

Status and distribution of Icelandic-breeding Geese: results of the 2005 international census

Wildfowl & Wetlands Trust Report

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Goose & Swan Monitoring

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Summary

The 46th consecutive census of Greenland/Iceland Pink-footed Geese and Iceland Greylag Geese took place during autumn and winter 2005. In addition to the two usual counts undertaken in October and November, a third count was introduced as part of a three year trial to re-assess the most suitable time for a complete census of Iceland Greylag Goose due to recent data indicating that departure from the breeding grounds is occurring later. Some sites were also counted during September. Coverage in Britain, Ireland and the Faroe Islands was similar to previous years, although data was not received for a small number of key sites in Britain. No data was received from Norway and estimated numbers of Pink-footed and Greylag Geese present in Iceland in October and November, respectively, was provided, rather than actual counts.

Weather conditions were generally considered favourable during the counts. Maxima of 258,258 Pink-footed Geese and 94,359 Greylag Geese were counted in November 2005. 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 268,650 Pink-footed Geese and 95,938 Greylag Geese. Both estimates were lower than those calculated for 2004, representing decreases of 8.0% in Pink-footed Goose numbers and 10.5% in Greylag Goose numbers.

Pink-footed Geese had a relatively poor breeding season in 2005: autumn flocks contained 18.1% young, and although lower than the preceding three years, was comparable to the mean of the most recent five years (18.1%). The mean brood size of 1.71 goslings per successful pair was lower than the five year mean (2.25). Breeding success in Greylag Geese was higher, with 22.7% of young recorded overall and a mean brood size of 2.29 goslings per successful pair. The percentage of young was above average (five year mean: 18.3%) although brood size fell below that of the five year mean (2.68).

Full analyses of the data generated by the newly introduced December count will not be possible until the end of the three year trial period owing to limited data prior to 2005. Since previous analysis has indicated that the Icelandic-breeding Goose Census (IGC) is effective in measuring population size of Pink-footed Goose, the priorities of the IGC are to improve monitoring of Greylag Geese by the completion and analysis of the December census data between 2005-2007 in order to re-assess the most appropriate time for census of the Iceland Greylag Goose population; the need to achieve complete coverage across the range with a particular focus to develop co-ordinated counts in Iceland and Norway; and the collection of age assessment data across the range using standardised methods.

1 Introduction

The Pink-footed Goose *Anser brachyrhynchus* which breeds in Iceland and eastern Greenland winters almost exclusively in Britain and Ireland, as does the Icelandic breeding Greylag Goose *A. anser* (Wernham *et al* 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, therefore 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 co-ordinated counts have been undertaken since 1990 (*eg* Rowell 2005), the first in October and the second in November. The October and November counts are timed to coincide with the 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.

The results of previous censuses and other information, however, have suggested that the departure of both species from Iceland may be occurring later (Rowell 2005). 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 co-ordinated count in December was therefore introduced in 2005 and will be included in the 2007 and 2008 censuses. This additional count will help to re-assess the best period in which to undertake a census to obtain good population estimates for the Iceland Greylag Goose. This report presents the results of the 46th consecutive census and provides an update on the population size and breeding success of Pink-footed and Greylag Geese following the 2005 breeding season.

2 Methods

Counts were conducted by a network of volunteer observers and professional conservation staff over the weekends of 8/9 October, 5/6 November and 3/4 December 2005. In some cases counts made close to these dates were included in the co-ordinated 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 co-ordinated counts were chosen to coincide with new moons as far as possible (3 October, 2 November and 1 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 analyses, Caithness, Orkney, Shetland, Southwest Lancashire 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 2005 census, numbers were estimated from the mean of the counts made during the relevant month during 2000-2004. 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 September, before the arrival of Icelandic migrants, were subtracted from the IGC count at some sites to calculate the number of Iceland Greylag Geese present at that time.

To assess reproductive 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 between mid September and mid 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 the 2005 counts was similar to the preceding year with 139 sites visited in October and 174 in November. The response to the newly introduced December count was extremely good with 161 sites surveyed in this month. Outside Britain and Ireland, counts were made at several sites in the Faroe Islands in all three months and estimates were provided of the maximum number (rather than actual counts) of Pink-footed Geese and Greylag Geese in Iceland in October and November, respectively. No data were received from Norway.

Counts for several sites were estimated and included in the census totals due to lack of coverage or late data. In October, three sites met the criteria for the calculation of an estimated count of Pink-footed Geese and two for Greylag Geese. In November, estimated counts were calculated for two sites for Pink-footed Geese and two for Greylag Geese. Since very little data exist for December prior to winter 2005/06, it was not possible to derive estimated counts for this month. Estimated counts of Pink-footed Geese were as follows: Westwater Reservoir, Tweedale (October 18,664, November 8,543), Lake of Menteith, Stirling (October 4,048, November 1,849) and River Tay: Bloody Inches, Perth & Kinross (October 2,224). Estimated counts of Greylag Geese were: Orkney (October 8,521), Caithness (October 1,070, November 6,275) and Haddo House Lakes, Gordon (November 1,080).

September counts of Greylag Geese were received for nine sites, and these were used to adjust the co-ordinated October and November counts to allow for the presence of Re-established or Northwest Scotland Greylag Geese at these sites, as follows: Big Waters, Northumberland (52); East Chevington Pools, Northumberland (355); Holywell Pond, Northumberland (80); Newton Pool, Northumberland (205); Branton Gravel Pits, Northumberland (290); Tweed Estuary, Northumberland (8); Loch Ken, Dumfries & Galloway (22); Abbots Moss, North Cumbria (620) and Loch Ascog, Bute (144). In addition, 4,000 birds were subtracted from the Orkney count based on an assessment on the number of breeding and non-breeding pairs during summer 2005 (E. Meek Unpubl. data), and 800 birds were subtracted from the Lough Swilly counts based on observations from summer 2004 (A. Speer Unpubl. data).

Weather conditions were reported as good at 76% of sites in October and November and 74% in December (count conditions were not reported for 23% of sites in October and November, and 22% of sites in December). Low counts (where counters felt they had underestimated the number of birds present) were received for five sites in October, four in November and 11 in December. Disturbance was reported as a problem at one site in October, none in November and four in December; the latter due to wildfowling activity. Comments were received regarding the general quality of the November count in areas close to urban settlements owing to the census weekend coinciding with Guy Fawkes night. It was considered that fireworks disturbed a number of roosts resulting in fewer geese present than would normally be expected at this time.

