	12.0	9.9	17.4	0.2	0.4	0.6
East Central Scotland	29.4	21.5	12.2	0.7	3.9	4.2
Southeast Scotland/ Northeast England	2.6	2.9	2.9	1.7	2.4	2.5
Southwest Scotland/Northwest England	19.9	4.2	1.5	1.7	2.4	2.8
West England	19.5	16.8	15.3	0.0	0.0	0.0
East England	11.3	17.8	25.0	0.0	0.0	0.0
Total	100.0	79.4	77.6	10.2	100.0	93.0

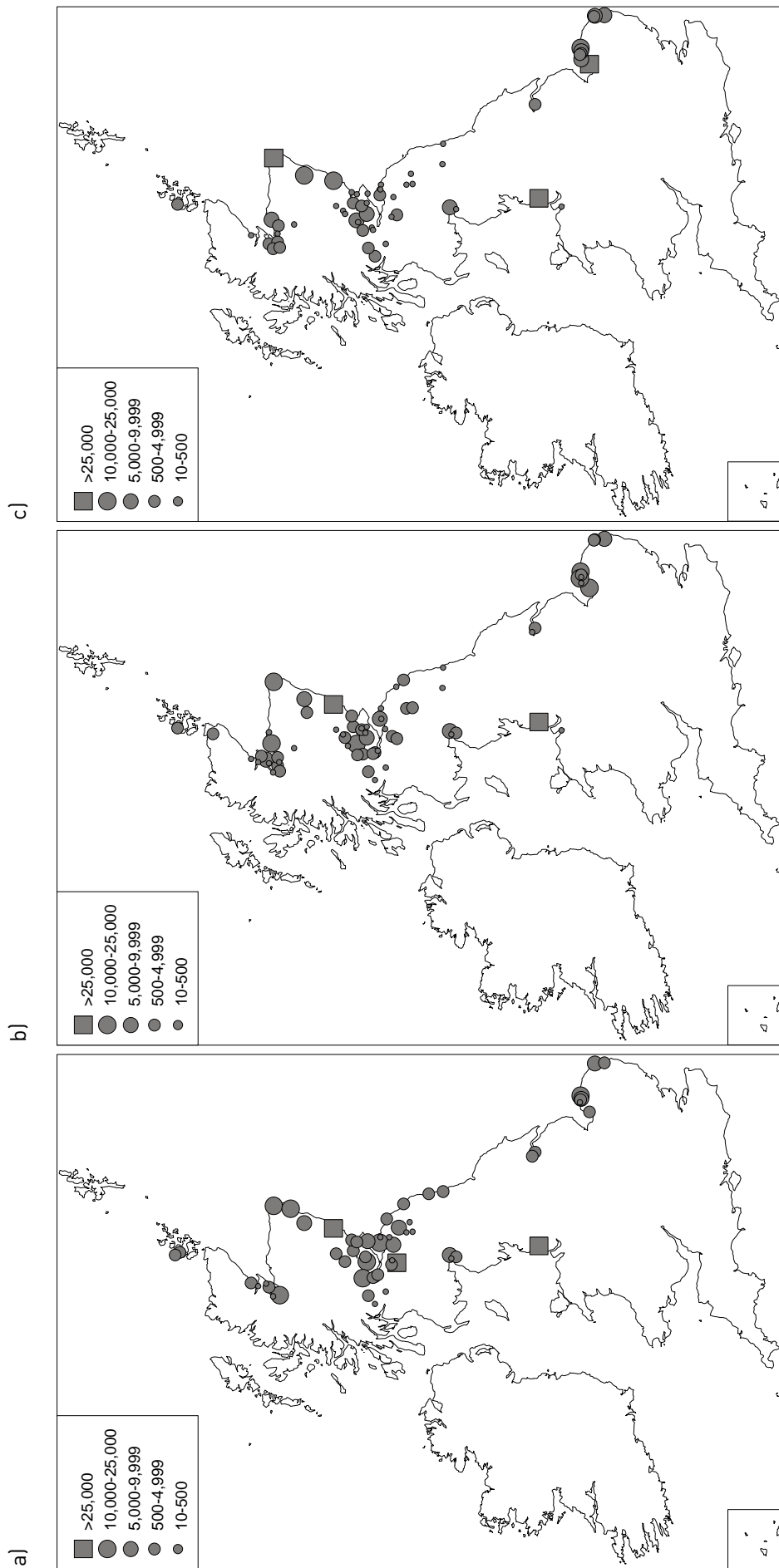


Figure 2. Distribution of Pink-footed Geese in Britain and Ireland in October (a), November (b) and December 2009 (c). Estimated counts are not shown.

