



**Status and distribution of  
Icelandic-breeding geese: results of  
the 2007 international census**

**Wildfowl & Wetlands Trust Report**

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**Goose & Swan Monitoring**

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## SUMMARY

The 48th consecutive census of Greenland/Iceland Pink-footed Geese and Iceland Greylag Geese took place during autumn and early winter 2007. In addition to the two usual counts undertaken in October and November, a third count in December (introduced in 2005) was also conducted as part of a three year trial to re-assess the most suitable time for a complete census of Iceland Greylag Goose. This was necessary due to recent data indicating that departure from the breeding grounds is occurring later. Some sites in the UK were also counted during late August and September in order to estimate the numbers of UK-breeding Greylag Geese from the Northwest Scotland and Re-established populations present at sites 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 involving an aerial survey of the south, together with coordinated ground counts conducted throughout the rest of the country in November 2007, contributing to goose estimates there.

Weather conditions were generally considered favourable during the counts. Maxima of 282,948 Pink-footed Geese were counted in October 2007 and 112,141 Greylag Geese were counted in November 2007. These figures were adjusted to account for major sites that were not counted and for the number of Greylag Geese from the Re-established and Northwest Scotland populations counted prior to this census, resulting in population estimates of 287,563 Pink-footed Geese and 107,137 Greylag Geese. Both estimates were higher than those estimated for 2006, representing increases of 25.0% in Pink-footed Goose numbers and 30.1% in Greylag Goose numbers.

The breeding success of Pink-footed Geese was slightly above average for the previous decade at 20.0% young (mean proportion of young 1997-2006: 18.6%,  $\pm$  0.5 s.e.). The mean brood size of successful pairs was 2.27 goslings, which was similar to the mean recorded during the preceding ten years (mean brood size 1997-2006: 2.2,  $\pm$  0.06 s.e.). The breeding success of Iceland Greylag Geese was slightly higher than average, with flocks containing 21.7% young (mean 1997-2006: 19.5%,  $\pm$  1.4 s.e.). The mean brood size of 2.61 goslings per successful pair was similar to that of the recent ten year mean (mean 1997-2006: 2.6,  $\pm$  0.06 s.e.).

# 1 INTRODUCTION

The Pink-footed Goose *Anser brachyrhynchus* population which breeds in Iceland and eastern Greenland winters almost exclusively in Britain and Ireland, as does the Icelandic-breeding Greylag Goose *Anser anser* (Mitchell 2002, Swann & Brockway 2002). Large concentrations of these species occur in autumn, particularly in East Central Scotland, 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 (e.g. Newth 2007), 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 from Iceland. Pink-footed Geese arrive earlier than Greylag Geese and are therefore usually best censused 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 (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 may be missed during the November count. A third coordinated count in December was therefore introduced in 2005 for a three-year trial period (Worden 2006). This report presents the 48<sup>th</sup> consecutive census and provides an update on the population size and breeding success of Pink-footed and Greylag Geese following the 2007 breeding season.

# 2 METHODS

Counts were conducted by a network of volunteer observers and professional conservation staff over the weekends of 13/14 October, 10/11 November and 8/9 December 2007. 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 are flighting in, or at dawn, as they depart to feeding areas. Dates of the coordinated counts were chosen to coincide with new moons as far as possible (11 October, 9 November and 9 December), thus minimising the likelihood of geese remaining in feeding areas overnight. 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, Ireland, 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 2007 census, numbers were estimated from the mean of the counts made during the relevant month during 2002-2006. 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 UK Greylag Geese (*ie* 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 counts in 2007 was good and higher than the preceding year, with 127 sites visited in October, 140 in November, and 138 in December. This represents an increase in the number of sites counted compared to the 2006 census, when 78, 130, and 127 sites were visited in October, November and December, respectively. 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 in October and November, respectively, were determined through an aerial survey of the south coast and coordinated ground counts elsewhere. Data were also received from several sites in Norway.

Two sites needed to be estimated due to lack of coverage or late data. In October, Lake of Menteith, Central, (4,615 Pink-footed Geese) met the criteria for the calculation of an estimated count and in November, an estimated count for Strathearn West sites, Perth & Kinross (1,457 Greylag Geese) was used.

Late August/September counts of Greylag Geese were received for eight sites, totalling 512 birds, and these were used to adjust the coordinated October, November and December counts to allow for the presence of Re-established or Northwest Scotland Greylag Geese at these sites, as follows: Tweed Estuary (36), Derwent Reservoir (128), Grindon Lough (40), Holywell Pond (56) all Northumberland, Gladhouse Reservoir, Midlothian (35), Carsebreck & Rhynd Lochs, Perth & Kinross (27), Aberlady Bay, East Lothian (40), and Upper Badenoch sites (150). In addition, 5,000 birds were subtracted from the Orkney count based on an assessment of the number of breeding and non-breeding pairs during summer 2007 (E. Meek, Unpubl. data). In Ireland, a comprehensive survey of Greylag Geese carried out by BirdWatch Ireland found 949 and 593 Greylag Geese in November and December, respectively, which were considered Re-established.

Weather conditions were reported as good for most sites with no sites reporting poor visibility in October, four in November and four in December. Low counts (where counters felt they had underestimated the number of birds present) were received for no sites in October, one in November (due to poachers) and one in December.

### 3.2 Total numbers

#### 3.2.1 Pink-footed Goose

Totals of 282,948 Pink-footed Geese were counted in October, 261,504 in November and 196,658 in December (Figure 1, Table 1). These represent increases of 75.3%, 28.7% and 3.6%, respectively, compared to counts in the same months in the preceding year. After the addition of estimated counts, the peak winter total in October 2007 was used to derive a population estimate of 287,563 geese. This represents a significant increase of 25.0% since 2006/07, when 230,123 individuals were estimated (see section 4 for revision of the population estimate presented in Newth 2007).

#### 3.2.2 Greylag Goose

Totals of 9,864 Greylag Geese were counted in October, 112,141 in November and 101,464 in December (Figure 1, Table 1). These represent increases of 74.3%, 40.1% and 33.3%, respectively, compared to counts in the same months in the preceding year. Following adjustments and addition of estimated counts, the peak winter total in November 2007 was used to derive a population estimate of 107,137 Greylag Geese. This represents an increase of 30.1% since the previous adjusted estimate of 82,339 geese recorded in 2006.

