



**Status and distribution of  
Icelandic-breeding geese: results of  
the 2008 international census**

**Wildfowl & Wetlands Trust Report**

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**Goose & Swan Monitoring**

# Contents

Summary	iv
<b>1 Introduction</b>	<b>1</b>
<b>2 Methods</b>	<b>2</b>
<b>3 Results</b>	<b>3</b>
3.1 Coverage and conditions	3
3.2 Total numbers	4
3.2.1 Pink-footed Goose	4
3.2.2 Greylag Goose	4
3.3 Regional Distribution	7
3.3.1 Pink-footed Goose	7
3.3.2 Greylag Goose	7
3.4 Principal concentrations	10
3.4.1 Pink-footed Goose	10
3.4.2 Greylag Goose	10
3.5 Breeding success	14
3.6 Revised population estimates	17
3.6.1 2007 Census (Mitchell 2008.)	17
<b>4 Discussion</b>	<b>18</b>
<b>5 Acknowledgements</b>	<b>20</b>
<b>6 References</b>	<b>21</b>
<b>Appendix 1</b>	<b>22</b>

## Summary

The 49th consecutive census of Greenland/Iceland Pink-footed Geese and Iceland Greylag Geese took place during autumn and early winter 2008. Sites holding Pink-footed Geese were primarily checked in October and November, whilst those holding Greylag Geese were checked primarily in November and December. The staggering of counts has become necessary due to later departures of Greylag Geese from their Iceland breeding grounds. Some sites in the UK were also counted during late August and September in order to estimate the numbers of Greylag Geese from the Northwest Scotland and Re-established 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 received from Norway, the Faroe Islands, Ireland and Iceland, the latter based on ground counts. Weather conditions were generally considered favourable during the counts with very few sites reporting underestimated counts due to poor visibility or disturbance.

Maxima of 340,734 Pink-footed Geese were counted in October 2008 and 110,441 Greylag Geese in November 2008. 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 351,188 Pink-footed Geese and 98,291 Iceland Greylag Geese. Compared to population estimates in 2007, the 2008 figures represent an increase of 23.5% in the Pink-footed Goose population and a decrease of 6.9% in the Greylag Goose population.

The breeding success of Pink-footed Geese was above the mean for the previous decade at 22.8% young (mean percent young 1998-2007: 19.1%,  $\pm$  0.38 s.e.). The mean brood size of successful pairs was 2.08 goslings, which was slightly lower than the mean recorded during the preceding ten years (2.19,  $\pm$  0.06 s.e.). The breeding success of Iceland Greylag Geese was also relatively high, with flocks containing 25.0% young (mean percent young 1998-2007: 20.4%,  $\pm$  1.21 s.e.), and the mean brood size of 2.29 goslings per successful pair was less than that of the recent ten year mean (2.60,  $\pm$  0.09 s.e.).

# 1 Introduction

The Pink-footed Goose *Anser brachyrhynchus* population which breeds in Iceland and eastern Greenland winters almost exclusively in Britain (Mitchell 2008), 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 and East 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, the results of recent censuses, and other information, suggest that the departure of both species from Iceland may be occurring later in some years (e.g. Worden 2006). For Pink-footed Goose, this later arrival is detected by the November count, but for Greylag Goose, where arrival occurs later than Pink-footed Goose, a substantial proportion of birds remaining in Iceland could be missed during the November count in some years. A third coordinated count in December was therefore introduced in 2005 for a three-year trial period (Worden 2006) and results of the trial suggested that, from 2008, special emphasis on counting sites holding Pink-footed Geese should be conducted in October and November, and sites holding Greylag Geese should be conducted in November and December. The 2008 census was the first to adopt this methodology.

This report presents the 49th consecutive census and provides an update on the population size and breeding success of Pink-footed and Greylag Geese following the 2008 breeding season.

## 2 Methods

Counts were conducted by a network of volunteer observers and professional conservation staff over the weekends of 4/5 October, 8/9 November and 6/7 December 2008. 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 (14 October, 13 November and 12 December), thus minimising the likelihood of geese remaining in feeding areas overnight. However, this meant that the October count was unusually early. In a small number of areas where roost sites are 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.

Two types of adjustment were applied to the peak count totals in order to generate population estimates. For regularly monitored sites (those counted in at least three of the previous five years) that were not counted during the 2008 census, numbers were estimated from the mean of the counts made during the relevant month during 2003-2007. Estimated numbers 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.

Since 1960, the recording areas used in the annual IGC reports have reflected the county boundaries in use at the time. However, several changes to unitary/political boundaries, notably in Scotland, have occurred in recent years. This report uses county boundaries currently in use and a look-up table giving comparisons of old and new recording areas is given in Appendix 1.

## 3 Results

### 3.1 Coverage and conditions

Coverage in Britain and Ireland during 2008 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 2008.

	October	November	December
Number of sites counted	104	137	133
Number of sites holding Pink-footed Geese	47	61	56
Number of sites holding Greylag Geese	38	72	70

Outside Britain and Ireland, counts were made at several sites in the Faroe Islands in all three months and estimates of the maximum numbers in Iceland were determined through ground counts. No aerial survey was undertaken in Iceland in autumn 2008. 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 seven sites were provided.

Numbers at four sites needed to be estimated due to lack of coverage. In October, Lake of Menteith, Stirling/Falkirk/Clackmannan (4,845 Pink-footed Geese) and Horsey Mere, Norfolk (5,609 Pink-footed Geese) met the criteria for the calculation of an estimated count. In Aberdeenshire, counts could not be undertaken at Middlemuir in November and December, although Pink-footed Geese were known to be roosting there. Based on the number of feeding geese seen during the day, an estimated 2,000 birds were added to the November and December IGC totals. In Ireland, seven sites were counted in November (far fewer than in autumn 2007). Only two sites were covered in December and the November count (2,230 birds in total) was therefore used as an estimated count in December. No count was made in Shetland during December and an estimated count of 1,200 birds was used.

An attempt was made to allow for the presence of Re-established or Northwest Scotland 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 (E. Meek unpubl. data) which were subtracted from the Orkney IGC counts. The previous estimate (used in the 2007 IGC) was of only 5,000 birds and was probably an underestimate in the most recent years (see Discussion). In both Shetland and Caithness (Highland), increasing numbers of Greylag Geese are breeding and, although the total number remains unknown, 500 birds were deducted from the IGC counts from both areas. Likewise in Badenoch & Strathspey (Highland), the summer stock is increasing and 150 birds were deducted from the IGC counts. Discussion with local area organisers estimated the presence of c.1,200 Re-established Greylag Geese in October, c.600 in November and c.500 in December in Lothians and c.400 Re-established Greylag Geese in both November and December in Northumberland. Despite the presence of small numbers of Re-established 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 summering Greylag Geese.

Weather conditions were reported as good for most sites with no sites reporting poor visibility in October, two in November and none in December. Low counts (where counters felt they had underestimated the number of birds present) were received for no sites in October, four in November (three due to disturbance) and four in December (two due to disturbance).