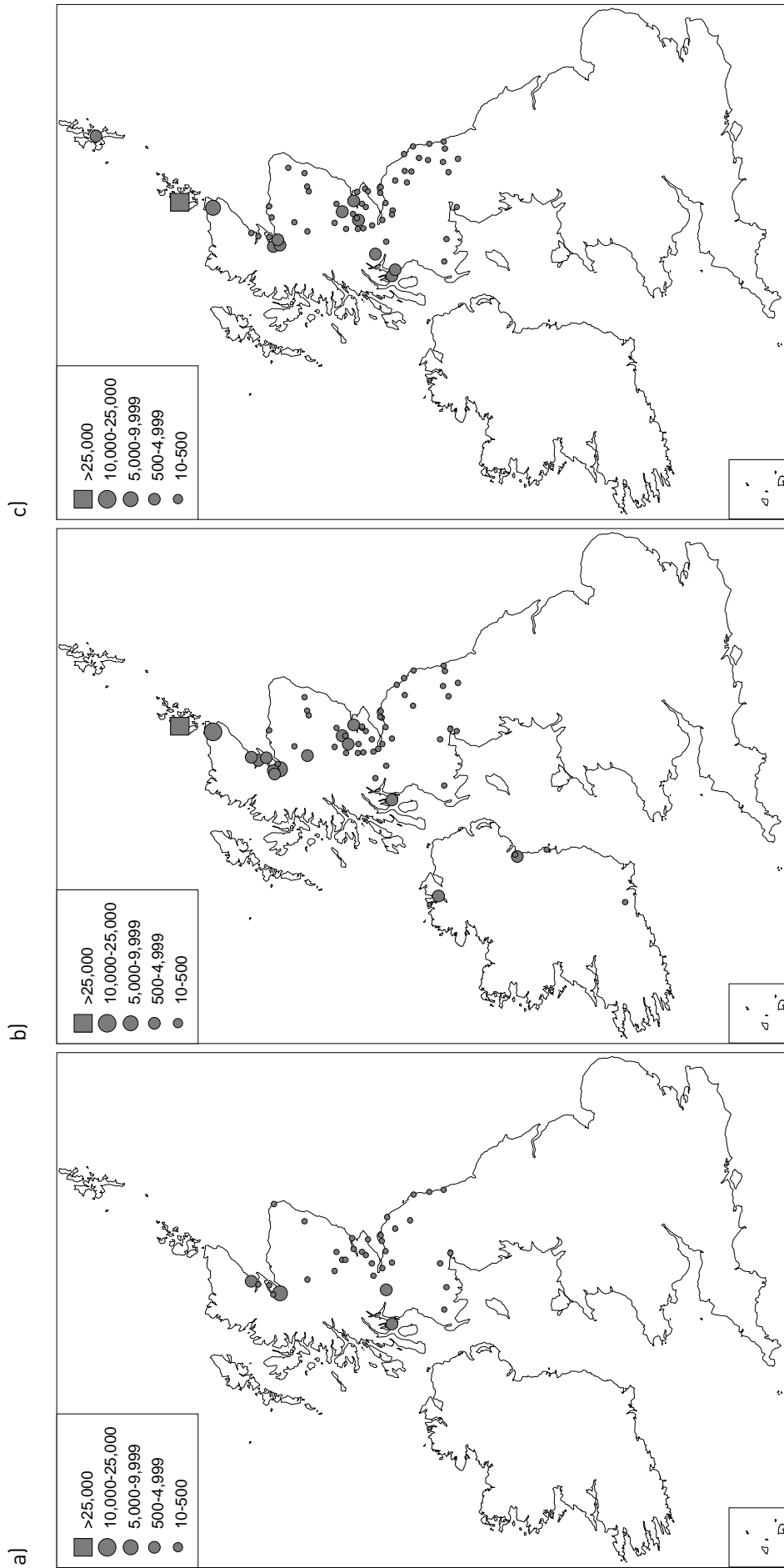


Figure 3. Distribution of Icelandic Greylag Geese in Britain and Ireland in October (a), November (b) and December 2009 (c). Estimated counts are not shown.