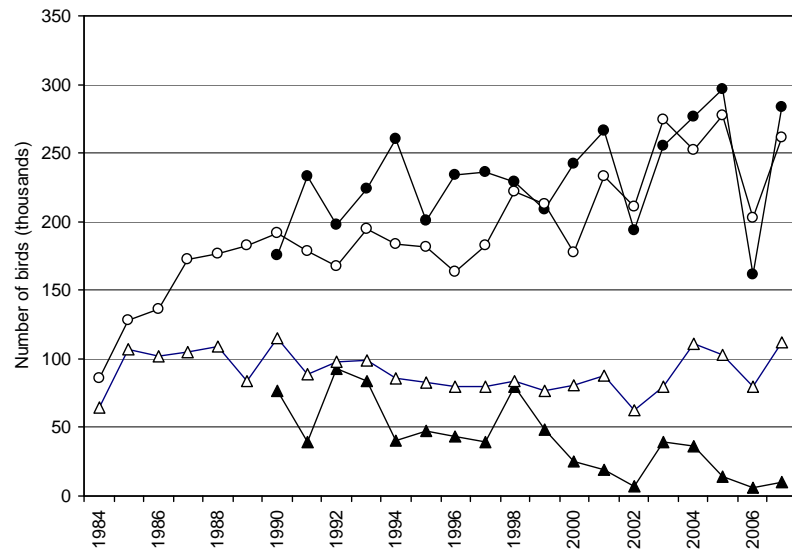


Figure 1. Peak counts of Pink-footed Geese (circles) and Iceland Greylag Geese (triangles) counted in October (filled) and November (open) during the Icelandic-breeding Goose Census, 1984 to 2007.

Table 1. Totals of Pink-footed Geese and Iceland Greylag Geese by country and region in October, November and December 2007. 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*	2,000 (1)	nc	nc	13,825 (1)	nc	nc
Norway	700 (1)	0 (1)	910 (4)	2,000 (11)	nc	2,000 (11)
Faroe Islands	7 (5)	633 (5)	8 (6)	921 (6)	1 (6)	822 (6)
Ireland	nc	nc	0 (32)	6,218 (32) [-949]	0 (18)	5,954 (18) [-593]
Shetland*	0 (1)	9 (1)	0 (1)	1,247(1)	0 (1)	728 (1)
Orkney*	nc	nc	0 (15)	54,612 (15) [-5,000]	0 (15)	67,540 (15) [-5,000]
Caithness+	nc	nc	214 (1)	6,802 (1)	214 (1)	2,054 (1)
Sutherland	0 (1)	2,100 (1)	0 (1)	326 (1)	0 (1)	390 (1)
Ross & Cromarty	964 (9)	1,242 (9)	12,145 (10)	14,114 (10)	4,140 (10)	7,112 (10)
Inverness/Nairn	0 (2)	0 (2)	205 (2)	0 (2)	470 (3)	20 (3)
Badenoch & Strathspey	13 (3)	639 (3) [-150]	14 (3)	1,229 (3) [-150]	15 (3)	2,510 (3) [-150]
Moray	7,950 (2)	89 (2)	6,250 (2)	94 (2)	5,800 (2)	121 (2)
Banff & Buchan	39,370 (1)	7 (1)	13,393 (1)	167 (1)	5,464 (1)	253 (1)
Gordon/Aberdeen	29,200 (4)	526 (4)	28,070 (4)	459 (4)	15,000 (3)	106 (3)
Kincardine & Deeside	0 (2)	36 (2)	0 (2)	221 (2)	730 (2)	345 (2)
Angus/Dundee	28,405 (2)	142 (2)	13,619 (2)	93 (2)	6,200 (1)	82 (1)
Perth & Kinross	29,761 (9) [+4,615]	808 (9) [-27]	17,547 (12)	2,961 (12) [-27] [+1,457]	14,232 (11)	3,172 (11) [-27]
Stirling/Falkirk/Clackmannan	2,376 (4)	0 (4)	1,238 (4)	52 (4)	1,120 (4)	0 (4)
Fife	2,815 (20)	189 (20)	10,518 (22)	1,423 (22)	3,755 (21)	2,112 (21)
Argyll & Bute	0 (3)	450 (3)	0 (1)	1,293 (1)	5 (1)	1,960 (1)
Glasgow area*	252 (3)	240 (3)	321 (3)	355 (3)	140 (3)	389 (3)
Clydesdale	nc	nc	nc	nc	nc	nc
Stewartry/Wigtown	0 (1)	65 (1)	54 (3)	536 (3)	790 (3)	1,061 (3)
Annandale & Eskdale/Nithsdale**	5,793 (6)	147 (6)	1,512 (6)	97 (6)	1,887 (7)	312 (7)
East/Midlothian	18,245 (10)	556 (10) [-75]	13,692 (10)	507 (10) [-75]	7,511 (10)	208 (10) [-75]
Edinburgh/West Lothian	0 (3)	180 (3)	470 (3)	331 (3)	0 (3)	114 (3)
West Borders/ Tweedale***	31,749 (9)	200 (9)	19,074 (11)	560 (11)	5,626 (11)	142 (11)
NE England****	9,382 (14)	1,111 (14) [-260]	4,325 (15)	1,338 (15) [-260]	6,922 (14)	1,762 (14) [-260]
Humber-side	3,470 (1)	0 (1)	2,360 (1)	0 (1)	3,885 (1)	0 (1)
Cumbria**	0 (1)	495 (1)	0 (1)	360 (1)	0 (1)	195 (1)
Lancashire & Merseyside+	46,025 (1)	0 (1)	38,478 (1)	0 (1)	27,908 (1)	0 (1)
N Wales/Dee Estuary	15 (1)	0 (1)	31 (1)	0 (1)	30 (1)	0 (1)
Norfolk	24,456 (8)	0 (8)	77,056 (8)	0 (8)	84,813 (8)	0 (8)
<i>Raw total counts</i>	282,948	9,864	261,504	112,141	196,658	101,464
<i>Adjustment for non-Icelandic birds</i>	n/a	5,512	n/a	6,461	n/a	6,105
<i>Estimated counts</i>	4,615	n/a	n/a	1,457	n/a	n/a
<b>Population Estimate</b>	<b>287,563</b>			<b>107,137</b>		

\* includes Cunninghame and Strathkelvin

\*\* counts from the Solway Firth are included in the Annandale & Eskdale/Nithsdale total even though some birds roost and feed on the Cumbrian side of the estuary

\*\*\* includes Ettrick & Lauderdale, Roxburgh and Berwickshire

\*\*\*\* includes Northumberland

+ several feeding sites consolidated      nc no count received      n/a adjustment not necessary



### 3.3 Regional Distribution

#### 3.3.1 Pink-footed Goose

The distribution of Pink-footed Geese varied over the three counts. Northeast Scotland held the highest numbers of birds in October with average proportions also present in East Central Scotland, Southeast Scotland/Northeast England, West and East England at this time. By November, a large movement of birds into East England had begun and this continued into December with most regions holding relatively few birds but East England holding approximately one third of the stock (Table 2, Figure 2).