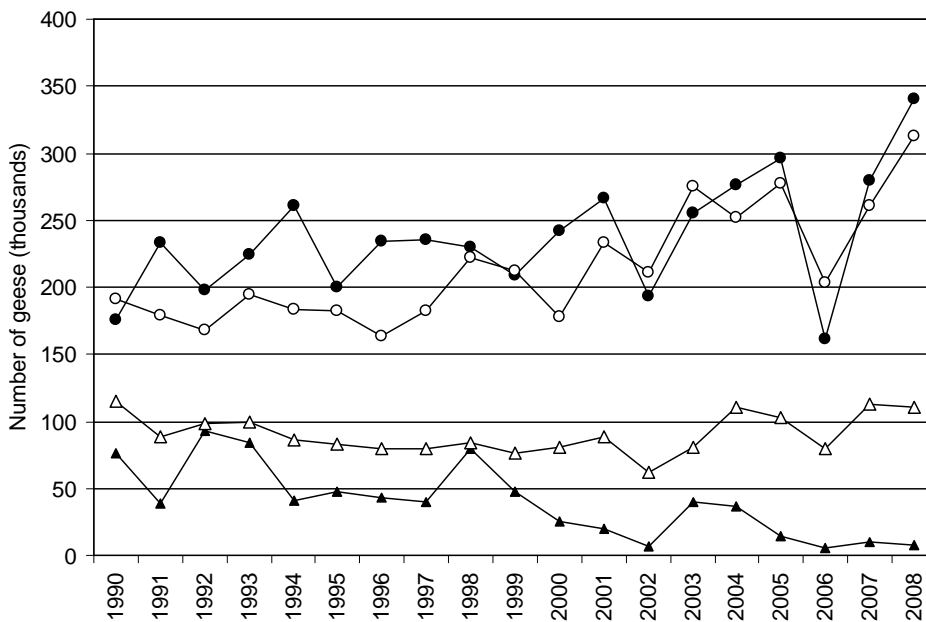
### 3.2 Total numbers

#### 3.2.1 Pink-footed Goose

Totals of 340,734 Pink-footed Geese were counted in October, 313,127 in November and 290,807 in December (Figure 1, Table 2). These represent increases of 21.8%, 19.9% and 51.1%, respectively, compared to the revised raw total counts in the same months in the preceding year (see Section 4). After the addition of estimated counts, the peak winter total in October 2008 was used to derive a population estimate of 351,188 geese. This represents a significant increase of 23.4% since 2007, when 284,405 individuals were estimated (see Section 4 for revision of the population estimate presented in Mitchell 2008).

#### 3.2.2 Greylag Goose

Totals of 7,966 Greylag Geese were counted in October, 110,441 in November and 98,904 in December (Figure 1, Table 2). These represent decreases of 19.0%, 1.6% and 2.5%, respectively, compared to the revised raw total counts in the same months in the preceding year (see Section 4). Following adjustments and addition of estimated counts, the peak winter total in November 2008 was used to derive a population estimate of 98,291 Greylag Geese. This represents a decrease of 6.9% since the previous adjusted estimate of 105,630 geese recorded in 2007 (see Section 4).



**Figure 1.** Peak counts of Pink-footed Geese (circles) and Iceland Greylag Geese (triangles) counted in October (filled) and November (open) during the Icelandic-breeding Goose Census, 1990 to 2008.



**Table 2.** Total of Pink-footed Geese and Iceland Greylag Geese by country and region in October, November and December 2008. 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*	1,000	nc	nc	18,000	nc	1,500
Norway*	0	nc	250	2,502	250	2,600
Faroe Islands*	2	1,577	6	570	0	nc
Ireland	nc	nc	0 (7)	2,230 (7)	0 (2)	277 (2) [+1,953]
Shetland*	56	1,724	0	1,246	0	nc [+1,200]
		[-500]		[-500]		[-500]
Orkney*	nc	nc	0	53,828	0	68,349 [-10,000]
				[-10,000]		[-10,000]
Caithness*	nc	nc	60	12,129	148	3,089 [-500]
				[-500]		[-500]
Highland	243 (11)	409 (11)	11,296 (14)	10,070 (14)	5,200 (15)	7,288 (15) [-150]
		[-150]		[-150]		[-150]
Moray	141 (2)	0 (2)	10,850 (2)	172 (2)	6,800 (2)	142 (2)
Aberdeenshire	77,109 (6)	55 (6)	33,187 (6)	1,443 (6)	30,378 (5)	743 (5) [+2,000]
						[+2,000]
Angus/Dundee	41,661 (4)	117 (4)	12,692 (5)	780 (5)	11,576 (5)	2,726 (5)
Perth & Kinross	32,345 (7)	503 (7)	26,962 (12)	2,084 (12)	20,226 (14)	2,908 (14)
Stirling/Falkirk/Clackmannan	685 (4)	532 (4)	4,463 (4)	57 (4)	1,169 (4)	546 (4) [+4,845]
						[+4,845]
Fife	883 (12)	30 (12)	8,455 (15)	647 (15)	18,166 (16)	2,282 (16)
Argyll & Bute	1 (3)	954 (3)	7 (3)	1,256 (3)	4 (3)	1,114 (3)
Clyde	0 (1)	0 (1)	176 (1)	488 (1)	902 (1)	620 (1)
Ayrshire	0 (1)	0 (1)	0 (1)	0 (1)	0 (1)	60 (1)
Dumfries & Galloway**	1,932 (8)	454 (8)	6,403 (8)	362 (8)	7,814 (7)	218 (7)
Lothians	34,582 (12)	1,296 (12)	14,884 (13)	955 (13)	6,416 (14)	929 (14) [-1,200]
		[-1,200]		[-600]		[-500]
Borders	53,670 (9)	225 (9)	19,341 (9)	557 (9)	10,312 (10)	1,820 (10)
Northumberland	3,596 (8)	90 (8)	2,296 (14)	1,065 (14)	978 (14)	1,493 (14) [-400]
				[-400]		[-400]

Region	October		November		December	
	Pinkfoot	Greylag	Pinkfoot	Greylag	Pinkfoot	Greylag
Cumbria**	1,500 (3)	0 (3)	4,208 (4)	0 (4)	1,881 (3)	200 (3)
Lancashire & Merseyside*	51,310	0	90,455	0	54,185	0
N Wales/Dee Estuary	nc	nc	nc	nc	nc	nc
Humber side	2,460 (2)	0 (2)	8,150 (2)	0 (2)	1,840 (2)	0 (2)
Norfolk	37,558 (6)	0 (6)	59,024 (8)	0 (8)	112,562 (8)	0 (8)
	[+5,609]					
<i>Raw total counts</i>	340,734	7,966	313,127	110,441	290,807	98,904
<i>Adjustment for non-Icelandic birds</i>	n/a	-1,850	n/a	-12,150	n/a	-12,050
<i>Estimated counts</i>	+10,454		+2,000		+2,000	+3,153
<b>Population Estimate</b>	<b>351,188</b>			<b>98,291</b>		

\* 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

Southeast Scotland/Northeast England held the highest number of birds in October with a high percentage also present in Northeast Scotland and East Central Scotland (Table 3, Figure 2). By November, a large movement of birds into West England had occurred, where 90,455 Pink-footed Geese (a record count) were recorded in Southwest Lancashire, and by December, many of these had moved to East England where 112,562 birds were counted.