3.4 Principal concentrations

3.4.1 Pink-footed Goose

Pink-footed Geese were recorded at 57 sites in October, 69 in November and 57 in December (this includes consolidated sites, but excludes estimated counts) (Table 1). Those sites holding more than 1% of the population estimate (3,642 birds) was 17 in October and November and decreased to 15 in December. Ten sites held over 10,000 birds in October, eight in November and six in December. Combined counts from the 17 sites exceeding 1% of the population estimate in October accounted for 84.8% of the total October count and numbers at the top five sites alone held 48.5% of the population estimate (Table 4). The most recent peak IGC counts from the top two sites in October 2009 are shown in Figure 4.

Particularly high numbers were recorded at Southwest Lancashire, with 19.2% of the October population estimate, Montrose Basin, Angus (11.4%) and West Water Reservoir, Borders (7.2%). The count of 41,584 Pink-footed Geese at Montrose Basin in November is the largest IGC count recorded at this site. However, an even higher count (51,000), the highest ever for the site, had been recorded there on 7 October, a week before the IGC October count weekend. Likewise, at Loch of Strathbeg, Aberdeenshire, an early count of 60,626 Pink-footed Geese was recorded on 23 September 2009.

Higher than recent (2004 to 2008) average numbers in October 2009 were also recorded at Alloa Inch (Stirling, Falkirk & Clackmannanshire), Beaully Firth, Cromarty Firth: Udale Bay (both Highland), Carsebreck & Rhynd Lochs, River Tay: Bloody Inches (both Perth & Kinross), Dowlaw Dam, Hule Moss (both Borders), East Chevington Pools (Northumberland), Eden Estuary, Kilconquhar Loch (both Fife), Fala Flow (Lothians), Solway Firth, Southwest Lancashire, Wells next the Sea (Norfolk) and Whitton Sands (Humberside). Lower than recent average numbers were recorded during October 2009 at Forth Estuary: Skinflats, Lake of Menteith (both Stirling, Falkirk & Clackmannanshire), Holburn Moss (Northumberland), Loch of Strathbeg (Aberdeenshire), Loch Spynie (Moray), Loch Tullybelton (Perth & Kinross), Scolt Head, Snettisham (both Norfolk) and West Water Reservoir (Borders).

3.4.2 Greylag Goose

By November, 70 sites held Greylag Geese (Table 1), nine of which held numbers exceeding 1% of the population estimate (1,095 birds) (this considers Orkney and Iceland as single sites). Excluding summering birds, Orkney held 46.1% of the population during this month (Table 2). Greylag Geese were recorded at 65 sites in December; those with counts exceeding 1% of the population estimate decreased to seven. The total unadjusted count of 80,538 Greylag Geese on Orkney was the highest ever recorded on the islands and continues both the marked shift in the distribution of Iceland Greylag Geese to these northern isles and the increase there in British Greylag Geese.

Higher than recent average numbers (2004 to 2008) were recorded on Orkney, in Caithness and at the Beaully Firth (all Highland). Lower than recent (2004 to 2008) average numbers were recorded at Bemersyde Loch, Dowlaw Dam (both Borders), Birns Farm Quarry, Kilconquhar Loch (both Fife), Derwent Reservoir (Northumberland), Dornoch Firth, Loch Eye (both Highland), Findhorn Bay, Loch Spynie (both Moray), Haddo House Lakes, Loch of Auchlossan, Loch of Skene, Loch of Strathbeg, Meikle Loch (all Aberdeenshire), River Tay: Bloody Inches, Upper Tay sites (both Perth & Kinross). That so many wetland sites appear to be holding fewer geese reflects 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. Eight of the count areas on Orkney held numbers exceeding 1% of the population estimate in November and ten did so in December, although these individual counts are not adjusted for the presence of Greylag Geese breeding on Orkney (thought to number *c.* 10,000 birds, but see Discussion) since such data are only available for Orkney as a whole. As in 2008, only on East Mainland and West Mainland were more than 10,000 birds recorded, which equates to 68.7% of the Orkney total in November and 64.4% in December.

