The 2002 Icelandic-breeding Goose Census

A Wildfowl & Wetlands Trust Report

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SUMMARY

The 43rd consecutive census of Pink-footed Geese and Iceland Greylag Geese took place during autumn and early winter 2002. Two discrete counts were undertaken, one in October and another in November. Some sites were also counted during September. Coverage was reasonable, although some important sites were not surveyed, and was again extended beyond Britain and Ireland: comprehensive coverage was achieved in the Faeroe Islands and estimates were also available for parts of Iceland and Norway. Weather conditions were generally favourable, although conditions prevented the count being made on the co-ordinated weekend in some areas. Maxima of 210,923 Pink-footed Geese and 62,145 Greylag Geese were recorded in November. 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 NW Scotland populations in the UK counted prior to this census, resulting in population estimates of 229,824 Pink-footed Geese and 73,115 Greylag Geese. Both population estimates were lower than those calculated for 2001: the Pink-footed Goose estimate represents a decrease of 15.2% and the Greylag Goose estimate decreased 18.4%. Possible explanations for these low counts are discussed. Pink-footed Geese had a good breeding season in 2002: autumn flocks contained 21.0% young and mean brood size was 2.3 goslings per successful pair. Greylag Geese were less successful than average and autumn flocks contained 15.9% young and mean brood size was 2.8 goslings per successful pair.

INTRODUCTION

The 43rd consecutive census of Iceland/Greenland Pink-footed Geese *Anser brachyrhynchus* and Iceland Greylag Geese *A. anser* took place during autumn and early winter 2002. The aim of the Icelandic-breeding Goose Census (IGC) is to estimate the size and monitor the distribution of these two goose populations. The methods used followed those of previous censuses, with two co-ordinated counts being undertaken, the first in October and the second in November. These 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. This report provides an overview of the results; more detailed data are available from WWT upon request.

METHODS

Counts were conducted by a network of largely volunteer counters over the weekends of 12/13 October and 9/10 November 2002. In a few cases counts made just outside this period 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. They were timed to coincide with the new moons, 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. 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.

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 2002 census, numbers were estimated from the mean of the counts made during the relevant month during 1997-2001. 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 (i.e. birds from the re-established or NW 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. In one case a count in late August was also used to adjust a November count.

To assess reproductive success, data collected between mid-September and mid-November were used to determine the proportion of young in flocks and the mean brood size of successful pairs.

RESULTS

Coverage and conditions

A total of 120 sites was covered during the two counts: 89 of these were counted in both months, ten only in October and 21 only in November. This is a reduction of 20% in the number of sites counted compared to the 2001 census. Outside Britain, several sites in the Faeroes were counted, and an estimate of the number of Pink-footed Geese remaining in Iceland in October was included, based on ground counts conducted around the date of the co-ordinated count.

In all, four sites not counted during October 2002 met the criteria for the calculation of an estimated count for Pink-footed Geese: Findhorn Bay (mean 1997-2001: 3,788), Inner Firth of Tay (2,688), Loch Mahaick (2,077) and the River Forth at Skinflats (2,004). Furthermore, the combined count for Southwest Lancashire (19,515) was revised to 24,515 on the advice of the count organiser, as one site (Martin Mere) was only partially covered. The estimate of 5,000 additional birds was based on counts just prior to the census.

During November, estimates of Greylag Geese were calculated for ten sites: Dinnet Lochs (5,435), Inner Firth of Tay (1,788), Findhorn Bay (1,294), Lough Swilly (1,183), Stranraer Lochs (885), Haddo Country Park (884), Lindisfarne (785), Dowlaw Dam (700), Long Loch (550) and Ballo Reservoir (359). In addition, the late arrival of Pink-footed Geese into Britain during 2002 meant that the peak count did not occur during October, therefore estimated counts of Pink-footed Geese counts were calculated for six sites in November: Inner Firth of Tay (5,373), Long Loch (5,022), Findhorn Bay (2,974), Lindisfarne (2,418), Fala Flow (1,868) and Upper Cowgill Reservoir (1,246).

Counts of UK Greylag Geese during September were received from 33 sites and these were used to adjust the co-ordinated November count of Greylag Geese at five sites or regions, as follows: Orkney Islands (-1,500), Loch Fleet (-817), East Chevington (-347), Loch Clunie (-300), Solway Estuary (-103), Loch Insh and Spey Marshes (-100), Dornoch Firth (-95), Island of Bute (-78) and Marlee Loch (-18).