#### 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, 70.0% of the population was present in North Scotland, principally on Orkney, with most of the remainder still in Iceland. The distribution in December was remarkably similar to November and, although no systematic count was made in Iceland during this month, no more than 1,500 birds were thought to be there (Table 3, Figure 3).

**Table 3.** National and, within Britain, regional distribution of Pink-footed Geese and Iceland Greylag Geese during October, November and December 2008, expressed as a percentage of the maximum count for each species. Areas are defined in Appendix 1.

	Pink-footed Goose			Greylag Goose		
	October	November	December	October	November	December
Iceland	0.1	n/a	n/a	n/a	16.3	1.4
Faroe Islands	0	0	0	1.4	0.5	0
Southwest Norway	0	0.1	0.1	n/a	2.3	2.4
Ireland	0	0	0	n/a	2.0	2.0
North Scotland	0.1	3.3	1.6	1.9	70.0	71.3
Northeast Scotland	22.7	12.9	10.9	0.1	1.5	0.8
East Central Scotland	22.2	15.4	15.0	1.1	3.2	7.7
Southeast Scotland/ Northeast England	27.0	10.7	5.2	1.5	1.5	3.8
Southwest Scotland/Northwest England	1.0	3.2	3.1	1.3	2.8	2.0
West England	15.1	26.5	15.9	n/a	n/a	n/a
East England	11.7	19.7	33.5	n/a	n/a	n/a
<b>Total</b>	<b>100.0</b>	<b>91.9</b>	<b>85.2</b>	<b>7.2</b>	<b>100.0</b>	<b>91.3</b>

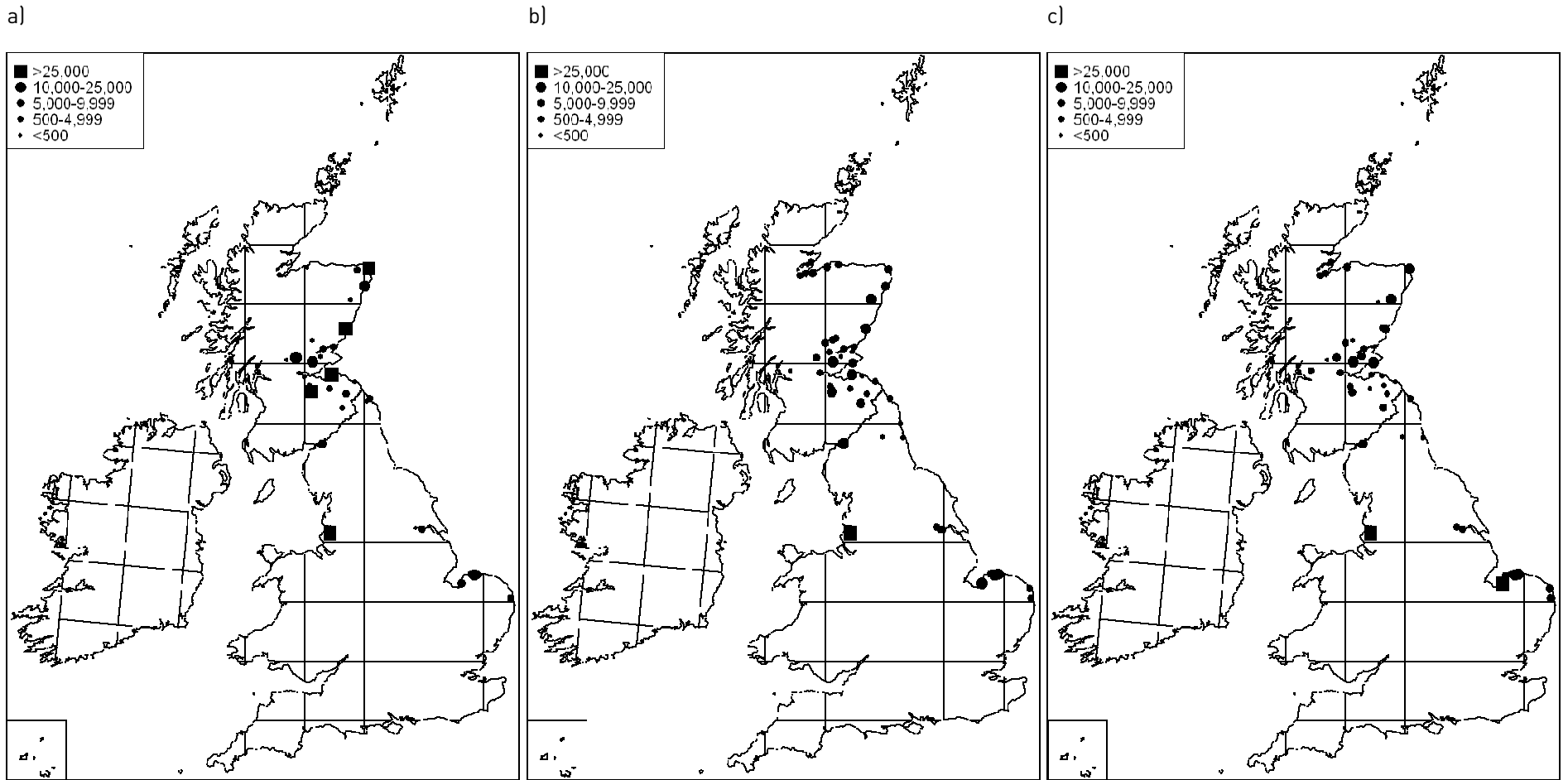
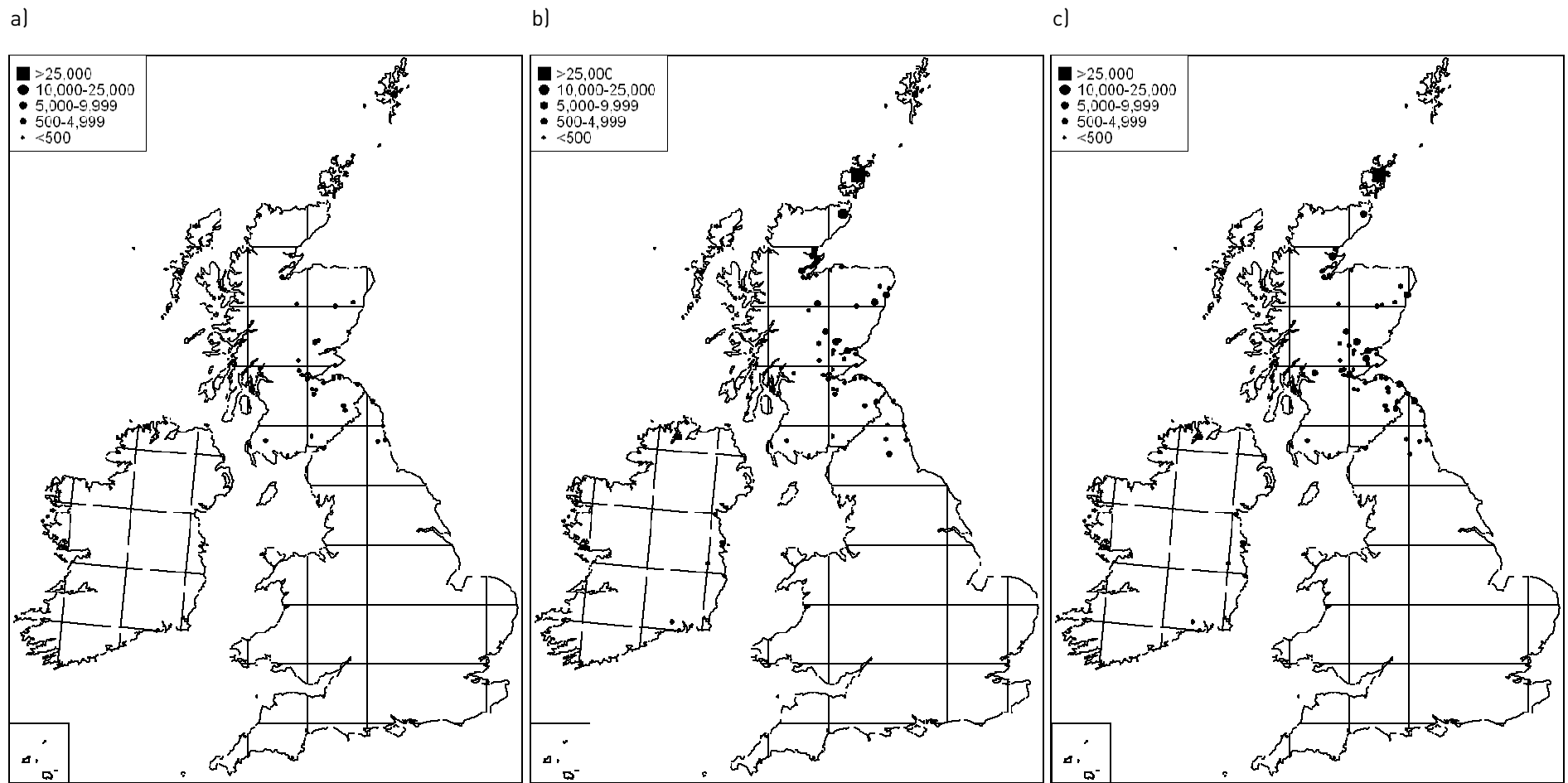