3.2 Total numbers

3.2.1 Pink-footed Goose

Totals of 234,120 Pink-footed Geese were counted in October, 258,258 in November and 244,064 in December (Figure 1, Table 1). The total number counted in October 2005 was 13.9% lower than that in the preceding year, while that in November 2005 was 2.5% higher. After addition of estimated counts, the peak winter total in November was used to derive a population estimate of 268,650. This represents a decrease of 8.0% since 2004/05 when 292,154 individuals were estimated.

3.2.2 Greylag Goose

Totals of 13,882 Greylag Geese were counted in October, 94,359 in November and 83,295 in December (Figure 1, Table 1). Both October and November counts were lower than those of the preceding year, however, counts were not received for some important regions in North Scotland in these months. Following adjustments and addition of estimated counts, these totals were adjusted to 17,697 in October, 95,938 in November and 77,519 in December (no estimated counts were included in the December total). The population estimate of 95,938 was derived from the higher November census total and represents a decrease of 10.5% since the previous adjusted estimate of 107,207. The pre-adjusted November count is also lower (by 14.6%) than that of the preceding year.

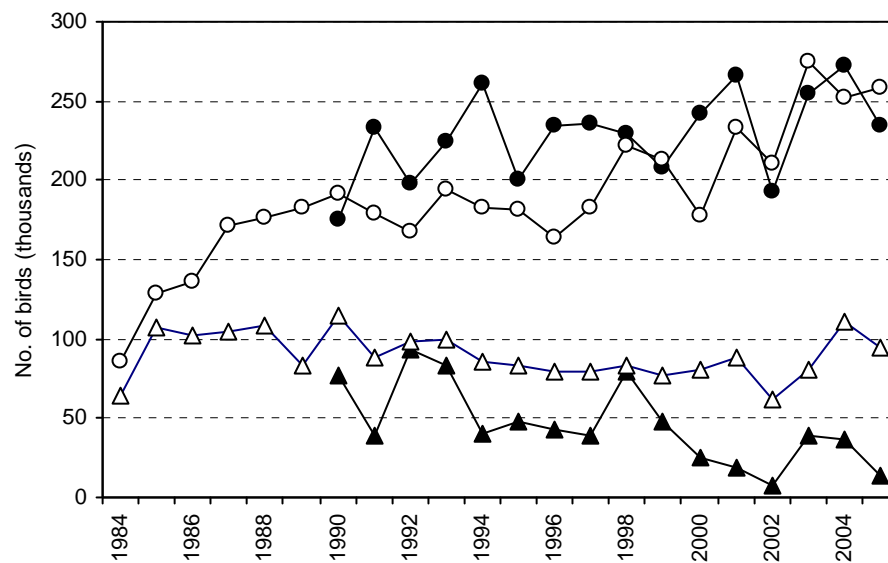


Figure 1. Peak counts of Pink-footed Geese (circles) and Iceland Greylag Geese (triangles) counted in October (filled) and November (open) during the Icelandic-breeding Goose Census, 1984 to 2005.

Table 1. Totals of Pink-footed Geese and Iceland Greylag Geese by country and region in October, November and December 2005. 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	5,500 (1)	nc	nc
Norway	nc	nc	nc	nc	nc	nc
Faroe Islands	3 (5)	865 (5)	11 (4)	979 (4)	3 (5)	568 (5)
Ireland	nc	nc	0 (8)	5,614 (8) [-800]	0 (1)	6 (1)
Shetland*	66 (27)	1,126 (27)	26 (30)	1,061 (30)	0 (25)	1,010 (25)
Orkney	nc	nc [+8,521] (1)	0 (15)	40,156 (15) [-4,000]	0 (15)	40,403 (15) [-4,000]
Caithness*	nc	nc [+1,070] (1)	nc	nc [+6,275] (1)	nc	nc
Sutherland	0 (2)	0 (2)	0 (2)	1,500 (2)	0 (2)	312 (2)
Ross & Cromarty	55 (12)	1,425 (12)	12,867 (13)	16,208 (13)	1,456 (13)	21,696 (13)
Inverness/Nairn	0 (2)	0 (2)	0 (2)	27 (2)	90 (3)	200 (3)
Badenoch & Strathspey	0 (3)	546 (3)	15 (3)	2,008 (3)	1 (3)	1,101 (3)
Moray	14,900 (2)	400 (2)	24,200 (2)	2,800 (2)	9,800 (2)	800 (2)
Banff & Buchan	41,600 (1)	161 (1)	14,612 (1)	568 (1)	9,729 (1)	853 (1)
Gordon/Aberdeen	24,300 (2)	226 (2)	20,800 (3)	4,810 (2) [+1,080] (1)	18,530 (2)	1,100 (2)
Kincardine & Deeside	0 (2)	20 (2)	0 (2)	411 (2)	0 (2)	114 (2)
Angus/Dundee	25,021 (3)	222 (3)	22,250 (3)	543 (3)	17,327 (3)	431 (3)
Perth & Kinross	33,305 (7) [+4,408] (1)	485 (7)	27,090 (12)	3,269 (12)	22,880 (11)	3,767 (11)
Stirling/Falkirk/ Clackmannan	1,061 (2) [+4,048] (1)	0 (2)	2,850 (3) [+1,849] (1)	192 (4)	1,490 (3)	103 (3)
Fife	2,017 (11)	241 (11)	9,402 (12)	3,435 (12)	4,199 (10)	3,114 (10)
Argyll & Bute	1 (3)	0 (3) [-144]	5 (3)	477 (3) [-144]	1 (4)	2,401 (4) [-144]
Glasgow area*	12 (3)	1,020 (3)	252 (3)	461 (3)	570 (3)	652 (3)
Clydesdale	300 (1)	0 (1)	0 (1)	0 (1)	0 (0)	0 (0)
Stewartry/Wigtown	1 (2)	417 (2)	0 (2)	430 (2)	308 (3)	414 (3)
Annandale & Eskdale/Nithsdale**	998 (8)	365 (8) [-22]	1,444 (8)	65 (8) [-22]	4,060 (9)	210 (9) [-22]
East/Midlothian	1,480 (3)	85 (3)	13,800 (3)	125 (3)	1,690 (2)	85 (2)
Edinburgh/West Lothian	0 (1)	78 (1)	0 (2)	359 (2)	0 (2)	778 (2)
West Borders/ Tweedale/East Borders***	6,737 (8) [+18,664] (1)	87 (9)	6,690 (9) [+8,543] (1)	1,671 (10)	300 (8)	473 (8)
NE England****	8,403 (16)	1,349 (16) [-990]	7,598 (18)	1,870 (18) [-990]	350 (18)	2,084 (18) [-990]
Humberside	5,350 (1)	0 (1)	2,520 (1)	0 (1)	2,350 (1)	0 (1)
Cumbria**	0 (1)	620 (1) [-620]	0 (1)	540 (1) [-620]	0 (1)	1 (1) [-620]
Lancashire & Merseyside†	31,860 (1)	0 (1)	17,560 (1)	0 (1)	30,620 (1)	0 (1)
Norfolk	34,650 (8)	0 (8)	74,266 (8)	0 (8)	118,310 (8)	0 (8)
<i>Raw total counts</i>	<i>234,120</i>	<i>13,882</i>	<i>258,258</i>	<i>94,359</i>	<i>244,064</i>	<i>83,295</i>
<i>Adjustment for non-Icelandic birds</i>	<i>n/a</i>	<i>5,776</i>	<i>n/a</i>	<i>5,776</i>	<i>n/a</i>	<i>5,776</i>
<i>Estimated counts</i>	<i>24,936</i>	<i>9,591</i>	<i>10,392</i>	<i>7,355</i>	<i>n/a</i>	<i>n/a</i>
Adjusted Totals	259,056 (141)	17,697 (140)	268,650 (177)	95,938 (179)	244,064 (161)	77,519 (161)