Supplementary counts, made in addition to the co-ordinated IGC counts, were received from 60 sites, most notably Aberlady Bay, Breydon Water, Caithness, Cameron Reservoir, Carsebreck and Rhynd Lochs, Dinnet Lochs, Dornoch Firth, Dun's Dish, Holburn Moss, Hoselaw Loch, Hule Moss, Humber Estuary, Isle of Bute, Linlithgow Loch, Loch Gelly, Loch of Skene, Loch of the Lowes, Loch Insh and Spey Marshes, Loch Spynie, the north Norfolk roosts, the Orkney Isles,

Solway Estuary, Southwest Lancashire, Upper Cowgill Reservoir and Westwater Reservoir.

Weather conditions and disturbance levels were generally reported by counters as satisfactory, although poor conditions (heavy driving rain) were reported from a few sites during the November count weekend and this may have negatively affected the count. As a result, a number of sites were counted a few days after the co-ordinated count weekend, as counts were impossible on the weekend itself. This may have further affected the overall count. The new moons were on 21 October and 20 November. Low counts (where counters felt they had underestimated the number of birds due to difficulties, such as poor visibility) were reported from a total of six sites during October and six sites during November. Of the latter, two held important numbers of Pink-footed Geese (Loch of Lintrathen and Loch of Skene) and two held important numbers of Greylag Geese (Loch of Skene and Loch Eye).

Total Numbers

Census count totals are illustrated in Figure 1 and regional count totals are shown in Table 1.

Pink-footed Goose

The November count total of 210,923 is a decrease of 54,894 (20.7%) on the previous year (Hearn 2003). After the inclusion of estimated counts, the adjusted population estimate is 229,824, a decrease of 41,097 (15.2%) on the previous estimate (Hearn 2003). During October 2002, 193,455 Pinkfeet were counted, 91.7% of the total November count.

Greylag Goose

The November count total of 62,145 is a decrease of 25,864 (29.4%) on the previous count in November 2001 (Hearn 2003). After adjustments and the inclusion of estimated counts, a population estimate of 73,115 was derived, a decrease of 16,513 (18.4%) over the previous adjusted estimate.

Pre-adjusted counts in October suggest that the arrival of Greylags into Britain in autumn 2002 was extremely late, with just 11.5% of the November count recorded during that month. It should be noted, however, that the timing of each census is not precisely synchronous with previous censuses, as it is based mostly on the phase of the moon, and fewer sites supporting Greylag Geese are counted during October than November.

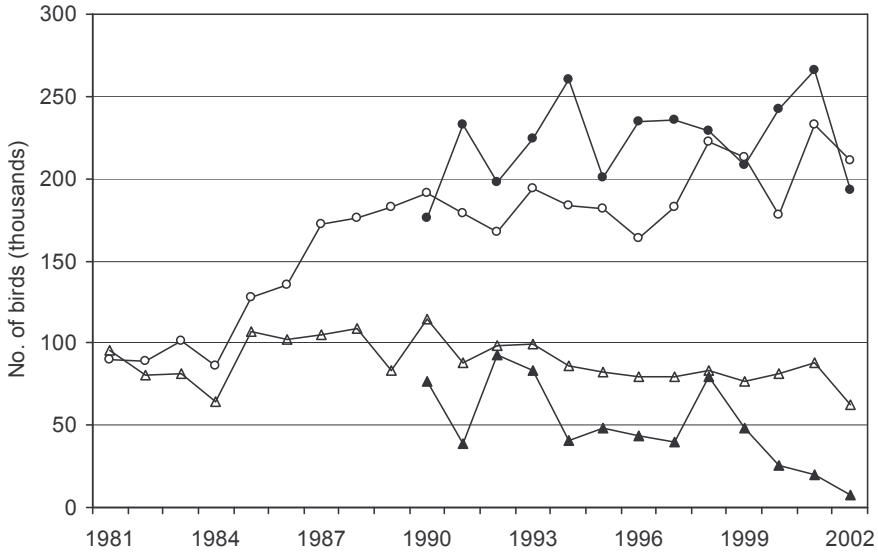


Figure 1. The numbers of Pink-footed Geese (circles) and Iceland Greylag Geese (triangles) counted in October (filled) and November (open) as part of the Icelandic-breeding Goose Census, 1980 to 2002.

Table 1. The regional distribution of Pink-footed Geese and Iceland Greylag Geese in October and November 2002. Figures in square brackets show adjusted or estimated totals.