#### 3.3.2 Greylag Goose

The autumn distribution of Greylag Geese was typical, with a very low proportion present in Britain during October. Those that had arrived were primarily concentrated in North Scotland, although no count was made in Orkney during this month, nor in Iceland. By November, 70% 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, although no count was made in Iceland during this month (Table 2, Figure 3).

Table 2. National, and, within Britain, regional distribution of Pink-footed Geese and Iceland Greylag Geese during October, November and December 2006, expressed as a percentage of the maximum count for each species.

Area	Pink-footed Goose			Greylag Goose		
	October	November	December	October	November	December
Iceland	0.7	0	0	n/a	12.3	n/a
Faroe Islands	0	0	0	0.6	0.8	0.7
S W Norway	0.2	0.3	0	n/a	1.8	1.8
Ireland	0	0	0	n/a	5.5	5.3
North Scotland	0.3	4.4	1.7	3.6	70.0	71.7
Northeast Scotland	27.1	16.9	9.5	0.6	0.8	0.7
East Central Scotland	22.4	15.2	8.9	1.0	4.0	4.8
Southeast Scotland/ Northeast England	21.0	13.3	7.1	1.9	2.4	2.0
Southwest Scotland/ Northwest England	2.1	0.7	1.0	1.3	2.4	3.5
West England	16.3	13.6	9.9	0	0	0
East England	9.9	28.1	31.4	0	0	0
<b>Total</b>	<b>100.0</b>	<b>92.5</b>	<b>69.5</b>	<b>9.0</b>	<b>100.0</b>	<b>90.5</b>

\* areas defined as follows:

Ireland: all regions

North Scotland: Shetland, Orkney, Western Isles and Highland

Northeast Scotland: Grampian (Aberdeenshire & Moray)

East-central Scotland: Tayside (Perth & Kinross), Central (Stirling) and Fife

Southeast Scotland/ Northeast England: Lothian, Borders and Northumberland

Southwest Scotland/ Northwest England: Strathclyde, Dumfries & Galloway and Cumbria

West England: Lancashire and Merseyside

East England: Humberside and Norfolk

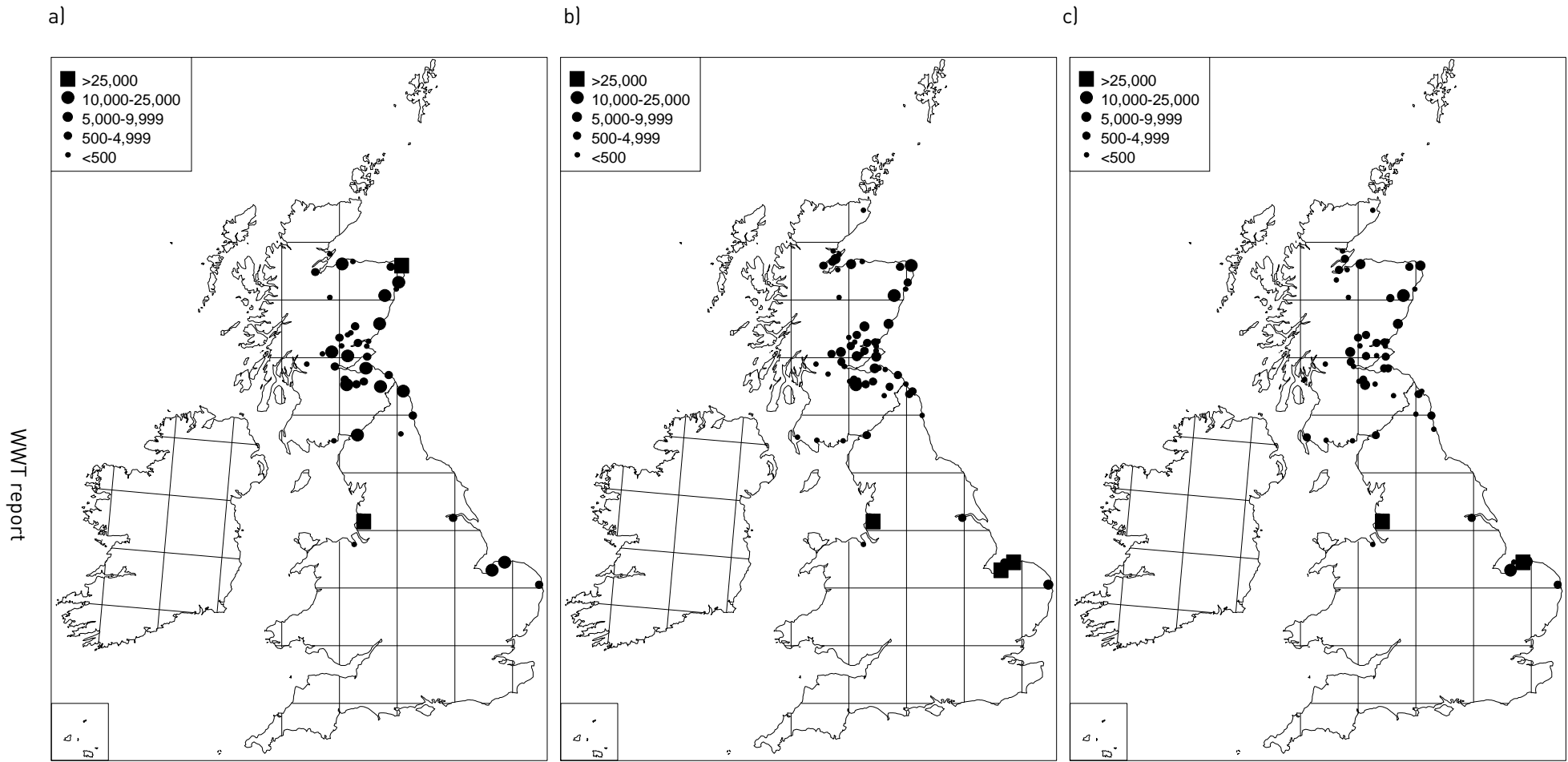


Figure 2. Distribution of Pink-footed Geese in Britain and Ireland in October (a), November (b) and December 2007 (c). Estimated counts are not shown.