Figure 2. Distribution of Pink-footed Geese in Britain and Ireland in October (a), November (b) and December (c) 2008. Estimated counts are not shown.



**Figure 3.** Distribution of Iceland Greylag Geese in Britain and Ireland in October (a), November (b) and December (c) 2008. Estimated counts are not shown.

## 3.4 Principal concentrations

### 3.4.1 Pink-footed Goose

Pink-footed Geese were recorded at 47 sites in October, 61 in November and 56 in December (this includes consolidated sites, but excludes estimated counts) (Table 1). Those sites holding more than 1% of the population estimate (3,512 birds) increased from 13 in October to 23 in November then decreased again to 17 in December (Table 3). Nine sites held over 10,000 birds in October, nine in November and eight in December. Combined counts from the 13 sites exceeding 1% of the population estimate in October accounted for 89.8% of the total October count and numbers at the top five sites alone held 63.6% of the population estimate (Table 4). The most recent peak IGC counts from the top two sites are shown in Figure 4.

Particularly high numbers were recorded at Loch of Strathbeg (Aberdeen), with 15.2% of the October population estimate, Southwest Lancashire (14.6%) and West Water Reservoir (Borders, 13.5%). The count of 90,455 Pink-footed Geese in Southwest Lancashire in November is the largest number ever recorded at this consolidated site. Higher than recent average numbers in October 2008 were also recorded at Aberlady Bay (Lothians), Carsebreck & Rhynd Lochs (Perth & Kinross), Duns Dish (Angus), Meikle Loch (Aberdeen), Montrose Basin (Angus) and Snettisham (Norfolk). Lower than average numbers were recorded during October 2008 at Findhorn Bay (Highland), East Chevington Pools and Holburn Moss (both in Northumberland), Loch of Lintrathen (Angus), Loch of Skene (Aberdeen), Loch Spynie (Moray), Loch Tullybelton and Bloody Inshes (both in Perth & Kinross) and Read's Island Flats (Humberside).

### 3.4.2 Greylag Goose

By November, 72 sites held Greylag Geese (Table 1), 11 of which held numbers exceeding 1% of the population estimate (983 birds) (this considers Orkney as one site). Orkney held 54.7% of the population during this month (Table 3). Greylag Geese were recorded at 68 sites in December; those with counts exceeding 1% of the population estimate decreased to eight, with Orkney holding 68,349 birds. This last count was the highest ever recorded on the islands and continues the marked shift in the distribution of the birds to these northern isles. Higher than recent average numbers were also recorded in November 2008 at Caithness, Derwent Reservoir (Northumberland), Dornoch Firth and Insh Marshes (both in Highland) and Meikle Loch (Aberdeen). Lower than usual numbers were recorded in November 2008 at Alloa Inch (Stirling, Clackmannanshire & Falkirk), Baron's Folly and Dowlaw Dam (both Borders), Carsebreck & Rhynd Lochs and Bloody Inshes (both in Perth & Kinross), Cromarty Firth (Highland), Findhorn Bay and Loch Spynie (both in Moray), Kilconquhar Loch and Rossie Bog (both in Fife) and Loch of Auchlossan (Aberdeen).

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 nine did so in December, although these individual counts are not adjusted for the presence of Greylag Geese breeding on Orkney (now though to number c.10,000 birds) since such data are only available for Orkney as a whole. Only on East Mainland and West Mainland were more than 10,000 birds recorded, which equates to 66.3% of the Orkney total in November (36.3% of the population estimate) and 69.1% in December. Total numbers in Orkney during the December count were the highest recorded there since monitoring began.

**Table 4.** Sites that supported more than 1% of the (a) Pink-footed Goose (>3,512) and (b) Iceland Greylag Goose (>983) population estimates in October and November 2008, 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).

## a) Pink-footed Goose

Site	October count	Percentage of population estimate	Five year peak mean 2004–2008 <sup>1</sup>
Loch of Strathbeg, Aberdeen	53,454	15.2	36,526
Southwest Lancashire	51,310	14.6	49,068
West Water Reservoir, Borders	47,361	13.5	33,953
Montrose Basin, Angus	38,911	11.1	25,203
Aberlady Bay, Lothians	32,244	9.2	16,921
Meikle Loch, Slains, Aberdeen	19,700	5.6	14,772
Loch Leven, Perth Kinross	17,618	5.0	17,082
Holkham, Norfolk	15,318	4.4	37,765
Carsebreck & Rhynd Lochs, Perth & Kinross	14,600	4.2	9,636
Snettisham, Norfolk	8,515	2.4	28,368
Hule Moss, Borders	6,250	1.8	5,840
Wells, Norfolk	5,685	1.6	14,537 <sup>2</sup>
Scolt Head, Norfolk	4,644	1.3	12,796

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

<sup>2</sup> Mean derived from 2006–2008 only.