* includes Bearsden & Milngavie, Clydebank, Cumbernauld & Kilsyth, Cumnock & Doon Valley, Cunninghame, Dumbarton, East Kilbride, Eastwood, Glasgow City, Hamilton, Inverclyde, Kilmarnock & Loudoun, Kyle & Carrick, Monklands, Motherwell, Renfrew 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 Etrick & Lauderdale, Roxburgh and Berwickshire

**** includes Tyne and Wear, Durham, Northumberland, North Yorkshire, South Yorkshire and West Yorkshire

† several feeding sites consolidated

nc no count received

3.3 Regional distribution

3.3.1 Pink-footed Goose

The distribution of Pink-footed Geese varied considerably over the three counts. Northeast Scotland and East Central Scotland held the greatest numbers of birds in October, with fewer present in the west and east of England. By November, numbers had decreased in Northeast Scotland but increased substantially in East England. Almost 47% of the population was present in East England in December, with a corresponding decline in numbers in Northeast and East Central Scotland (Table 2, Figure 2).

3.3.2 Greylag Goose

Very few Greylag Geese had arrived by October; of those that were present, the largest numbers were recorded in North and Southwest Scotland. By November, almost 64% of the population was present in North Scotland, with most of the remainder in Northeast and East Central Scotland. The distribution in December was broadly similar to that in November, with the proportion in North Scotland and East Central Scotland comparable to that in November. A decrease in numbers, however, was seen in Northeast Scotland, while larger concentrations were present in Southwest Scotland at this time (Table 2, Figure 3).

Table 2. Regional distribution of Pink-footed Geese and Iceland Greylag Geese in Britain and Ireland during October, November and December 2005, expressed as a percentage of the maximum count for each species.

	Pink-footed Goose			Greylag Goose		
	October	November	December	October	November	December
Ireland		0.00	0.00		5.43	0.01
North Scotland	0.05	5.00	0.60	3.50	64.30	68.55
Northeast Scotland	31.29	23.08	14.74	0.91	9.70	3.24
East Central Scotland	23.78	23.85	17.77	1.07	8.40	8.37
Southeast Scotland/ northeast England	6.44	10.88	0.91	0.69	3.43	2.74
Southwest Scotland/ northwest England	0.51	0.66	1.91	2.01	1.43	3.96
West England	12.34	6.80	11.86	0.00	0.00	0.00
East England	15.49	29.73	46.72	0.00	0.00	0.00
Total	89.88	100	94.50	8.17	92.69¹	86.87

* 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, Lincolnshire and Norfolk

¹ Does not equal 100% because some birds were also present in other countries (Faroe Islands and Iceland)

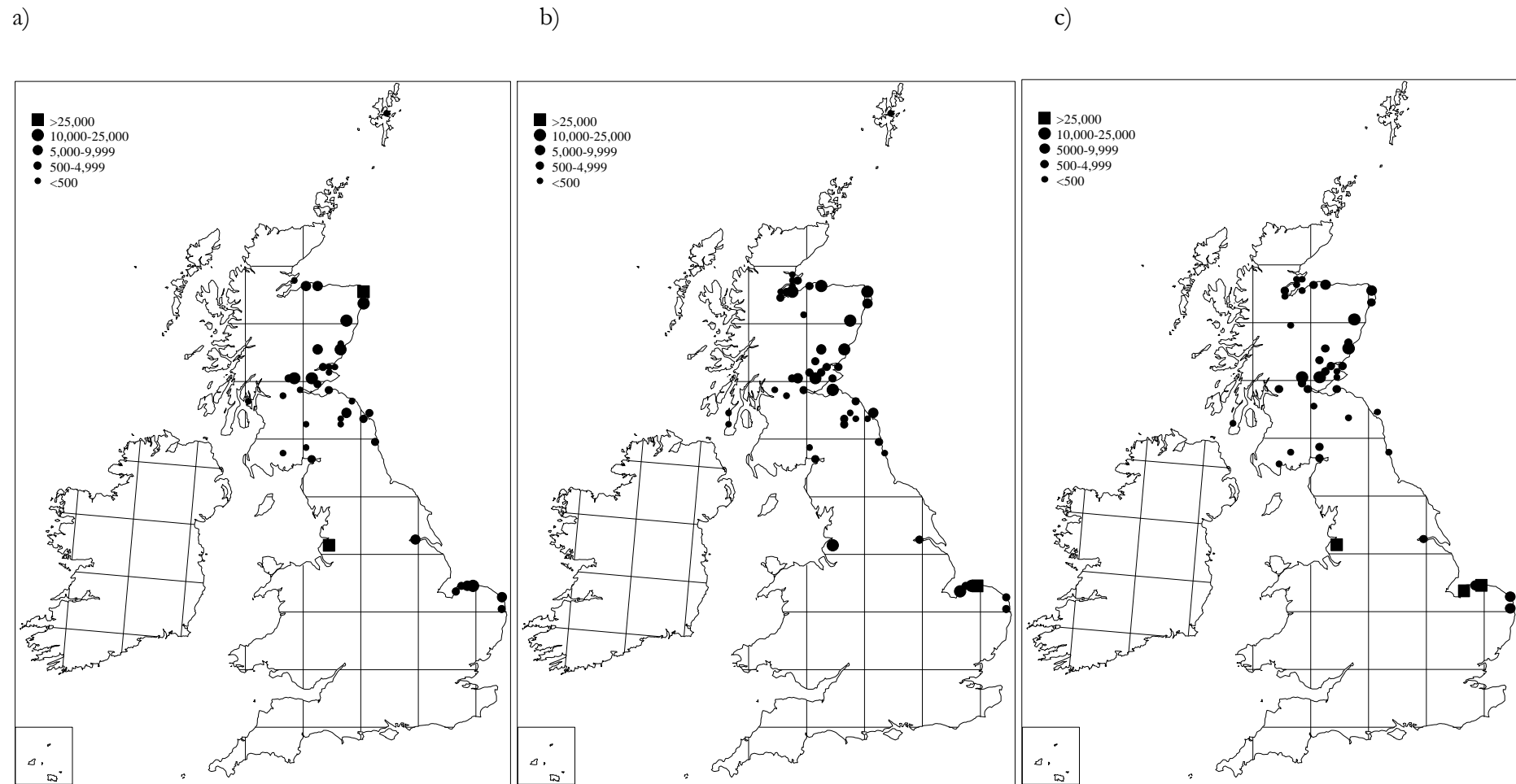


Figure 2. Distribution of Pink-footed Geese in Britain and Ireland in October (a), November (b) and December 2005 (c). Estimated counts are not shown.