Table 4. Sites that supported >1% of the (a) Pink-footed Goose (>3,642) and (b) Iceland Greylag Goose (>1,095) population estimates in October and November 2009, 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	69,790	19.2	55,4382
Montrose Basin, Angus	41,584	11.4	31,924
West Water Reservoir, Borders	26,400	7.2	40,471
Loch of Strathbeg, Aberdeen	20,351	5.6	44,740
Loch Leven, Perth Kinross	18,573	5.1	17,853
Carsebreck & Rhynd Lochs, Perth & Kinross	17,700	4.9	13,446
Aberlady Bay, Lothians	15,721	4.3	19,165
Meikle Loch, Slains, Aberdeen	14,000	3.8	14,332
Wells, Norfolk	13,479	3.7	23,479 ²
Beaully Firth, Highland	12,800	3.5	3,387
Holkham, Norfolk	8,650	2.4	43,821
Kilconquhar Loch, Fife	9,540	2.6	6,556
Hule Moss, Borders	9,350	2.6	6,140
Fala Flow, Lothians	9,000	2.5	4,083 ²
Loch of Skene, Aberdeenshire	8,700	2.4	19,000
Solway Estuary (consolidated)	7,700	2.1	10,792
Horse Mere, Norfolk	5,525	1.5	5,385 ³

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

² Mean derived from 2007–2009 only.

³ Mean derived from 2005, 2006, 2007 and 2009 only.

b) Greylag Goose

Site	November count	Percentage of population estimate	Five year peak mean 2005– 2009 ¹
Orkney Islands (all sites)	60,519 ²	55.3	63,099
Iceland (lowlands)	22,500	20.5	13,165
Caithness	11,510 ²	10.5	9,105
Beaully Firth (consolidated), Highland	5,100	4.7	1,560
Bute, Argyll & Bute	2,080	1.9	1,788
Lough Swilly, County Donegal, Ireland	1,999	1.8	2,442 ³
Inner Cromarty Firth: Dingwall Bay, Highland	1,992	1.8	1,992
Inner Firth of Tay, Angus & Dundee	1,431	1.3	1,245
Dornoch Firth (consolidated), Highland	1,220	1.1	2,426

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

² Unadjusted counts (see text and Table 2).

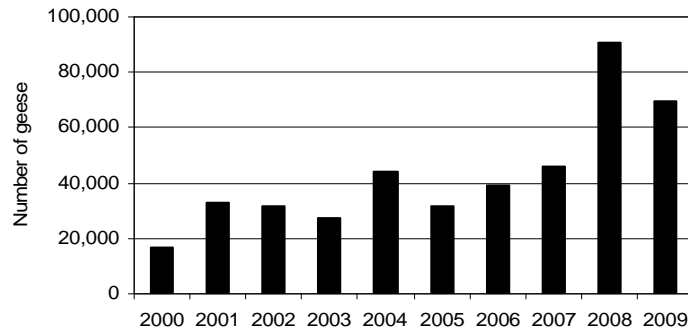
³ Mean derived from 2007–2009 only.

⁴ Mean derived from 2009 only.

Table 5. Greylag Goose counts at individual sites on Orkney in November and December 2009 (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	29,234	26.7	36,220	33.1	28,904
East Mainland	12,321	11.3	15,638	14.3	12,565
Island of Stronsay	4,502	4.1	6,674	6.1	4,266
Island of Shapinsay	3,356	3.1	5,761	5.3	4,173
Island of South Ronaldsay	3,360	3.1	5,100	4.7	3,478
Island of Sanday	2,905	2.7	3,910	3.6	2,868
Island of Eday	1,600	1.5	1,347	1.2	1,183
Island of Papa Westray	1,152	1.1	1,471	1.3	1,095
Island of Rousay	616	0.6	385	0.4	889
Island of Egilsay	238	0.2	820	0.7	776
Island of Westray	325	0.3	1,140	1.0	751
Island of North Ronaldsay	594	0.5	1,096	1.0	484
Isles of Hoy and Walls	41	0.0	548	0.5	437
Island of Wyre	84	0.1	176	0.2	378
Island of Burray	137	0.1	127	0.1	198
Flotta	54	0.0	125	0.1	1251
Total	60,519	55.3	80,538	73.6	63,099