## b) Greylag Goose

Site	November count	Percentage of population estimate	Five year peak mean 2004–2008 <sup>1</sup>
Orkney Islands (all sites)	53,828	54.7	54,902
Iceland (lowlands)	18,000	18.3	12,665
Caithness	12,129	12.3	9,154
Dornoch Firth, Highland	3,112	3.2	2,194
Loch Eye, Highland	2,574	2.6	5,533
South West Norway	2,502	2.5	2,251 <sup>2</sup>
Ireland	2,200	2.2	3,752 <sup>2</sup>
Shetland (consolidated)	1,246	1.3	1,116 <sup>3</sup>
Bute, Argyll & Bute	1,200	1.2	1,570
Loch Fleet, Highland	1,110	1.1	1,365
Loch Insh and Insh Marshes, Highland	1,047	1.0	495

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

<sup>2</sup> Mean derived from 2007–2008 only.

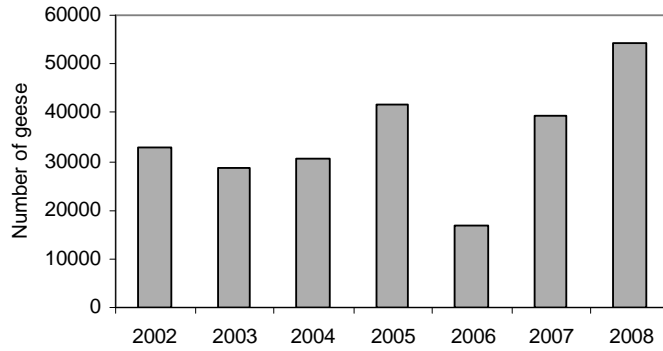
<sup>3</sup> Mean derived from 2005–2008 only.

**Table 5.** Greylag Goose counts at individual sites on Orkney in November and December 2008 (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 2008 (no counts were undertaken in December 2004).

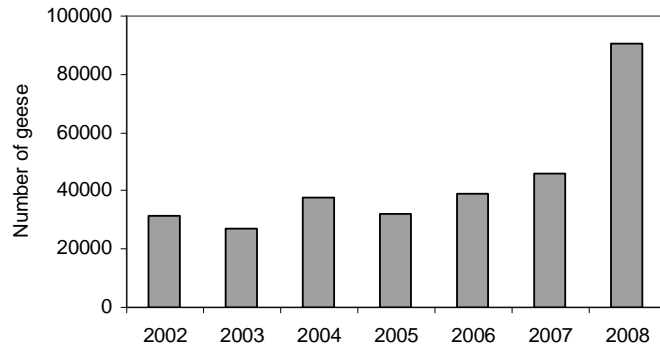
	<b>November count</b>	<b>% of population estimate</b>	<b>December count</b>	<b>% of population estimate</b>	<b>Five year peak mean</b>
West Mainland	22,952	23.3	33,306	33.8	27,076
East Mainland	12,718	12.9	13,945	14.2	11,797
Island of Stronsay	4,255	4.3	4,938	5.0	3,664
Island of South Ronaldsay	3,063	3.1	3,829	3.9	3072
Island of Shapinsay	3,204	3.3	3,657	3.7	3776
Island of Sanday	2,430	2.5	3,100	3.2	2607
Island of Papa Westray	940	1.0	1,408	1.4	1000
Island of Eday	1,320	1.3	1,125	1.1	1141
Island of Rousay	303	0.3	1,012	1.0	1015
Island of Westray	630	0.6	495	0.5	653
Island of North Ronaldsay	454	0.5	465	0.5	331
Island of Egilsay	720	0.7	376	0.4	764
Island of Burray	193	0.2	371	0.4	216
Island of Wyre	405	0.4	254	0.3	428
Isles of Hoy and Walls	241	0.2	68	0.1	409
<b>Total</b>	<b>53,828</b>	<b>54.7</b>	<b>68,349</b>	<b>69.5</b>	<b>57,953</b>



a) Loch of Strathbeg

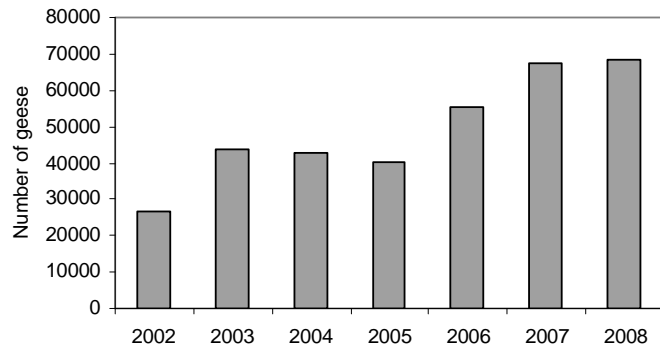


b) Southwest Lancashire

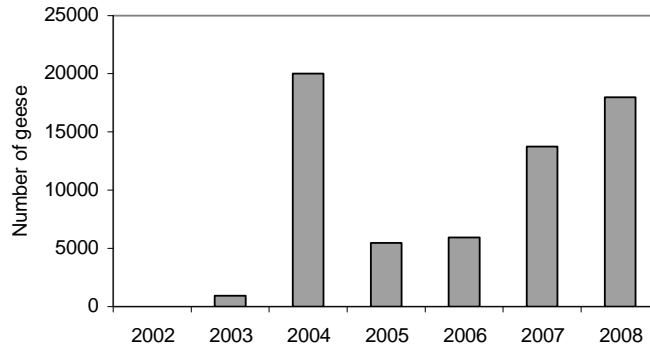


**Figure 4.** Peak IGC counts of Pink-footed Geese at Loch of Strathbeg (a) and Southwest Lancashire (b), 2002 to 2008.

a) Orkney



b) Iceland



**Figure 5.** Peak IGC counts of Iceland Greylag geese at Orkney (a) and Iceland (b), 2002 to 2008

### 3.5 Breeding success

Totals of 14,478 Pink-footed Geese (from 30 flocks) and 1,890 Greylag Geese (31 flocks) were aged at various localities throughout Scotland and England between 17 September and 19 November. The percentage of birds aged in relation to the estimated size of the population in 2008 was 4.1% for Pink-footed Goose and 1.9% for Greylag Goose. Information on the brood sizes of 107 families of Pink-footed Goose and 42 families of Greylag Goose was also collected during this period.

The breeding success of Pink-footed Geese was above the mean for the previous decade at 22.8% young (mean proportion of young 1998-2007: 19.1%,  $\pm$  0.38 s.e.). The mean brood size of successful pairs was 2.08 goslings, slightly lower than the mean recorded during the preceding ten years (mean brood size 1998-2007: 2.19,  $\pm$  0.06 s.e.) (Table 6, Figure 6).

There was evidence of modest regional variation in the percentage of young Pink-footed Geese, which varied from 15.6% in North Scotland to 25.6% in Southeast Scotland, although both were based on small sample sizes (Table 6). Similarly, mean brood size varied from 1.79 goslings in East England to 2.47 recorded in East Central Scotland. The majority of birds were aged during the second half of October (57.0% of the sample). The percentage young declined from late September to early November (Figure 7).

The breeding success of Iceland Greylag Geese was higher than the mean for the previous decade, with flocks containing 25.0% young (mean 1998-2007: 20.4%,  $\pm$  1.21 s.e.). However, the mean brood size of 2.29 goslings per successful pair was less than that of the recent ten year mean (mean 1998-2007: 2.60,  $\pm$  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 were limited and age counts were only collected in one region (North Scotland) during early November.