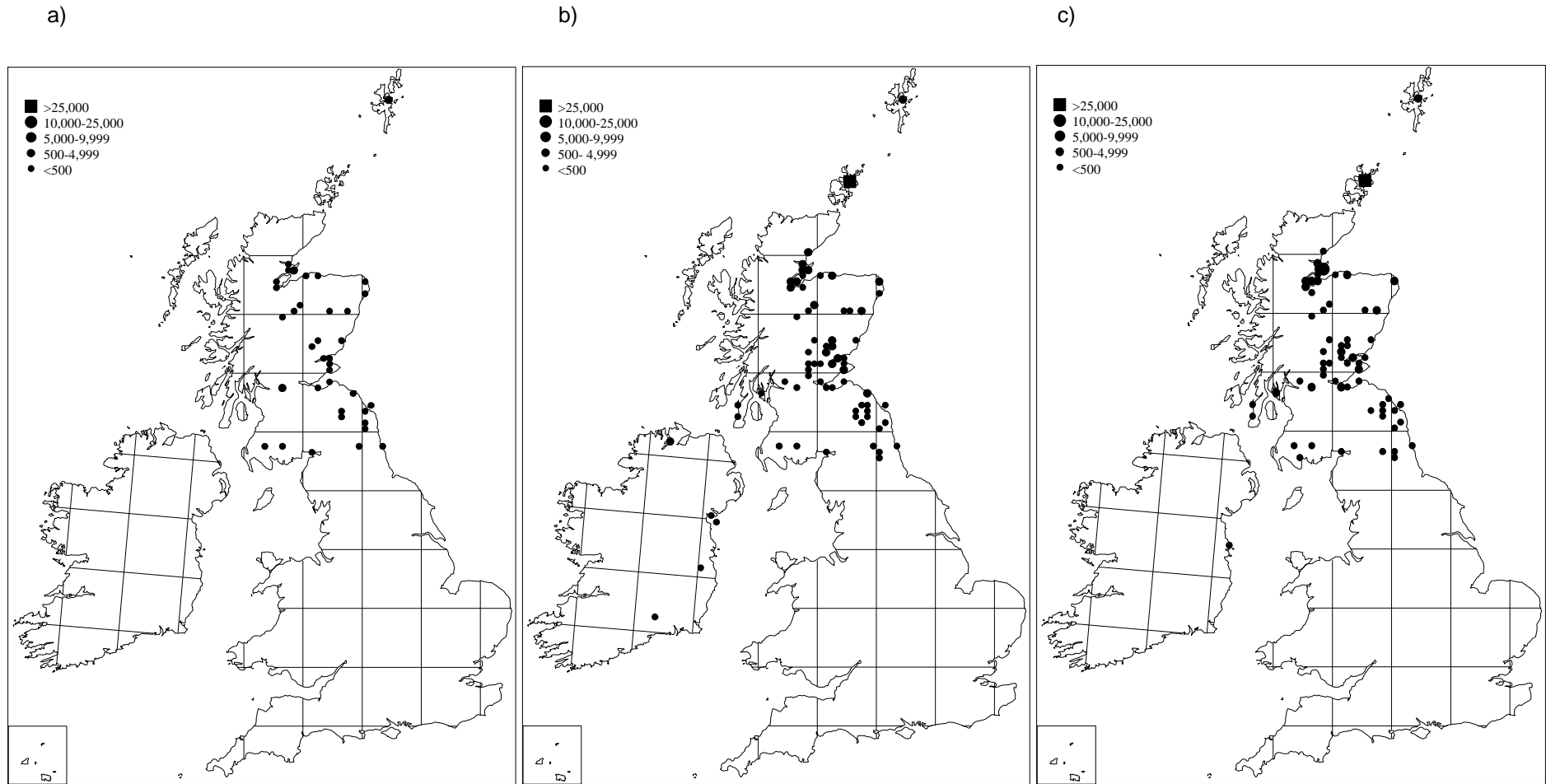


Figure 3. Distribution of Greylag Geese in Britain and Ireland in October (a), November (b) and December 2005 (c). Estimated counts are not shown.

3.4 Principal concentrations

3.4.1 Pink-footed Goose

Pink-footed Geese were recorded at 49 sites in October, 55 in November and 45 in December. Those sites holding more than 1% of the population estimate (2,687) decreased from 21 in October and November, to 13 in December (Table 3). Likewise, those sites with numbers exceeding 10,000 decreased from nine in October and ten in November, to six in December – a result of almost 50% of birds concentrating at a small number of sites in Norfolk in this latter month.

Combined counts from the 21 sites exceeding 1% of the population estimate in November accounted for 90.4% of the total count and numbers at the top four sites alone equated to 34.1% of the population estimate.

Loch of Strathbeg held fewer birds than in recent years but particularly high counts were made at Loch Spynie (for the second consecutive year), Barons Folly and Tentsmuir Point. Many sites recorded higher than average numbers including Loch Leven, Montrose Basin, Loch of Skene, Aberlady Bay and Breydon Water & Berney Marshes, but lower numbers of birds were recorded in Southwest Lancashire. Observations of geese in this area have suggested that some traditional feeding areas and roosts have been largely abandoned due to changes in food availability and increased disturbance. New roost sites are thought to be in use which are not surveyed as part of the census due to uncertainty of location or lack of public access (Forshaw 2006). This may explain the lower totals recorded in Lancashire this year.

3.4.2 Greylag Goose

The arrival of most Greylag Geese had not occurred at the time of the October count. Geese were recorded at 45 sites, only five of which held more than 1,000 birds.