a) Southwest Lancashire



b) Montrose Basin

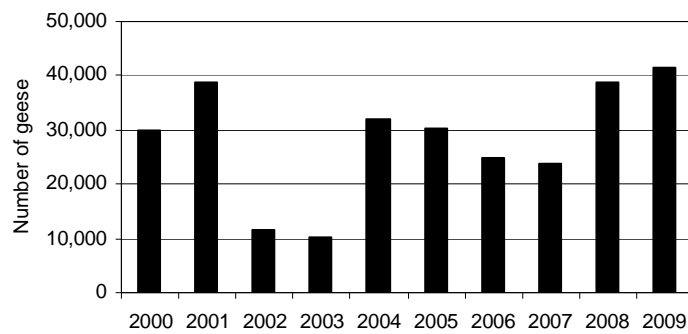
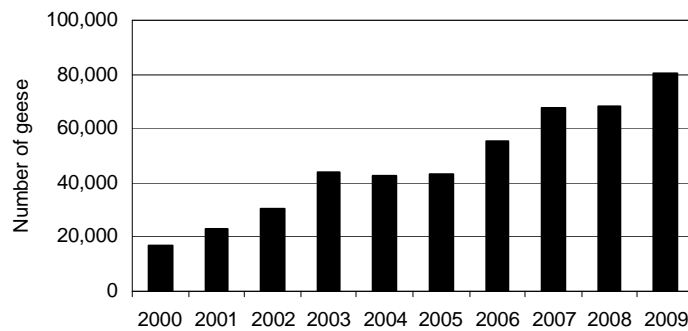


Figure 4. Peak IGC counts of Pink-footed Geese at a) Southwest Lancashire and b) Montrose Basin, 2000 to 2009.

a) Orkney



b) Iceland

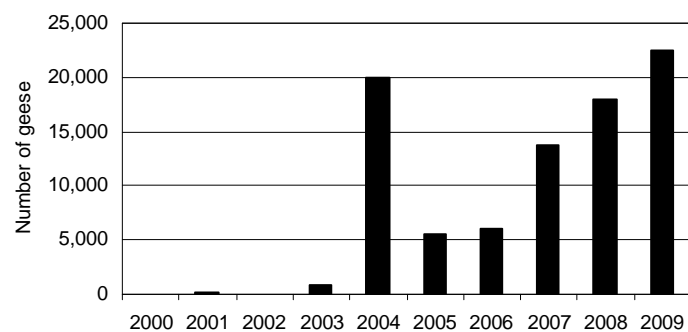


Figure 5. Peak IGC counts of Iceland Greylag Geese at a) Orkney (includes summering birds) and b) Iceland (not counted in 2000), 2000 to 2009.

3.5 Breeding success

Totals of 9,403 Pink-footed Geese (from 17 flocks) and 2,911 Greylag Geese (35 flocks) were aged at various localities throughout Scotland between 17 September and 23 November. The percentage of birds aged in relation to the estimated size of the population in 2009 was 2.6% for Pink-footed Geese and 2.7% for Greylag Geese. Information on the brood sizes of 55 families of Pink-footed Geese and 43 families of Greylag Geese was also collected during this period.

The breeding success of Pink-footed Geese was slightly below the mean for the previous decade at 17.3% young (mean proportion of young 1999–2008: $19.3\% \pm 0.53$ s.e.). The mean brood size of successful pairs was 1.87 goslings, also lower than the mean recorded during the preceding ten years (2.16 ± 0.05 s.e.) (Table 6, Figure 6).

There was evidence of modest regional variation in the percentage of young Pink-footed Geese, which varied from 14.2% in East Central Scotland to 22.8% in Southeast Scotland (Table 6). Similarly, mean brood size varied from 1.69 goslings in East Central Scotland to 1.92 in Northeast Scotland. The majority of birds were aged during the first half of November (68.0% of the sample). The percentage young was low in late September (although this was based on a small sample size), increased in October but then declined to early November (Figure 7).

The breeding success of Iceland Greylag Geese was similar to the mean for the previous decade, with flocks containing 21.9% young (mean 1999–2008: $20.9\% \pm 1.29$ s.e.). However, the mean brood size of 2.26 goslings per successful pair was slightly lower than that of the recent ten year mean (2.54 ± 0.09 s.e.) (Table 6, Figure 6). 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.