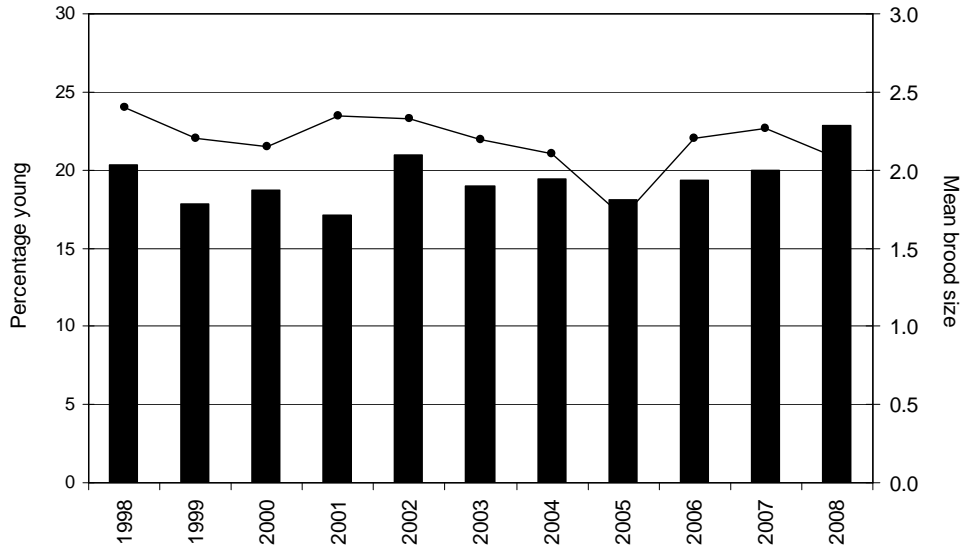
**Table 6.** The percentage of young and mean brood size of Pink-footed and Greylag Geese in autumn 2008 (regions defined in Appendix 1).

	Region	Total aged	% young	No. of broods	Mean brood size
Pink-footed Goose <sup>1</sup>	North Scotland	96	15.6		
	Northeast Scotland	5,055	22.8	60	2.05
	East Central Scotland	3,759	20.7	23	2.47
	Southeast Scotland	1,217	25.6		
	Southwest Scotland	621	23.5		
	East England	1,277	24.4	24	1.79
	West England	2,453	24.1		
	<b>Total</b>	<b>14,478</b>	<b>22.8</b>	<b>107</b>	<b>2.08</b>
Greylag Goose <sup>2</sup>	North Scotland	1,890	25.0	42	2.29
	<b>Total</b>	<b>1,890</b>	<b>25.0</b>	<b>42</b>	<b>2.29</b>

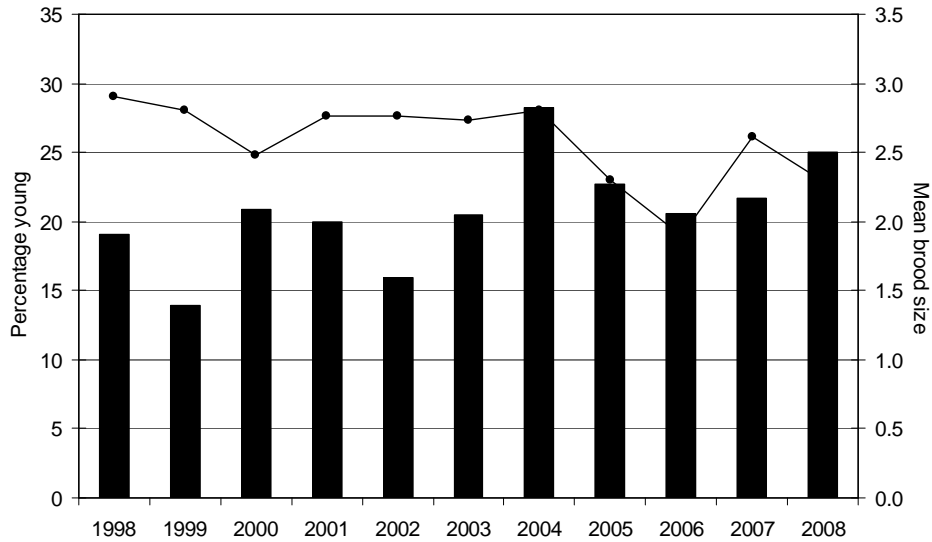
<sup>1</sup> Pink-footed Geese aged between 17 September and 19 November.

<sup>2</sup> Greylag Geese aged between 8 and 9 November.

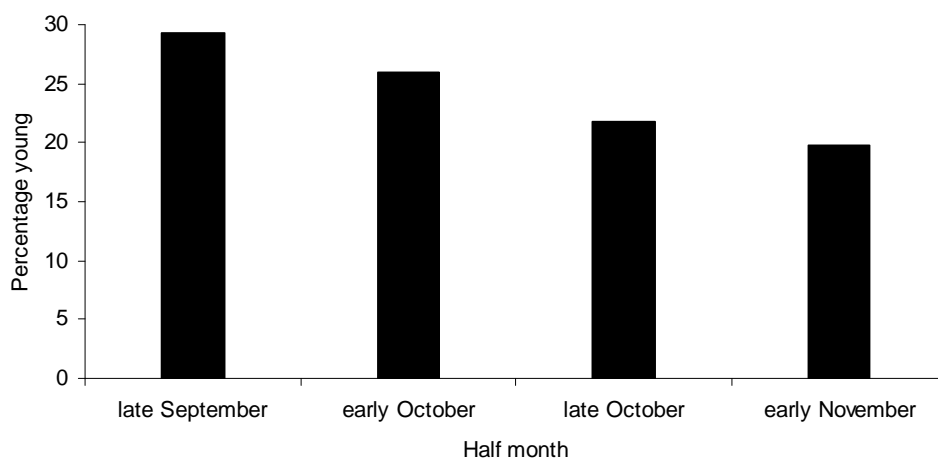
a) Pink-footed Goose



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, 1998–2008.



**Figure 7.** Mean percentage young derived from Pink-footed Goose age samples during autumn 2008.

## 3.6 Revised population estimates

### 3.6.1 2007 Census (Mitchell 2008.)

No late submissions of 2007 count data were received, however, several minor mistakes were made in the last annual report (Mitchell 2008). The correct values were kindly pointed out by Allan Brown and the revised population estimates are given in Table 7. For example, one involved ascribing counts from the Tay Estuary to the wrong recording area (Fife instead of Angus/Dundee). Another involved including counts that were not verified (for Gladhouse Reservoir, East/Midlothian) and a typographical error was made for the number of Pink-footed Geese recorded at Aberlady Bay, East/Midlothian in December 2007.