By November, 81 sites held Greylag Geese, 17 of which held numbers exceeding 1% of the population estimate (959) and only one (Orkney Islands) holding more than 10,000 birds (Table 3). Combined counts from those sites exceeding 1% of the population estimate equated to 76.9% of the overall total for November. Greylag Geese were recorded at 73 sites in December; those with counts exceeding 1% of the population estimate decreased to ten, although two sites held over 10,000 birds (Orkney Islands and Loch Eye, Ross & Cromarty).

Numbers at the Loch of Skene were considerably higher than previous years (mean 2000-2004: 1,210) as were those at Loch Brora, and Loch Ussie. Numbers recorded at Lough Swilly were the highest recorded yet on a census weekend. For the purpose of analysis, Orkney is treated as a consolidated site, however, Table 4 shows the individual totals for the islands. Eight sites held numbers exceeding 1% of the population estimate in both November and 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 West Mainland were more than 10,000 birds recorded, which equated to 37.8% of the Orkney total in November (15.8% of population estimate) and 42.1% in December (17.7% of population estimate). Total numbers on Orkney during the November count were lower than the preceding two years.

Table 3. Sites that supported more than 1% of the (a) Pink-footed Goose (>2,687) and (b) Iceland Greylag Goose (>959) population estimates in November 2005. 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 2,400 for Pink-footed Goose and 1,000 for Greylag Goose (Wetlands International 2002).

a) Pink-footed Goose

Site	November count	Percentage of population estimate	Five year peak mean 2000-2004
Holkham/Wells next the sea, Norfolk	32,000	11.9	34,054
Loch Spynie, Moray	23,000	8.6	13,380
Snettisham, Norfolk	19,080	7.1	18,174
Southwest Lancashire	17,560	6.5	25,152
Loch Leven, Perth & Kinross	15,700	5.8	10,924
Montrose Basin, Angus	15,000	5.6	9,725
Loch of Strathbeg, Banff & Buchan	14,612	5.4	23,024
Confidential site, Norfolk	14,500	5.4	41,710
Loch of Skene, Gordon	14,200	5.3	6,532
Aberlady Bay, East Lothian	13,800	5.1	7,228
Easterton - Fort George, Ross & Cromarty	10,000	3.7	n/a
West Water Reservoir, Tweeddale	<i>8,543</i>	3.2	8,543
Loch of Lintrathen, Angus	7,250	2.7	5,117
Meikle Loch Slains, Gordon	6,600	2.5	4,354
Lindisfarne NNR, Northumberland	5,800	2.2	2,612
Carsebreck & Rhynd Lochs, Perth & Kinross	5,600	2.1	5,748
Horsey Mere, Norfolk	4,686	1.7	4,072
Barons Folly, Roxburgh	4,563	1.7	1,550
Tay Estuary: Tentsmuir Point, Fife	3,800	1.4	2,584
River Tay: Bloody Inches, Perth & Kinross	3,500	1.3	1,880
Breydon Water & Berney Marshes, Norfolk	3,000	1.1	1,398

b) Greylag Goose

Site	November count	Percentage of population estimate	Five year peak mean 2000-2004
Orkney Islands (all sites)	36,156	37.7	27,846
Caithness, Highland	<i>6,275</i>	6.5	6,275
Iceland	5,500	5.7	7,031
Loch of Skene, Gordon	4,700	4.9	3,527
Loch Eye, Ross & Cromarty	4,343	4.5	4,292
Lough Swilly, County Donegal	4,260	4.4	1,560
Loch Ussie, Ross & Cromarty	3,280	3.4	130
Loch Spynie, Moray	2,600	2.7	3,440
Cromarty Firth: Nigg Bay, Ross & Cromarty	2,500	2.6	95
Dornoch Firth, Ross & Cromarty	1,632	1.7	1,614
Kilconquhar Loch, Fife	1,500	1.6	959
Loch Brora, Sutherland	1,500	1.6	24
Beaully Firth, Ross & Cromarty	1,380	1.4	1,209
Loch Garten, Badenoch & Strathspey	1,300	1.4	1,920
Haddo House Lakes, Gordon	<i>1,080</i>	1.1	1,049
Shetland Isles	1,061	1.1	778
Inner Cromarty Firth: Conor Islands, Ross & Cromarty	1,000	1.0	n/a

Counts in italics denote estimated counts used for November 2005 count totals.

Table 4. Greylag Goose counts at individual sites on Orkney in November and December 2005 (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).

	November count	% of count total	December count	% of count total	Five year peak mean
West Mainland	15195	15.8	17008	17.7	15170.2
East Mainland	6618	6.9	8589	9.0	5776.4
Island of Shapinsay	5200	5.4	2841	3.0	2360.6
Island of Sanday	2990	3.1	2300	2.4	1518.75
Island of Stronsay	2393	2.5	2185	2.3	1710
Island of South Ronaldsay	2000	2.1	1832	1.9	837.4
Island of Egilsay	1730	1.8	1051	1.1	1673.4
Island of Rousay	1024	1.1	437	0.5	201.75
Island of Papa Westray	812	0.8	812	0.8	741
Island of Westray	811	0.8	560	0.6	253
Island of Eday	725	0.8	1060	1.1	704
Isles of Hoy and Walls	361	0.4	314	0.3	357.5
Island of North Ronaldsay	197	0.2	197	0.2	108.2
Island of Wyre	52	0.1	774	0.8	407.5
Island of Burray	48	0.1	443	0.5	252.25
Total	40156	41.9	40403	42.2	30046

3.5 Breeding success

A total of 16,448 Pink-footed Geese (35 flocks) and 4,242 Greylag Geese (47 flocks) were aged at various localities throughout Scotland and England. The percentage of birds aged in relation to the estimated size of the population in 2005/06 was 6.1% for Pink-footed Goose and 4.4% for Greylag Goose. Information on the brood sizes of 298 families of Pink-footed Geese and 84 families of Greylag Geese was also collected during this time period.

The percentage of young in flocks of Pink-footed Geese during winter 2005/06 was 18.1% (Table 5, Figure 4). Most flocks contained 15-20% young with the highest percentage of young seen in flocks of less than 100 birds (Figures 6 and 7). This figure is lower than the preceding three years but similar to the mean for the previous ten years (1995-2004 mean: 18.1% \pm 0.7se) (Figure 4). The mean brood size was below the ten-year mean at 1.71 goslings per successful pair (1995-2004 mean: 2.25 \pm 0.04 se).

There was considerable regional variation in the percentage of young Pink-footed Geese, varying from 14.7% in West England to 23.7% in East England (Table 5). Likewise, mean brood size varied from 1.54 in West England to 2.25 in East England. The highest number of birds aged was in Northeast Scotland with samples taken throughout September to early November while East Central and Southeast Scotland were sampled in late October only. Age assessments were made in East England during early October and in West England in early/mid November (Figure 5).