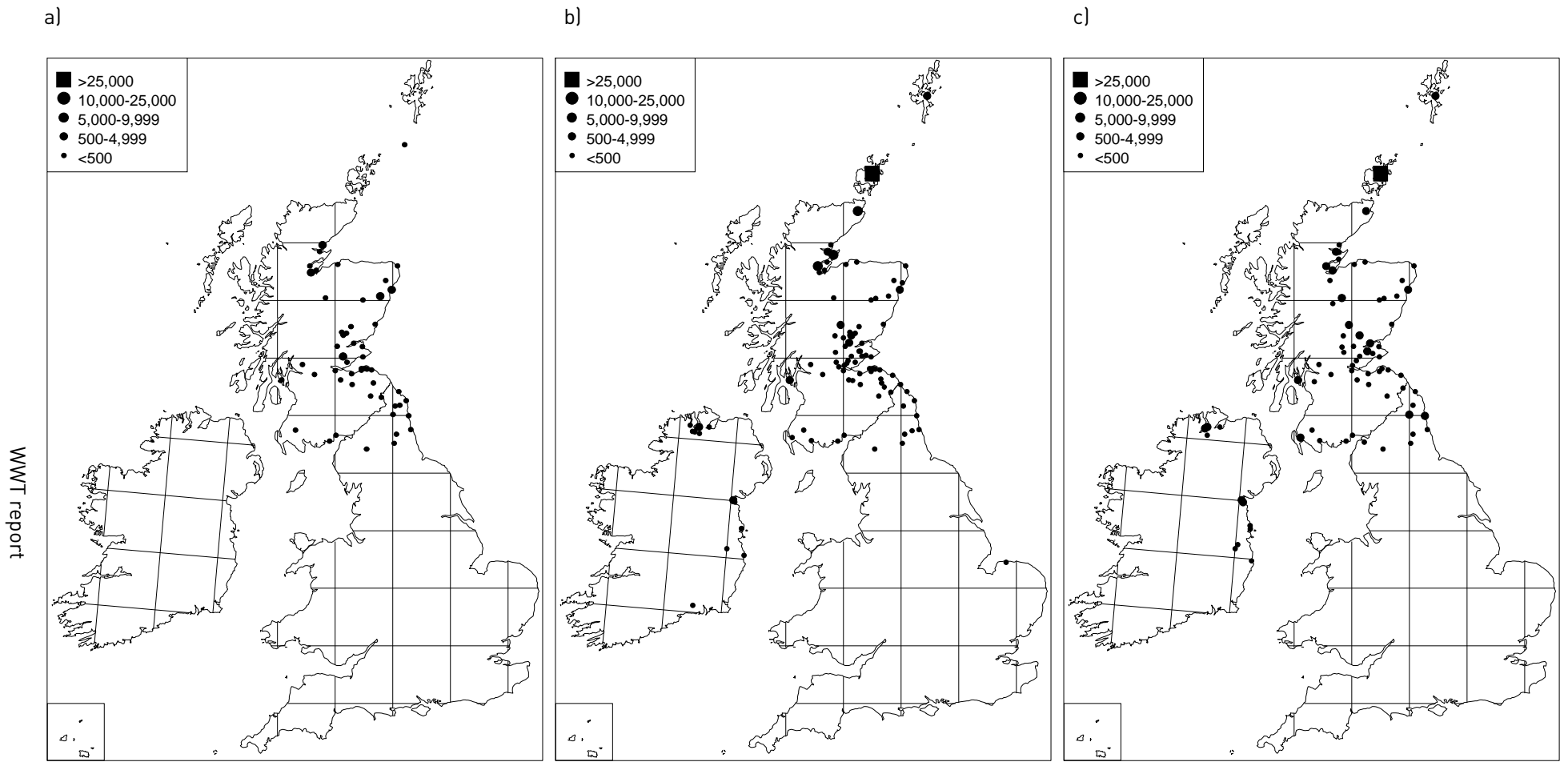


Figure 3. Distribution of Greylag Geese in Britain and Ireland in October (a), November (b) and December 2007 (c). Estimated counts are not shown.

## 3.4 Principal concentrations

### 3.4.1 Pink-footed Goose

Pink-footed Geese were recorded at 51 sites in October, 72 in November and 57 in December (this excludes estimated counts). Those sites holding more than 1% of the population estimate (2,875) decreased from 22 in both October and November to 15 in December (Table 3). Seven sites held over 10,000 birds in October, six in November and five in December. Combined counts from the 22 sites exceeding 1% of the population estimate in October accounted for 92.3% of the total October count and numbers at the top four sites alone equated to 46.5% of the population estimate (Table 3).

Particularly high numbers were recorded at South Lancashire Mosses, with 16% of the October population estimate. The count of over 46,000 geese is the largest number ever recorded at the consolidated site and is higher than the mean recorded there in the preceding five years. Higher than recent average numbers were also recorded at Loch of Strathbeg (Banff & Buchan), Montrose Basin (Angus/Dundee) and Carsebreck & Rhynd Lochs (Perth & Kinross).

During 2007, lower than usual numbers were recorded at Cameron Reservoir (Fife), Loch Mahaick Doune, (Perth & Kinross), Norton Marsh (Norfolk), Peppermill Dam (Dunfermline), Rossie Bog (Fife), the Tay Estuary (Angus/Dundee/Fife) and Wells next the Sea (Norfolk).

### 3.4.2 Greylag Goose

The arrival of most Greylag Geese had not occurred at the time of the October count. They were recorded at a total of 55 sites, mostly in North Scotland. Loch Fleet for example held the highest count of 2,100 birds. Note however that counts were not undertaken in Iceland, Norway, Ireland nor on Orkney during this month. By November, 85 sites held Greylag Geese, 11 of which held numbers exceeding 1% of the population estimate (1,071) (this considers Orkney as one site). Orkney held 51% of the population during this month (Table 3). Greylag Geese were recorded at 70 sites in December; those with counts exceeding 1% of the population estimate decreased to eight with Orkney holding 67,540 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.

During 2007, lower than usual numbers were recorded at Findhorn Bay (Moray), Haddo House Lakes (Gordon/Aberdeen), Loch of Lintrathen (Angus/Dundee), Loch of Skene (Gordon/Aberdeen), Loch Spynie (Moray) and Marlee Loch (Perth & Kinross).

Combined counts from the 11 sites exceeding 1% of the population estimate in October accounted for 93.1% of the total November count and numbers at the top four sites alone equated to 75.9% of the population estimate (Table 3). For the purpose of analysis, Orkney is treated as a consolidated site, although Table 4 shows the individual totals for the islands. Seven islands held numbers exceeding 1% of the population estimate in November and eight did so in December, although these individual counts are not adjusted for the presence of UK-breeding Greylag Geese since such data are only available for Orkney as a whole. Only on East Mainland and West Mainland were there more than 10,000 birds recorded, which equates to 66.2% of the Orkney total in November (33.7% of the population estimate) and 69.5% in December. Total numbers on Orkney during the December count were the highest recorded there since monitoring began.