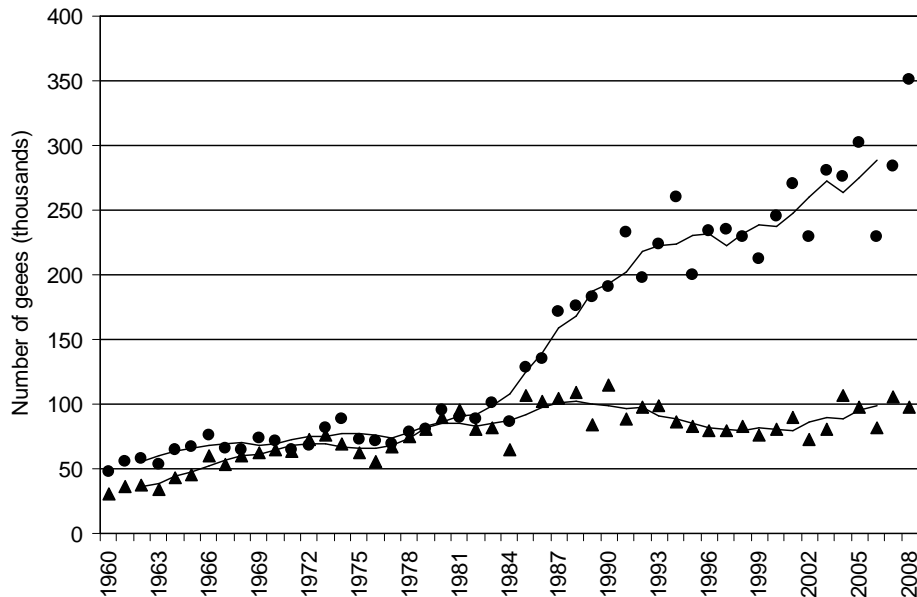
Correction of these errors did not affect the population estimates markedly. The population estimates given in Mitchell (2008) were 287,563 Pink-footed Geese and 107,137 Greylag Geese. The corrected figures (Table 7) show a reduction of 1% of the Pink-footed Goose population estimate and a reduction of 1.4% in the Greylag Goose estimate. Corrections are always welcomed (and, with the late submission of data, sometimes inevitable) since they provide the opportunity to refine the population estimates for future analysis.

**Table 7.** Revised Pink-footed Goose and Iceland Greylag Goose counts in October, November and December 2007 and population estimates for 2007. Raw counts are shown with adjustments for non-Icelandic birds [-x] and estimated counts are given in brackets [+x]. Figures in parentheses indicate the number of sites visited.

Region	October		November		December	
	Pinkfoot	Greylag	Pinkfoot	Greylag	Pinkfoot	Greylag
Angus/Dundee	29,569 (3)	257 (3)	15,435 (3)	291 (3)	6,740 (2)	718 (2)
Perth & Kinross	29,761 (9)	808 (9)	17,547 (12)	3,276 (14)	14,232 (11)	3,172 (11)
		[-27]		[-27]		[-27]
Stirling/Falkirk/Clackmannan	2,376 (4)	0 (4)	1,238 (4)	52 (4)	1,120 (4)	0 (4)
	[+4,615]					
Fife	1,653 (19)	74 (19)	10,452 (21)	1,225 (21)	3,065 (20)	1,476 (20)
East/Midlothian	14,605 (10)	387 (10)	11,637 (10)	307 (10)	3,491 (10)	165 (10)
		[-387]		[-100]		[-100]
Edinburgh/West Lothian	0 (3)	199 (3)	470 (3)	331 (3)	0 (3)	152 (3)
		[-199]		[-100]		[-100]
West Borders/ Tweedale	32,229 (9)	320 (9)	19,074 (10)	520 (10)	5,626 (10)	102 (11)
<i>Raw total counts</i>	279,790	9,834	261,199	112,216	192,488	101,419
<i>Adjustment for non-Icelandic birds</i>	n/a	1,023	n/a	6,586	n/a	6,230
<i>Estimated counts</i>	4,615	n/a	n/a	n/a	n/a	n/a
<b>Revised population estimate</b>	<b>284,405</b>		<b>105,630</b>			

## 4 Discussion

The 2008 Icelandic-breeding Goose Census revealed an increase of 23.4% in the Pink-footed Goose population estimate compared to 2007 (Figure 8) to the highest figure ever recorded. The long-term trend is one of apparent steady growth; numbers have increased seven fold from c.50,000 birds in 1960 to c.350,000 in 2008. The population estimate of Iceland Greylag Goose was 6.9% lower than that recorded in 2007. The long-term trend is one of an apparent stable population of c.80,000–100,000 birds since the mid 1980s (Figure 8).



**Figure 8.** Population estimates for Pink-footed Goose (circles) and Iceland Greylag Goose (triangles), 1960 to 2008. The five-year running means (e.g. mean for 2006 is from population estimates for 2004–2008) are shown as lines

Despite the large increase in Pink-footed Goose numbers between 2007 and 2008, the 2008 population estimate appears reasonable since coverage, particularly of the main sites, was good. Breeding success was high in summer 2008 and above the 1998–2007 mean of 19.1%, (Figure 4a) and apparently more than compensated for annual mortality. This suggests that the 2007 population estimate (in Mitchell 2008) may have been a modest underestimate, and that the population estimate for 2006 (in Newth 2007) was a considerable underestimate. Bag statistics from Iceland for autumn 2008 are not yet available, but it is not expected that these were significantly greater than other recent years (c. 10,000–15,000 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.

Pink-footed Geese were early in reaching Britain in autumn 2008 with rapid a increase in numbers witnessed at several important sites – the top five sites alone accounting for 63.6% of the population estimate. In order to avoid the mid month full moon, the October count weekend was also unusually early and it seems that, with some good fortune, a mass early arrival of Pink-footed Geese into Britain in autumn 2008 coincided with favourable count conditions. Very few Pink-footed Geese were recorded in central Iceland in October (Arnór Sigfússon pers comm.), however, the species often remains dispersed at inaccessible areas at this time. Peak counts of Pink-footed Geese have occurred in November in two of the previous five years (in 2005 and 2006), so 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 autumn 2006) large numbers may still be residing at inaccessible 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.

Counts of Pink-footed Geese were received from Southwest Norway in autumn 2008. Whilst the numbers involved are modest (c.250 birds in November and December), this is an interesting new development and follows the establishment of Iceland Greylag Geese wintering in the area from the late 1990s. However, Pink-footed Geese from the Svalbard breeding population pass through southern Norway on the way south to Denmark and the Netherlands. It is possible, therefore, that the small number of Pink-footed Geese in Southwest Norway may belong to the Svalbard population.

The count of Iceland Greylag Geese was fairly 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 2008 (compared with an extensive survey carried out 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 a record count of 68,349 Greylag Geese in December 2008. However, a comprehensive survey of the summer stock (breeding pairs, their young and a large non-breeding component) was carried out in summer 2008 and an estimated 10,000 birds was found (Eric Meek pers comm.). Previous estimates of the summer stock have been lower than this figure (5,000 birds in 2006 and 2007, for example). Thus, the 2008 summer survey has given us greater confidence in estimating the number of Iceland Greylag Geese wintering on Orkney. For example, it is highly likely that there were more than the estimated 5,000 summer Greylag Geese on Orkney in autumn 2007, and the population estimate of Iceland Greylag Geese in that year could therefore have been an overestimate of several thousand individuals.