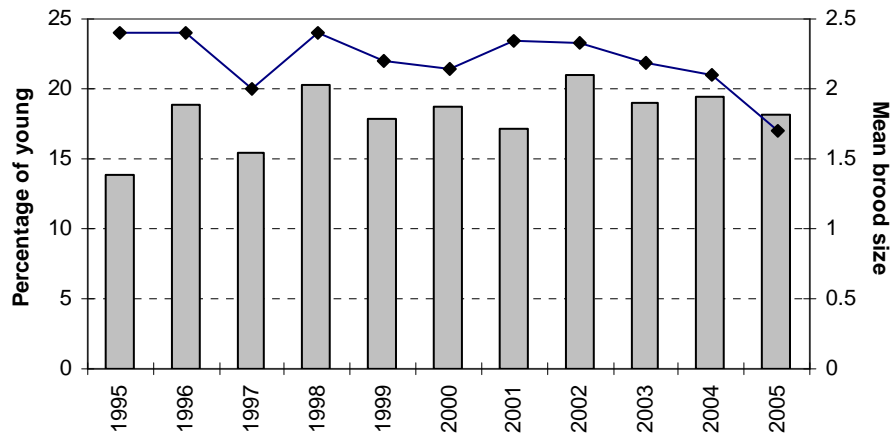
The breeding success of Iceland Greylag Geese was higher than the mean of the preceding ten years (1995-2004 mean: 18.3 \pm 1.5se) with flocks containing 22.7% young and was the second highest over that time period (2004 was a very good breeding season yielding 28.2% young) (Figure 4). Most flocks contained 20-25% young with the highest percentage found in flocks of less than 100 birds, although the variation with flock size was not as great as that seen in Pink-footed Goose flocks (Figures 6 and 7). The mean brood size of 2.29 was below that of the most recent five year mean (2.68 \pm 0.05se) and the lowest recorded over the preceding ten years.

Variation across regions was also apparent for Greylag Geese with the lowest percentage of young recorded in East Central Scotland and the highest in Northeast Scotland (Table 5). Brood sizes also showed some regional variation with a range between 2.2-2.8. The largest number of birds aged was in North Scotland, mostly in early November, with a sample also in late October. Smaller numbers were aged in Northeast Scotland in late October and early November, and in East Central Scotland in late October (Figure 5).

Table 5. The percentage of young and mean brood size of Pink-footed and Greylag Geese in autumn 2005 (regions defined in Table 2).

	Region	Total aged (no. of flocks)	% young	No. of broods	Mean brood size (se)
Pink-footed Goose	Northeast Scotland	6,038 (11)	19.2	107	1.93 (0.10)
	East Central Scotland	4,494 (8)	15.3	12	2.08 (0.31)
	Southeast Scotland	1,639 (2)	16.7	5	2.00 (0.45)
	East England	2,435 (7)	23.7	4	2.25 (0.63)
	West England	1,842 (5)	14.7	170	1.54 (0.05)
	Total	16,448 (35)	18.1	298	1.71 (0.05)
Greylag Goose	North Scotland	3,302 (38)	22.6	61	2.16 (0.13)
	Northeast Scotland	820 (8)	24.4	18	2.56 (0.22)
	East Central Scotland	120 (1)	15.8	5	2.80 (0.58)
	Total	4,242 (47)	22.7	84	2.29 (0.11)

(a) Pink-footed Goose



(b) Greylag Goose

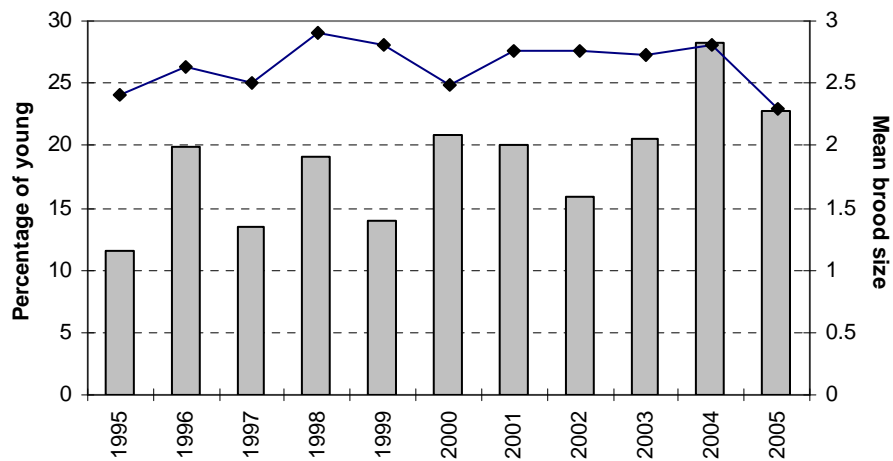
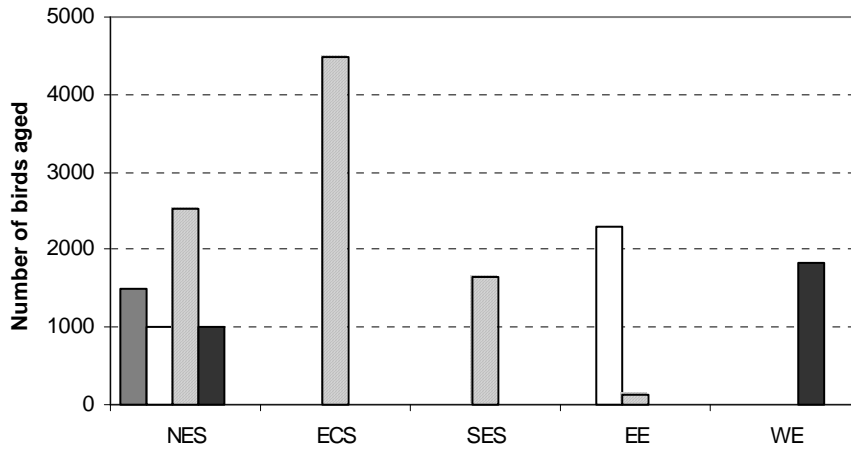


Figure 4. The percentage of young (column) and mean brood size (line) found in flocks of Pink-footed Geese (a) and Iceland Greylag Geese (b) in Britain, 1995-2005.