Table 3. Sites that supported more than 1% of the (a) Pink-footed Goose (>2,875) and (b) Iceland Greylag Goose (>1,071) population estimates in October and November 2007 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 Greylag Goose (Wetlands International 2006).

## a) Pink-footed Goose

Site	October count	Percentage of population estimate	Five year peak mean 2003-2007
South Lancashire Mosses, Lancashire	46,025	16.0	38,701
Loch of Strathbeg, Banff & Buchan	39,370	13.7	51,001
West Water Reservoir, Tweeddale	24,269	8.4	40,960
Montrose Basin, Angus	23,945	8.3	24,234
Loch Leven, Perth & Kinross	16,300	5.7	16,582
Meikle Loch, Slains, Gordon/Aberdeen	16,300	5.7	12,653 <sup>1</sup>
Carsebreack & Rhynd Lochs, Perth & Kinross	10,100	3.5	11,030
Aberlady Bay, Lothians	9,935	3.5	16,265
Overy Marshes, Holkham, Norfolk	9,500	3.3	53,600 <sup>2</sup>
Loch of Skene, Gordon/Aberdeen	8,400	2.9	16,032
Findhorn Bay, Moray	7,800	2.7	12,800
Lindisfarne, Northumberland	6,900	2.4	4,270
Hule Moss, Berwickshire	6,850	2.4	5,506
Solway Firth (consolidated)	5,793	2.0	7,653
Snettisham, Norfolk	5,780	2.0	38,667
Horseley Mere, Norfolk	5,126	1.8	6,445
Middlemuir, Gordon/Aberdeen	4,500	1.6	7,081 <sup>3</sup>
Loch of Lintrathen, Angus/Dundee	4,460	1.6	9,052
Berney Marshes, Norfolk	3,700	1.3	15,788 <sup>4</sup>
Fala Flow, Midlothian	3,650	1.3	3,002 <sup>5</sup>
Read's Island Flats, Humberside	3,470	1.2	5,025
Gladhouse Reservoir, Midlothian	3,200	1.1	3,356 <sup>6</sup>

<sup>1</sup> Mean derived from years 2005-2007 only; <sup>2</sup> Mean derived from years 2004-2007 only; <sup>3</sup> Mean derived from 2006 and 2007 only; <sup>4</sup> Mean derived from 2004, 2006 and 2007 only; <sup>5</sup> Mean derived from 2003, 2004, 2006 and 2007 only; <sup>6</sup> Mean derived from 2003, 2006 and 2007 only

## b) Greylag Goose

Site	November count	Percentage of population estimate	Five year peak mean 2003-2007
Orkney Islands (all sites)	54,612	51.0	47,341
Iceland (lowlands)	13,825	12.9	11,331 <sup>1</sup>
Caithness	6,802	6.4	7,322
Loch Eye, Ross & Cromarty	6,013	5.6	5,946
Ireland (all sites)	5,275	4.9	5,275 <sup>2</sup>
Dingwall Bay, Ross & Cromarty	5,068	4.7	2,287
Dornoch Firth, Ross & Cromarty	2,516	2.3	1,175
SW Norway	2,000	1.9	2,000 <sup>2</sup>
Bute, Argyll & Bute	1,293	1.2	1,904
Shetland (consolidated)	1,247	1.1	986 <sup>3</sup>
Loch Garten and strath, Badenoch & Strathspey	1,115	1.0	1,413

<sup>1</sup> Mean derived from 2004-2007 only (note counts are not undertaken in October when many more birds are present); <sup>2</sup> Mean derived from 2007 only, the first year extensive co-ordinated counts have been undertaken; <sup>3</sup> Mean derived from 2005-2007.

Table 4. Greylag Goose counts at individual sites on Orkney in November and December 2007 (counts have not been adjusted to take into account number of UK Greylags, as data on numbers of these populations are only available for Orkney as a whole). Five year peak mean derived from November and December counts from 2003 to 2007.

	<b>November count</b>	<b>% of count total</b>	<b>December count</b>	<b>% of count total</b>	<b>Five year peak mean</b>
West Mainland	24,905	23.3	33,152	34.8	23,336
East Mainland	11,263	10.5	13,829	14.5	9,967
Island of Shapinsay	4,662	4.4	3,774	4.0	4,319
Island of South Ronaldsay	2,180	2.0	3,800	4.0	2,148
Island of Sanday	3,400	3.2	2,830	3.0	2,564
Island of Stronsay	3,446	3.2	4,233	4.4	2,764
Island of Eday	1,327	1.2	1,363	1.4	1,024
Island of Rousay	924	0.9	1,032	1.1	817
Island of Westray	607	0.6	735	0.8	667
Island of Papa Westray	606	0.6	758	0.8	873
Island of Egilsay	586	0.5	742	0.8	1,401
Island of Burray	0	0	7	0	274
Island of Wyre	158	0.1	348	0.4	562
Island of North Ronaldsay	318	0.3	362	0.4	227
Isles of Hoy and Walls	230	0.2	575	0.6	484
<b>Total</b>	<b>54,612</b>	<b>51.0</b>	<b>67,540</b>	<b>70.9</b>	<b>51,426</b>

### 3.5 Breeding success

Totals of 18,835 Pink-footed Geese (from 44 flocks) and 3,340 Greylag Geese (38 flocks) were aged at various localities throughout Scotland and England between 18 September and 27 November. The percentage of birds aged in relation to the estimated size of the population in 2007 was 6.6% for Pink-footed Goose and 3.1% for Greylag Goose. Information on the brood sizes of 263 families of Pink-footed Goose and 44 families of Greylag Goose was also collected during this period.

The breeding success of Pink-footed Geese was slightly above average for the previous decade at 20.0% young (mean proportion of young 1997-2006: 18.6%,  $\pm$  0.5 s.e.). The mean brood size of successful pairs was 2.27 goslings which was slightly higher than the mean recorded during the preceding ten years (mean brood size 1997-2006: 2.2,  $\pm$  0.06 s.e.) (Table 5, Figure 4).

There was evidence of modest regional variation in the percentage of young Pink-footed Geese, which varied from 18.9% in East England to 23.6% in West England, although the latter was based on a small sample size (Table 5). Similarly, mean brood size varied from 2.16 goslings in Southeast Scotland to 2.67 recorded in East Central Scotland. The majority of birds were aged during the second half of October (52% of the sample). The proportion of young declined from late September to late November (Figure 5).

The breeding success of Iceland Greylag Geese was slightly higher than average, with flocks containing 21.7% young (mean 1997-2006: 19.5%,  $\pm$  1.4 s.e.). The mean brood size of 2.61 goslings per successful pair was similar to that of the recent ten year mean (mean 1996-2005: 2.6,  $\pm$  0.06 s.e.) (Table 5, Figure 4).