The movements of the Orkney summering birds remains largely unknown, although it is thought that most are resident throughout the year, with the Iceland population joining them from November onwards. A ringing programme of both summering and wintering birds has recently been initiated and this will shed light on whether any of the Orkney summer stock leaves the islands during the winter months (Alan Leitch pers comm.).

The survey of wintering Iceland Greylag Geese for the first forty years of the IGC counts was reasonably straightforward with Icelandic migrants and the Scottish summer stock rarely overlapping (although sites around Stranraer held both stock throughout the period). However, by the early 2000s the situation had become complicated due to the presence of increasing numbers of summer stock notably in Shetland, Orkney, Caithness, east Sutherland, Badenoch & Strathspey, and smaller numbers in southeast and east central Scotland. Continued ringing, especially of the summer stock, will help in determining the provenance of birds counted in the winter.

The November counts in Iceland, which have only recently been initiated, are based on a mixture of occasional dedicated aerial survey, together with ground coverage elsewhere and anecdotal evidence (rather than systematic counts) informing the estimate of the number present from a number of areas. Unfortunately, no aerial survey was possible in Iceland in autumn 2008 and information provided by hunters and local counters suggested that between 16,000 and 20,000 birds were present (Arnór Sigfússon pers comm.). Thus, the population estimate for November 2008 is perhaps more accurately represented by the estimate 98,291 birds (range 96,291 - 100,291). Interestingly, c.1500 Greylag Geese were also thought to overwinter in Iceland in the Eyjaföll area – the first time this has thought to have occurred (Arnór Sigfússon, pers comm.).

Despite the annual harvest of c.30,000-40,000 Greylag Geese annually in Iceland (data from Wildlife Management Institute, Akureyri, Iceland) and an unknown number shot in other parts of the winter range, breeding success at over c. 20% in seven out of the last eight years (Figure 6b) appears to be maintaining numbers at c.80,000 to c.100,000 individuals. However, as noted above, there is an increasing number of summering Greylag Geese in Scotland. Mitchell *et al.* (2008) estimated there to be c. 40,000 Greylag Geese in Scotland, based on a dedicated survey in summer 2008 (with more fieldwork planned for 2009). This will help in our understanding of the abundance and distribution of these birds. In particular, this will help in understanding where summering Greylag Geese are and where they are most likely to overlap with the winter distribution of Iceland birds, although more needs to be understood about post-breeding movements of these birds.

Since peak counts of Greylag Geese have occurred in November in each of the four years 2005 to 2008, 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.

## 5 Acknowledgements

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## Appendix 1

Since 1960, the recording areas used in the annual IGC reports have reflected the county boundaries in use at the time. However, several changes to unitary/political boundaries, notably in Scotland, have occurred in the last fifty years. This report now uses Local Authority Areas currently in use and a look-up table giving comparisons of old and new recording areas is shown below.

<b>Original IGC area</b>	<b>Local authority area</b>	<b>Bird recording area</b>	<b>Region</b>
Angus	Angus	Angus & Dundee	EC Scot
Dundee	Dundee City	Angus & Dundee	EC Scot
Clackmannanshire	Stirling, Falkirk & Clackmannanshire	Upper Forth	EC Scot
Falkirk	Stirling, Falkirk & Clackmannanshire	Upper Forth	EC Scot
Stirling	Stirling	Upper Forth	EC Scot
Dunfermline	Fife	Fife	EC Scot
Fife	Fife	Fife	EC Scot
Kirkcaldy	Fife	Fife	EC Scot
North East Fife	Fife	Fife	EC Scot
Perth And Kinross	Perth And Kinross	Perth And Kinross	EC Scot
Caithness	Highland	Caithness	N Scot
Sutherland	Highland	Highland	N Scot
Badenoch And Strathspey	Highland	Highland	N Scot
Inverness	Highland	Highland	N Scot
Lochaber	Highland	Highland	N Scot
Ross And Cromarty	Highland	Highland	N Scot
Skye And Lochalsh	Highland	Highland	N Scot
Nairn	Highland	Moray & Nairn	N Scot
Orkney	Orkney	Orkney	N Scot
Shetland	Shetland	Shetland	N Scot
Western Isles	Western Isles	Outer Hebrides	N Scot
Aberdeen	Aberdeen City	NE Scotland	NE Scot
Banff And Buchan	Aberdeenshire	NE Scotland	NE Scot
Gordon	Aberdeenshire	NE Scotland	NE Scot
Kincardine And Deeside	Aberdeenshire	NE Scotland	NE Scot
Moray	Moray	Moray & Nairn	NE Scot
Berwickshire	Borders	Borders	SE Scot/NE Eng
Ettrick And Lauderdale	Borders	Borders	SE Scot/NE Eng
Roxburgh	Borders	Borders	SE Scot/NE Eng
Tweeddale	Borders	Borders	SE Scot/NE Eng
East Lothian	East Lothian	Lothians	SE Scot/NE Eng
Edinburgh	Edinburgh City	Lothians	SE Scot/NE Eng
Midlothian	Midlothian	Lothians	SE Scot/NE Eng
West Lothian	West Lothian	Lothians	SE Scot/NE Eng
Argyll And Bute	Argyll And Bute	Argyll	SW Scot/NW Eng
Annandale And Eskdale	Dumfries And Galloway	Dumfries And Galloway	SW Scot/NW Eng
Nithsdale	Dumfries And Galloway	Dumfries And Galloway	SW Scot/NW Eng
Stewartry	Dumfries And Galloway	Dumfries And Galloway	SW Scot/NW Eng
Wigtown	Dumfries And Galloway	Dumfries And Galloway	SW Scot/NW Eng
Cumnock And Doon Valley	East Ayrshire	Ayrshire	SW Scot/NW Eng
Kilmarnock And Loudoun	East Ayrshire	Ayrshire	SW Scot/NW Eng
Cunninghame	North Ayrshire	Ayrshire	SW Scot/NW Eng
Kyle And Carrick	North Ayrshire	Ayrshire	SW Scot/NW Eng

<b>Original IGC area</b>	<b>Local authority area</b>	<b>Bird recording area</b>	<b>Region</b>
Glasgow	City Of Glasgow	Clyde	SW Scot/NW Eng
Bearsden And Milngavie	East Dumbartonshire	Clyde	SW Scot/NW Eng
Strathkelvin	East Dumbartonshire	Clyde	SW Scot/NW Eng
Eastwood	East Renfrewshire	Clyde	SW Scot/NW Eng
Inverclyde	Inverclyde	Clyde	SW Scot/NW Eng
Cumbernauld And Kilsyth	North Lanarkshire	Clyde	SW Scot/NW Eng
Monklands	North Lanarkshire	Clyde	SW Scot/NW Eng
Motherwell	North Lanarkshire	Clyde	SW Scot/NW Eng
Renfrew	Renfrewshire	Clyde	SW Scot/NW Eng
Clydesdale	South Lanarkshire	Clyde	SW Scot/NW Eng
East Kilbride	South Lanarkshire	Clyde	SW Scot/NW Eng
Hamilton	South Lanarkshire	Clyde	SW Scot/NW Eng
Clydebank	West Dumbartonshire	Clyde	SW Scot/NW Eng
Dumbarton	West Dumbartonshire	Clyde	SW Scot/NW Eng