(a) Pink-footed Goose



(b) Greylag Goose

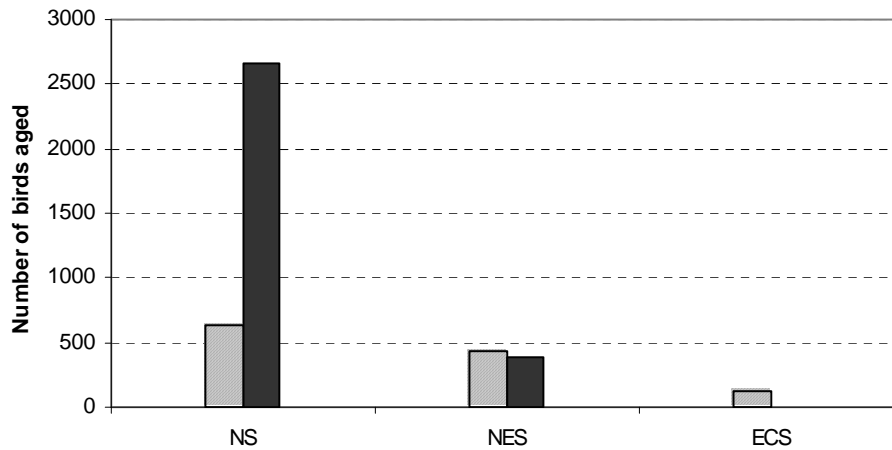
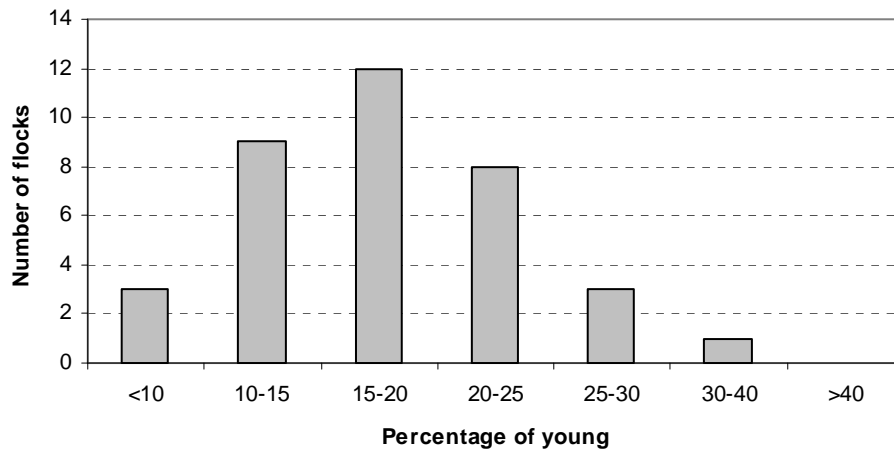


Figure 5. The temporal distribution of Pink-footed (a) and Greylag Goose (b) age samples in each region during autumn 2005. Periods: September (dark grey), early October (white), late October (hashed lines) and early November (black). Regions are defined in Table 2.

(a) Pink-footed Goose



(b) Greylag Goose

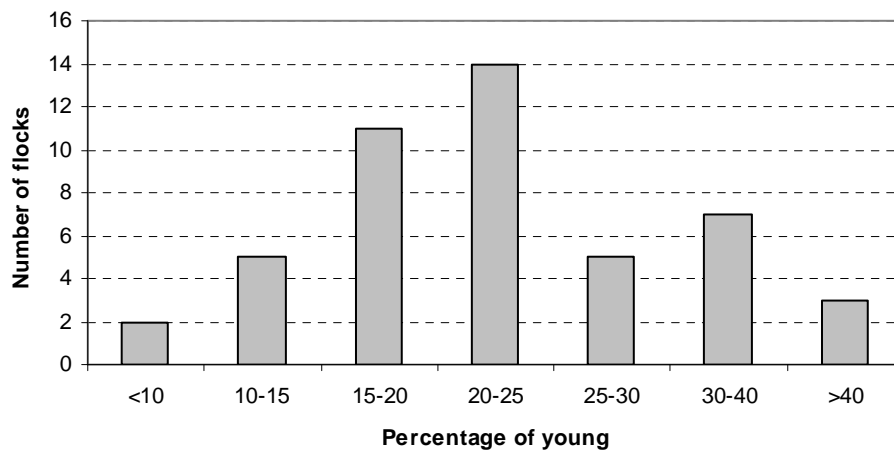


Figure 6. Frequency distribution of the percentage of young in flocks of Pink-footed (a) and Greylag Goose (b) in Britain during autumn 2005.

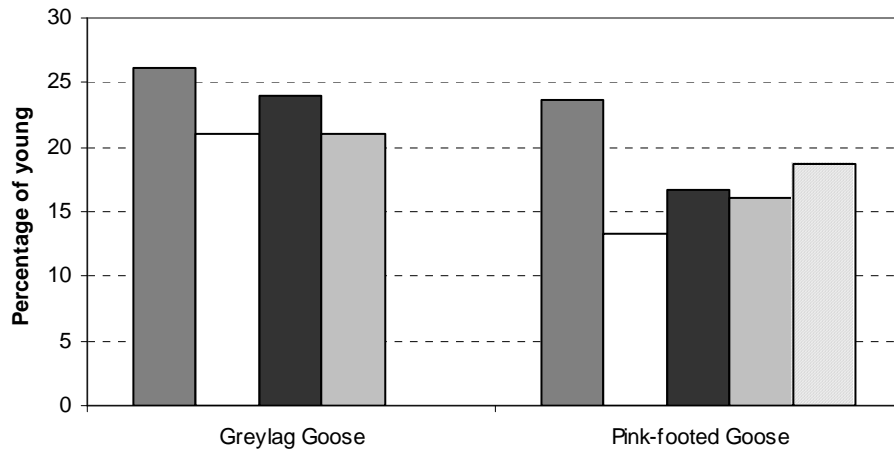


Figure 7. The percentage of young Greylag and Pink-footed Geese in flocks of different sizes in Britain during autumn 2005: <100 birds (dark grey); 100-250 (white); 252-500 (black); 501-2,000 (pale grey) and >2,000 (hashed).

4 Discussion

The 2005 Icelandic-breeding Goose Census has revealed declines in both the Pink-footed Goose and Iceland Greylag Goose populations since 2004 (Figure 8). The preceding year saw increases for both species following good breeding seasons, but there has since been a decline of 8% in the Pink-footed Goose population and 10.5% in the Iceland Greylag Goose population. The 2005 population estimate of 268,650 for Pink-footed Geese is lower than the previous two years but remains above estimates prior to 2001. The estimate of 95,938 for the Iceland Greylag Goose population, although lower than the preceding year, is still the second highest since 1993.