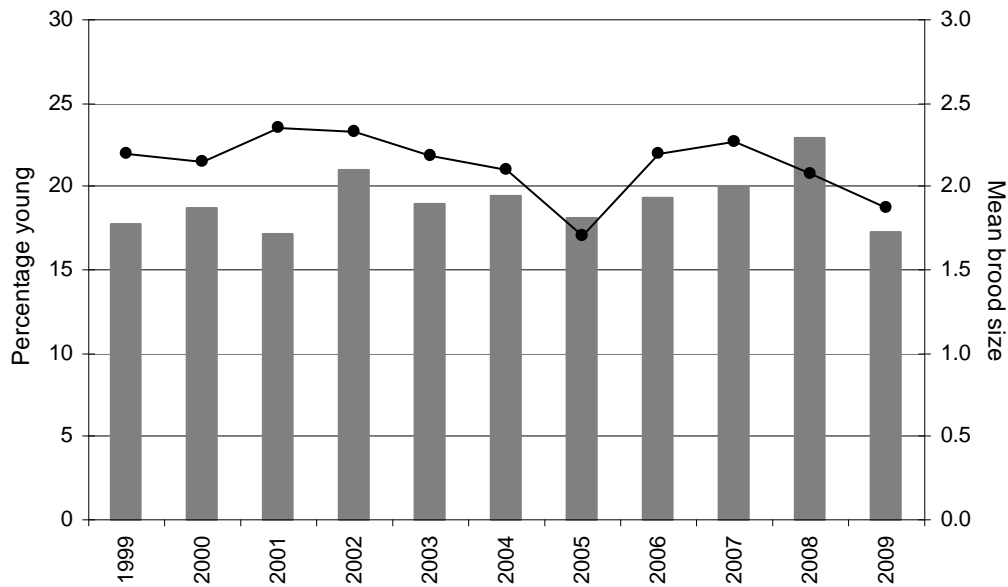
Table 6. The percentage of young and mean brood size of Pink-footed and Greylag Geese in autumn 2009.

	Region	Total aged	% young	No. of broods	Mean brood size
Pink-footed Goose ¹	Northeast Scotland	3,000	18.6	42	1.92
	East Central Scotland	4,524	14.2	13	1.69
	Southeast Scotland	1,879	22.8	0	na
	Total	9,403	17.3	55	1.87
Greylag Goose ²	North Scotland	2,911	21.9	43	2.26
	Total	2,911	21.9	43	2.26

¹ Pink-footed Geese aged between 17 September and 11 November.

² Greylag Geese aged between 7 and 23 November.

a) Pink-footed Goose



b) Greylag Geese

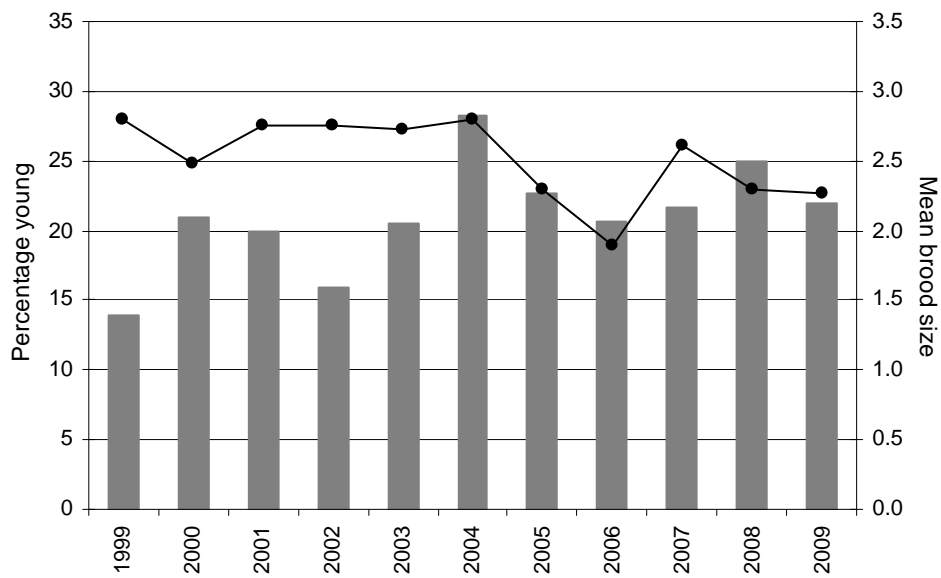


Figure 6. The percentage young (column) and mean brood size (line) found in flocks of Pink-footed Goose (a) and Iceland Greylag Goose (b) in Britain, 1999–2009.