Due to their later migration and more limited range, the temporal and spatial distribution of Greylag Goose age samples was more limited. However, there appeared to be little difference between the average breeding success recorded around the Moray Firth (20.9%) compared to that recorded on Orkney (22.0%). Samples were collected in one region (North Scotland) during late October and early November.

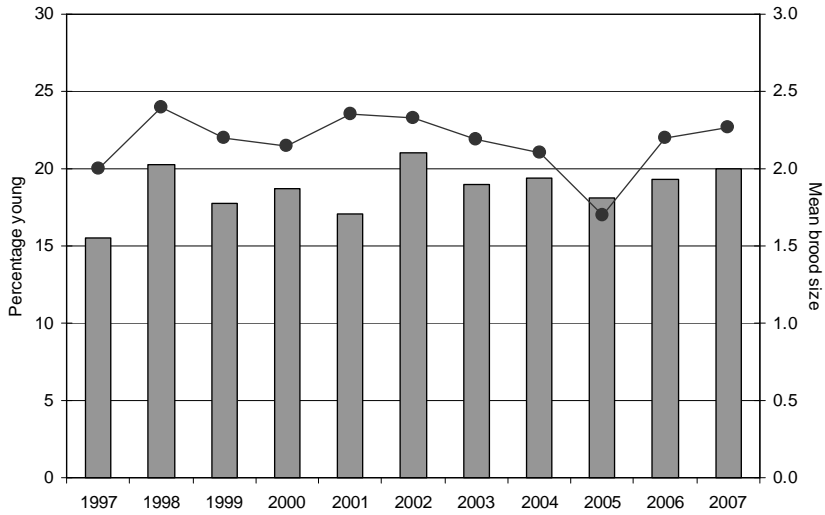
Table 5. The percentage of young and mean brood size of Pink-footed and Greylag Geese in autumn 2007 (regions defined in Table 2).

	Region	Total aged (No. of young)	% young	No. of broods (No. of young)	Mean brood size
Pink-footed Goose <sup>1</sup>	North Scotland	77 (15)	19.4	0	n/a
	Northeast Scotland	6,833 (1,377)	20.2	109 (255)	2.34
	East Central Scotland	4,485 (917)	20.4	15 (40)	2.67
	Southeast Scotland	2,794 (558)	20.0	19 (41)	2.16
	East England	4,146 (783)	18.9	120 (261)	2.18
	West England	500 (118)	23.6	0	n/a
	<b>Total</b>		<b>18,835 (3,768)</b>	<b>20.0</b>	<b>263 (597)</b>
Greylag Goose <sup>2</sup>	North Scotland	3,340 (724)	21.7	44 (115)	2.61
	<b>Total</b>	<b>3,340 (724)</b>	<b>21.7</b>	<b>44 (115)</b>	<b>2.61</b>

<sup>1</sup>Pink-footed Geese aged between 18 September and 27 November

<sup>2</sup>Greylag Geese aged between 26 October and 11 November

(a) Pink-footed Goose



(b) Greylag Goose

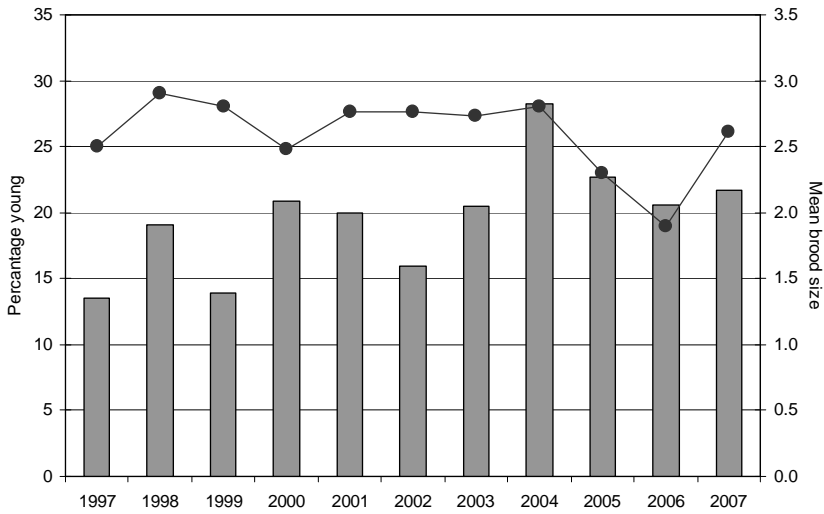


Figure 4. The percentage young (column) and mean brood size (line) found in flocks of Pink-footed Geese (a) and Iceland Greylag Geese (b) in Britain, 1997-2007.

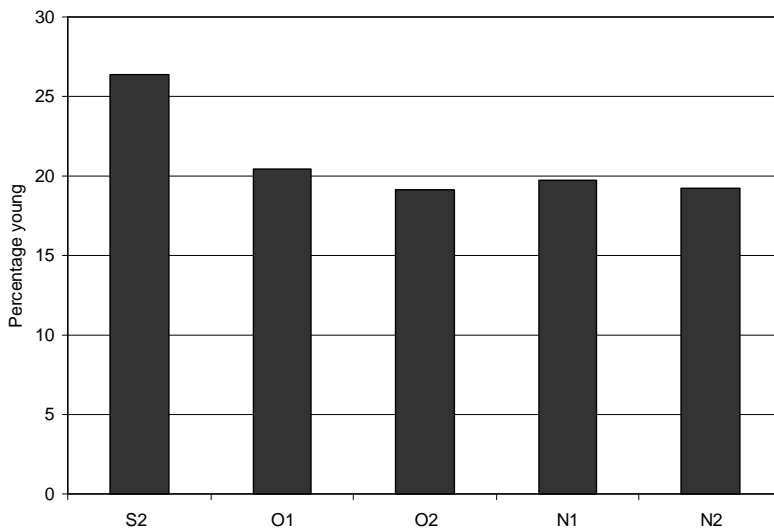


Figure 5. Average proportion of young derived from Pink-footed Goose age samples during autumn 2007. Periods: S2 =late September, O1=early October, O2=late October, N1=early November and N2 = late November.



## 4 REVISED POPULATION ESTIMATES

### 4.1 2006 (Newth 2007)

Late data were received from one key site for which estimated counts were calculated in the population estimates presented in the previous report (Newth 2007). This was for the Solway Firth (consolidated), and affected the Pink-footed Goose population estimate (Table 6).

Table 6. Revised Pink-footed Goose count and population estimate for 2006.