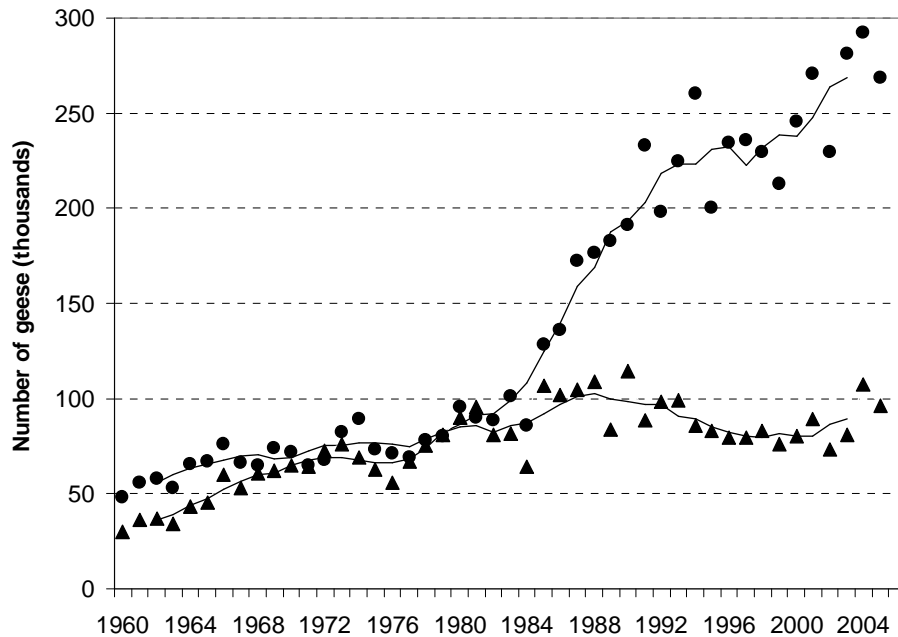


Figure 8. Population estimates for Pink-footed Goose (circles) and Iceland Greylag Goose (triangles), 1960 to 2005. The 5-year running means (eg mean for 2003 is from population estimates for 2001-05) are shown as lines.

Previous census results and anecdotal evidence from Iceland have suggested that Greylag Geese may be remaining for longer in Iceland, prior to departure to the wintering grounds, giving rise to the possibility that a substantial proportion of birds may be missed during the November count. The introduction of a December count, as part of a three year trial to re-assess the most suitable time period for measuring population size effectively, was very well received by the counter network with almost as many sites counted in December as in November. Full analyses of the December counts will not be possible until the three year trial period is completed due to lack of data collected in this month prior to 2005.

No regular count data are collected in Iceland throughout October, November and December, however. Most figures from Iceland which are included in the census totals are derived from estimates rather than actual counts. The number of geese remaining in Iceland in November 2004 was estimated at 20,000 – larger than estimates in previous years - which was partly responsible for the large increase in the 2004 census total. Even though the arrival of Greylag Geese were apparently late in autumn 2005 (only 8% of the population was present in Britain in October 2005, compared with 29% in October 2004), only 5,500 were estimated to be present in Iceland in November 2005. There is a need to develop coordinated counts in both Iceland and Norway (where small numbers are thought to winter based on sightings of birds ringed in Iceland and Britain), conducted over the same time period as those in Britain and Ireland to fully assess the most appropriate time to census this population and to effectively estimate population size with confidence. Collaborative plans, involving the Icelandic Institute of Natural History and key Goose specialists in Iceland, to conduct an aerial survey of

southern Iceland in November 2005, with co-ordinated ground counts throughout the rest of Iceland, were unfortunately not possible due to bad weather in November 2005. Subject to funding, it is hoped that these surveys will be possible in November 2006.

Recent data collected during the censuses have revealed that Pink-footed Geese may also be departing from the breeding grounds later. The peak count of Pink-footed Geese in 2005 occurred in November, suggesting that the arrival of geese in 2005 may have been slightly later than that in 2004 when peak numbers occurred in October. Over the most recent five years, the peak count has occurred most commonly in November. Subsequent censuses should clarify whether the population is best censused in November due to progressively later arrival from the breeding grounds.

The breeding success of both Pink-footed Geese and Iceland Greylag Geese was lower than the preceding year, although the percentage of young Greylag Geese was still the second highest over the most recent ten years. Preliminary hunting bag statistics for Iceland suggested a successful breeding season for Greylag Geese with 36% young found in the bag, although sample size was small at 400 birds (A. Sigfusson pers. comm.).

Considerable variation in the percentage of young in flocks of Pink-footed Geese existed between regions. The lowest percentage of young was seen in East Central Scotland, Southeast Scotland and West England. This relatively low breeding success was consistent with preliminary hunting bag statistics from Iceland which suggested a poor breeding season (15% of young in the bag – A. Sigfusson pers. comm.). East England, however, recorded a comparatively high percentage of young Pink-footed Geese (23.7%). Few age assessment data have been collected regularly in this region prior to 2005 to confidently ascertain whether this region regularly supports a higher proportion of families.

It is interesting to note that there is evidence (based on ring sightings) to suggest that some species of geese and swans using particular areas of the breeding grounds preferentially use different parts of the wintering range (*eg* Whooper Swans breeding in West Iceland show a tendency to winter in Ireland – Garðarsson 1991, Rees *et al* 2002). The majority of ring sightings of Pink-footed Geese are from birds that have been ringed in Britain and Iceland. Few individuals, however, have been ringed in Greenland to determine whether geese from the Iceland and Greenland breeding grounds show a preference for different wintering areas. Numbers have increased substantially in Norfolk over recent years and past observations have recorded a relatively high number of young in this area compared to other wintering sites. The overall increase in Pink-footed Goose numbers particularly since the mid 1980s may have resulted in density dependent limitations on the Icelandic breeding grounds – Pink-footed Geese have been observed using lowland areas in recent years (those more commonly used by Iceland Greylag Geese), away from the traditionally favoured central highland breeding grounds (R. Hearn pers. comm.). It is interesting to speculate that perhaps birds on the Greenland breeding grounds are not affected by the same density dependent limitations and as a result have a higher degree of breeding success. If differential winter distribution between birds using distinct breeding areas was a factor, then this is a potential explanation for the higher number of young seen in East England. Studies involving marked birds would be necessary to further our understanding regarding the movements of Greenland breeding birds.

One priority for improvement of the Icelandic Goose Census is to achieve complete coverage throughout the range. There are a number of sites within Britain where data has not been received for a series of years – some of which are thought to hold important numbers of Pink-footed Geese or Iceland Greylag Geese. These gaps in coverage need to be addressed. Improved monitoring of both species needs to be developed in areas outside Britain, particularly by initiating regular co-ordinated counts in Iceland and Norway (timed to coincide with the IGC) as well as age assessments in Iceland. A greater understanding regarding the delimitation of Greylag Geese from the Northwest Scotland population is also necessary to confirm the current estimated numbers and status of these populations.

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