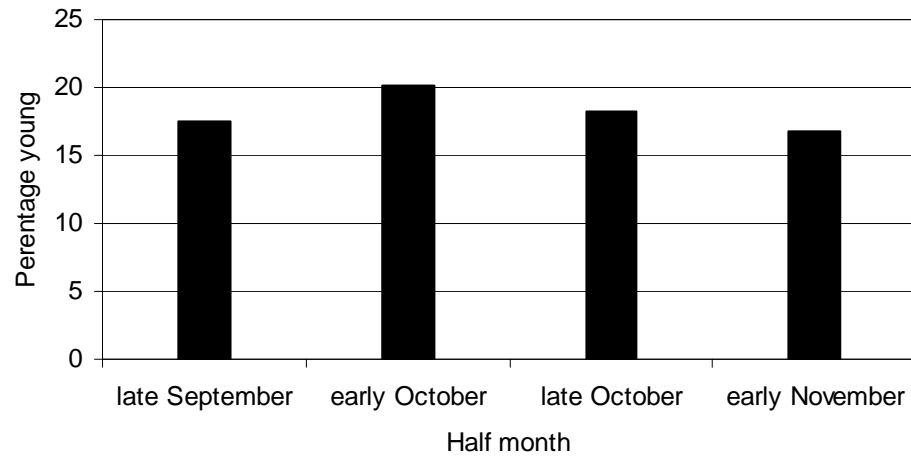


Figure 7. Mean percentage young derived from Pink-footed Goose age samples during autumn 2009.

4 Discussion

The 2009 Icelandic-breeding Goose Census revealed an increase of 3.7% in the Pink-footed Goose population estimate compared to 2008 (Figure 8) to the highest figure ever recorded. The long-term trend is one of apparent steady growth; numbers have increased seven fold in the last fifty years from *c.*50,000 birds in 1960 to *c.*364,000 in 2009. The population estimate of Iceland Greylag Goose was 11.4% higher than that recorded in 2008. The long-term trend is one of an apparent stable population of *c.*80,000–110,000 birds since the mid 1980s, with a decrease in numbers recorded during the mid 1990s (Figure 8).

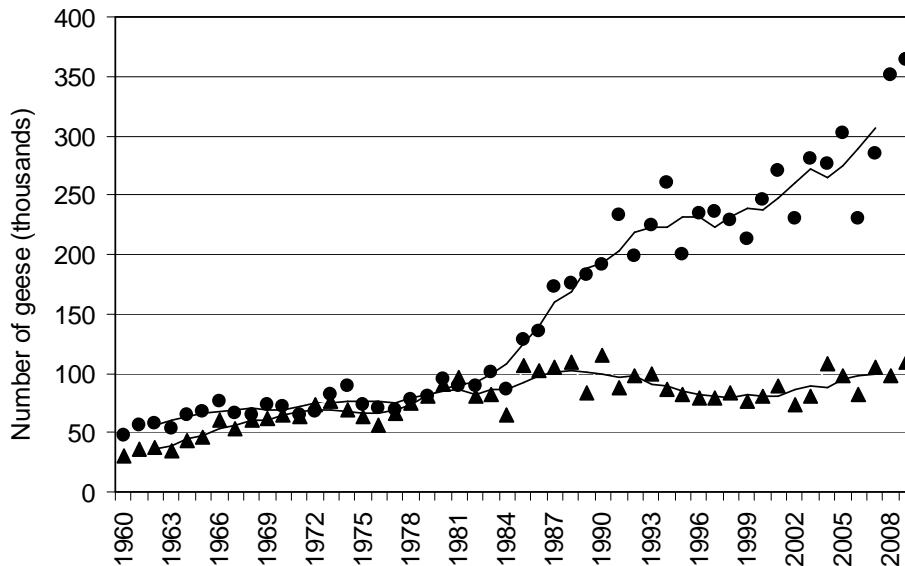


Figure 8. Population estimates for Pink-footed Goose (circles) and Iceland Greylag Goose (triangles), 1960 to 2009. The five-year running means (e.g. mean for 2007 is from population estimates for 2005–2009) are shown as lines

The 2008 population estimate for Pink-footed Goose appears reasonable since coverage, particularly of the main sites, was good and counts were undertaken in reasonable conditions. Breeding success in summer 2009 was slightly lower than the 1999–2008 mean (19.3%, Figure 6a) but apparently more than compensated for annual mortality. The new population estimate, and that of 2008, appear to confirm that the 2006, and possibly the 2007, population estimates (Newth 2007, Mitchell 2008) were underestimates.