	<b>Pink-footed Goose</b>	
	<b>Newth 2007</b>	<b>New data</b>
Raw count totals	203,168	204,168
Estimated counts	25,955	25,955
Population estimate	229,123	230,123

## 5 DISCUSSION

The 2007 Icelandic-breeding Goose Census has revealed increases in the population estimates of both Pink-footed Goose and Iceland Greylag Goose since 2006, when an undercount is likely to have occurred (see Newth 2007), with increases of 25.0% and 30.1%, respectively (Figure 6). The population estimate of Pink-footed Goose was lower than that recorded in 2005 (302,774), but the second highest ever recorded. Following the relatively high numbers of Greylag Geese found in 2004 (107,207), the estimate in 2007 returned to a similar level.

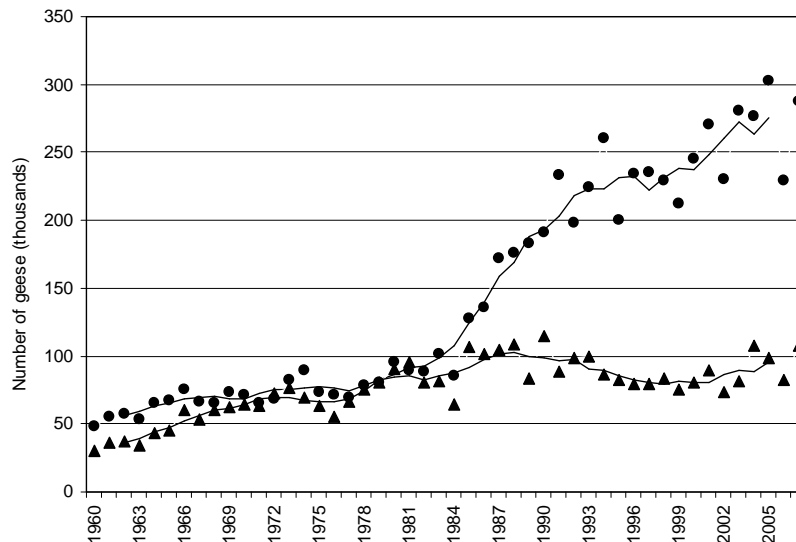


Figure 6. Population estimates for Pink-footed Goose (circles) and Iceland Greylag Goose (triangles), 1960 to 2007. The 5-year running means (e.g. mean for 2005 is from population estimates for 2003-07) are shown as lines.

The breeding success of both Pink-footed Geese and Iceland Greylag Geese was higher than average in 2007, and the proportion of young Greylag Geese in autumn flocks has been consistently high (above 20%) for the past four years (including 2007; Figure 4). The proportion of young recorded in 2007 for both species was very similar to that observed in 2006 (0.7% higher for Pink-footed Goose and 1.1% higher for Greylag Geese). The mean brood size per successful pair was also similar in both years for Pink-footed Goose, but for Greylag Goose the value increased from 1.9 goslings to 2.6 per successful pair.

The Pink-footed Goose population estimate appears reasonable since coverage, particularly of the main sites, was good. Despite recent fluctuations in numbers, partly caused by fluctuations in coverage, notably so in 1995 and 2006, the long term population trend is one of continued increase. Breeding success remains fairly stable at c. 15-20% (Figure 4a) and is, presumably, more than compensating for annual deaths. Bag statistics from Iceland for autumn 2007 are not yet available, but it is not expected that these were significantly greater than other recent years (c. 10,000-15,000 geese; Figure 7). 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 British shores in autumn 2007. In southwest Lancashire, Derek Forshaw reported an unusually early arrival of geese with the first arrivals being recorded on 1 September 2007. There was a rapid increase in numbers, with 10,000 birds roosting at WWT Martin Mere, Lancashire, on 17 September and probably as many as 20,000 geese in the area on 18 September. Despite the early arrivals, up to 2,000 were recorded still in Iceland during the October count. However, it is still possible that the count there was likely to underestimate the number present at that time. Coverage remains patchy and this species often remains dispersed in inaccessible areas at this time.

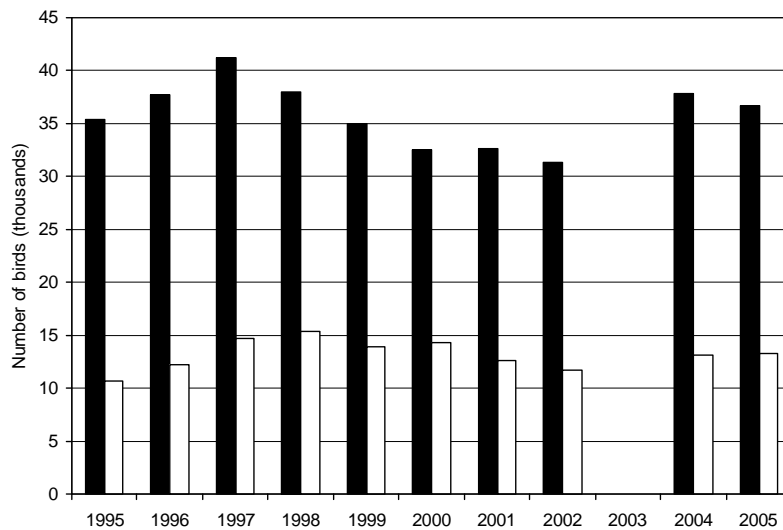


Figure 7. The number of Pink-footed Geese (open columns) and Greylag Geese (filled columns) found in hunting bags in Iceland, 1995-2006 (data were unavailable for 2003) (Source: Wildlife Management Institute, Akureyri, Iceland).

Late departures from Iceland were a feature of the previous year (2006) and peak counts of Pink-footed Geese have occurred in November in three of the previous five years (2003, 2005 and 2006), whereas prior to this period, the peak count had only occurred in November on two occasions (in 1990 and 1999). 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 Greylag Geese was comprehensive with sites being covered in most of the winter range. It was particularly good to get coverage in Ireland, the Faroe Islands and southwest Norway. The increasing concentration of the population on Orkney continued, with a record count of 67,540 in December 2007 (see below). The November counts in Iceland, which have only recently been initiated, remain somewhat crude, with a mixture of dedicated aerial survey, together with patchy coverage elsewhere and anecdotal evidence (rather than accurate counts) informing the estimate of the number present from a number of areas. Since peak population counts have occurred in November in each of the three years 2005-2007, 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.

Despite the annual harvest of c. 30,000-40,000 birds annually in Iceland (Figure 7) 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 4b) appears to be maintaining numbers at c. 80,000 to c. 100,000 individuals. However, there is an increasing number of summering Greylag Geese in Scotland. Swann (2007) estimated there to be c. 25,000 Greylag Geese in Scotland and a dedicated summer survey in summer 2008 is being undertaken to better understand the abundance and distribution of these birds. This will help enormously in understanding where summering Greylags are and where they are most likely to overlap with the winter distribution of Iceland birds, although little is known about post-breeding movements of these birds.