Bag statistics from Iceland for 2009 suggest that *c.*17,420 Pink-footed Geese were shot there during the autumn, a slight increase on the mean for the last 10 years (*c.*14,350 geese, data from Wildlife Management Institute, Akureyri, Iceland). Unfortunately, meaningful bag statistics remain unavailable from Britain and Ireland. This makes interpreting changes in population dynamics all the more complicated.

As in 2008, Pink-footed Geese were early in reaching Britain in autumn 2009, with arrivals of large numbers at several important sites, notably on the east coast of Scotland – Loch of Strathbeg recorded 60,626 birds on 23 September and Montrose Basin held 51,000 birds on 7 October. Few Pink-footed Geese were recorded in Iceland at the time of the October IGC count (Arnór Sigfússon pers. comm.), however, the species sometimes remains 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 an underestimate occurs, notably so in 2006, large numbers may still be residing at inaccessible and uncounted areas of Iceland. It would appear prudent that coverage of sites holding Pink-footed Geese needs to be maintained in both October and November due to the varying time of arrival from the breeding grounds.

The count of Iceland Greylag Geese was comprehensive with sites being covered throughout most of the winter range. It was particularly good to get coverage in the Faroe Islands and Southwest Norway. However, fewer sites were covered in Ireland in autumn 2009 (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, once again, a record total count (unadjusted) of 80,538 Greylag Geese in December 2009. The survey of the summering stock, carried out in summer 2008, estimated 10,000 birds, but no survey was possible in summer 2009. 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 has given 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.*12,300 birds in summer 2009. 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. Movements of the Orkney summering birds remain poorly known, however, although early results from the ringing programme initiated in summer 2008 confirm that most of these birds are resident on the islands (Alan Leitch pers. comm.).

The situation on Shetland is just as complex. A survey in August 2009, the first to cover the entire islands, 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. During autumn 2009, no IGC counts were made in October or November, but *c.*1,000 Greylag Geese were counted in December. This was acknowledged by the counter as an underestimate but these could comprise entirely summer residents, Iceland winter visitors, or a mixture of the two. Of all the locations in Britain where a better understanding of the status and movements of summer stock are required to make sense of the status of Iceland Greylag Geese, Orkney and Shetland appear two of the most important.

As mentioned last year, 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 of birds counted in the winter.

The November 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 of the southern lowlands together with non-systematic information provided by hunters and local birdwatchers around the country. This suggested that between 15,000 and 30,000 birds were present (Arnór Sigfússon pers. comm.). The large range of this estimate is not ideal given the potentially large numbers involved and the consequent importance of this count in deriving an accurate population estimate. However, this simply reflects the size of the area occupied by Greylag Geese in autumn in Iceland and the relatively few counters available. Given this estimate, a central figure of 22,500 was used for deriving the overall population estimate (Table 2). Thus, the population estimate for Iceland Greylag Geese is perhaps more accurately expressed as 109,496 birds (range 102,000 – 117,000). Interestingly, *c.*2,000–3,000 Greylag Geese were also thought to have overwintered in southern Iceland – the second winter in succession that such high numbers have been present (Arnór Sigfússon pers. comm.).

Trinder *et al.* (2010) analysed the IGC data from the last 15 years, the time in which the majority of Iceland Greylag Geese began wintering on Orkney. This shift in winter distribution has probably meant that fewer Greylag Geese are being shot in Britain, as there are fewer wildfowlers on Orkney than in East and East Central Scotland. Despite the annual harvest in Iceland of *c.*30,000–40,000 Greylag Geese (data from Wildlife Management Institute, Akureyri, Iceland), a presumed reduction in the number shot in other parts of the winter range and breeding success at over 20% young in eight out of the last nine years (Figure 6b) was thought sufficient to reverse the decline noted in this population during the 1990s.

Peak counts of Greylag Geese have occurred in November in each of the five years 2005 to 2009, but it would appear prudent that coverage of sites holding Greylag Geese needs to be maintained in both November and December, due to the varying time of arrival from the breeding grounds.

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