One of the important values of long term datasets is the ability to explore not only changes in abundance, but also changes in distribution over time. The redistribution of Greylag Geese within Britain during the autumn is represented in Figure 8. From 1960 to 1974, East Central Scotland held, on average, 61% of the autumn population of Iceland Greylag Geese. In 1975, the proportion in that region dropped to 32%, and from 1975 to 1986, averaged only 32%.

In 1977, there was also a ‘most unusual’ shift in autumn concentrations ‘with a very large number of geese (half the total) in the north of Scotland, and corresponding large decreases in East Central and Southwest Scotland. This was probably caused by the plentiful supply of food in the north on the stubbles’ (Ogilvie 1978). This situation continued through the 1980s and 1990s with a gradual redistribution of Iceland Greylag Geese further north within Britain. Lochs Davan and Kinord and Loch Eye became, for a time, important autumn roost gatherings, although both have subsequently declined in their importance. It was only from the mid-1990s that Orkney became important as an over-wintering destination, and this has continued into the early 2000s, with the islands now supporting some c. 60-70% of the entire population (Figure 8).

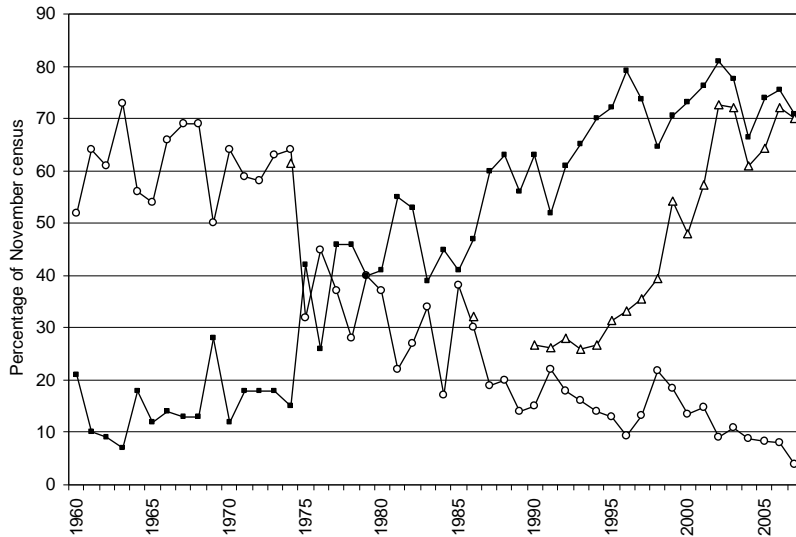


Figure 8. The proportion of the November count of Greylag Geese in East Central Scotland (open circles), North and Northeast Scotland (squares) and North Scotland only (open triangles), 1960 to 2007.

This shift northwards was later mirrored by a gradual shift in the winter distribution of Pink-footed Geese within Britain. Figure 9 illustrates that, up to the early 1980s, the East of England (Norfolk and Humberside) held very little of the winter population of this species, yet by the early 2000s, c. 30% was present there by November. The shifts in distribution merit further investigation since a complex interplay of refuge creation, habitat availability, disturbance, hunting pressure and possibly climate change may be affecting over-winter distribution.

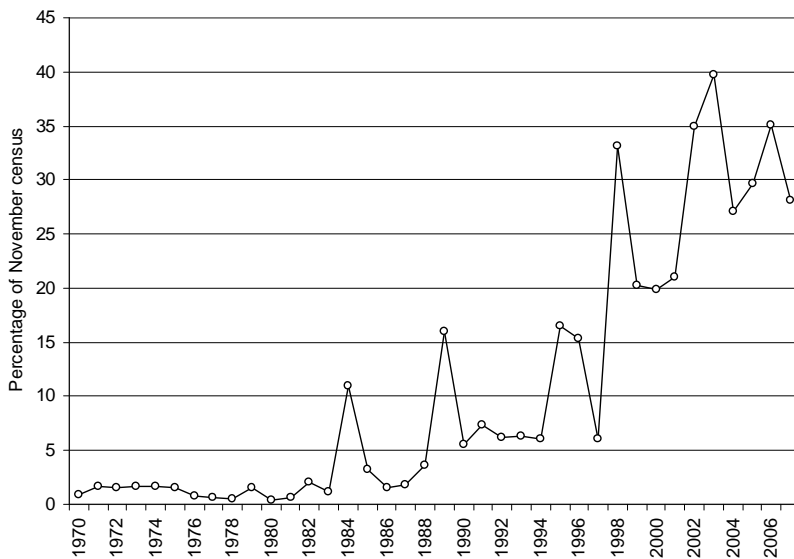


Figure 9. The proportion of the November count of Pink-footed Geese in East England, 1970 to 2007.

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## 7 REFERENCES

- Hearn, RD & C Mitchell. 2004. *Greylag Goose Anser anser (Iceland population) in Britain and Ireland 1960/61 - 1999/2000*. Waterbird Review Series, Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.
- Mitchell, C. 2002. Pink-footed Goose. In: Wernham, CV, MP Toms, JH Marchant, JA Clark, GM Siriwardena & SR Baillie. (Eds). *The Migration Atlas: movements of the Birds of Britain and Ireland*. T. & A.D. Poyser.
- Mitchell, C & RD Hearn. 2004. *Pink-footed Goose Anser brachyrhynchus (Greenland/Iceland population) in Britain and Ireland 1960/61 - 1999/2000*. Waterbird Review Series, Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.
- Newth, JN. 2007. *Status and distribution of Icelandic-breeding geese: results of the 2006 international census*. Wildfowl & Wetlands Trust Report, Slimbridge.
- Ogilvie, M. 1978. Greylag and Pink-footed Geese in Britain. 5/6<sup>th</sup> November, 1977. WWT Report, Slimbridge.
- Swann, R. 2007. Greylag Goose. In: Forrester, R, I Andrews, C McInerny, R Murray, B McGowan, B Zonfrillo, M Betts, D Jardine & D Grundy. (Eds). *The Birds of Scotland*. SOC, Aberlady Bay.
- Swann, R & I Brockway. 2002. Greylag Goose. In: Wernham, CV, MP Toms, JH Marchant, JA Clark, GM Siriwardena & SR Baillie. (Eds). *The Migration Atlas: movements of the Birds of Britain and Ireland*. T. & A.D. Poyser.
- Worden, J. 2006. *The 2005 Icelandic-breeding Goose Census*. The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.
- Wetlands International. 2006. *Waterbird Population Estimates – Fourth Edition*. Wetlands International, Wageningen, The Netherlands.