Region	October			November		
	Sites	Pinkfoot	Greylag	Sites	Pinkfoot	Greylag
Iceland+	1	3,750	nc	0	nc	nc
Norway	0	nc	nc	0	nc	nc
Faeroe Islands	3	1	129	3	2	175
Ireland	0	nc	nc	2 [1]	0	826 [+1,183]
Shetland+	1	4	0	1	1	259
Orkney	8	128	1,930 [-1,500]	10	112	26,505 [-1,500]
Caithness+	1	0	526	1	0	2,792
Sutherland	2	0	560 [-817][1]	2	0	352 [-817][1]
Ross & Cromarty	9	4	320 [-95]	10	15,003	14,045 [-95]
Inverness/Nairn	2	0	0	2	2	0
Badenoch & Strathspey	1	0	0	2	0	1,168 [-100]
Moray	1 [1]	0 [+3,788]	0 [+1,098]	1 [1]	2,800 [+2,974]	3,200 [+1,294]
Banff & Buchan	1	32,800	0	1	19,575	415
Gordon/Aberdeen	2	21,705	46	2 [1]	12,820	1,177 [+884]
Kincardine & Deeside	1	0	18	0 [1]	nc	nc [+5,435]
Angus/Dundee	4	15,500	0	3 [1]	14,833 [+5,022]	400 [+550]
Perth & Kinross	10	35,471	692 [-268]	15	22,431	3,988 [-318]
Stirling/Falkirk/	2	4,515	0	4	1,470	0

Clackmannan	[2]	[+4,081]				
Fife	9 [1]	112 [+2,688]	153 [+1,087]	9 [2]	2,220 [+5,373]	1,260 [+2,147]
Argyll & Bute	3	9	135 [-78]	4	1	2,021 [-78]
Glasgow area*	2	0	450	3	45	280
Clydesdale	1	40	0	[1]	[+1,246]	0
Stewartry/Wigtown	2	4	660	2 [1]	3	517 [+885]
Annandale & Eskdale/Nithsdale**	7	3,401	378 [-103]	8	2,213	193 [-103]
East/Midlothian	4	16,304	274	2 [1]	8,550 [+1,868]	320
Edinburgh/West Lothian	2	0	0	2	0	0
West Borders/ Tweedale/East Borders***	5	11,182	750	7 [1]	3,032	1,224 [+700]
NE England	9	4,600	127	8 [1]	300 [+2,418]	1,028 [+785] [-347]
Humberside	1	2,160	0	1	4,620	0
Cumbria**	1	0	0	1	0	0
Lancashire & Merseyside+	1 [1[2]]	19,515 [+5,000]	0	1	31,645	0
Lincolnshire	0	nc	nc	0	nc	nc
Norfolk	3	22,250	0	3	69,245	0
Totals	99 [4] 103	193,455 [+15,557] 209,012	7,148 [+2,185] [-2,604] 6,729	110 [12] 122	210,923 [+18,901] 229,824	62,145 [+13,863] [-2,893] 73,115

* 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 Ettrick & Lauderdale, Roxburgh and Berwickshire

+ several feeding sites consolidated

nc no count received

[1] estimate of Re-established birds greater than November count, therefore adjusted count taken as zero

[2] estimate of birds not counted at WWT Martin Mere

Regional Distribution

The regional distribution of geese during the two counts is summarised in Table 2 and illustrated in Figures 2 and 3.

Table 2. Gross regional distribution of Pink-footed Geese and Iceland Greylag Geese in Britain during October and November 2002, expressed as a percentage of the maximum count for each species.

Area*	Pink-footed Goose		Greylag Goose	
	October	November	October	November
North Scotland	0.1	7.2	2.0	72.7
Northeast Scotland	25.8	16.7	0.1	8.1
East Central Scotland	26.4	19.4	1.0	9.0
Southeast Scotland/ Northeast England	15.2	5.6	1.9	3.8
Southwest Scotland/ Northwest England	1.6	1.1	2.4	4.8
West England	9.3	15.0	0	0
East England	11.6	35.0	0	0
Total	90.0	100.0	7.4	98.4

* areas defined as follows:
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

Pink-footed Goose

The regional distribution of Pink-footed Geese during autumn 2002 was typical, with key concentrations during October in Northeast and East Central Scotland. A higher than average proportion was also present in East England at this time. By November, the late arrival had been completed and over one third were found in East England (principally Norfolk) at this time. Other key areas were again Northeast and East Central Scotland, as well as West England. In both months, the proportion found in Southeast Scotland/Northeast England was below average.

Greylag Goose

The autumn distribution of Greylag Geese was less typical. A very low proportion of the population was present in Britain during October, again a reflection of the apparent late departure from Iceland in autumn 2002 by both species. By November, almost three-quarters of the population were in North Scotland, with most of the remainder in Northeast and East Central Scotland. These proportions are skewed, however, by the lack of counts from some important roosts in these two regions, although numbers in Orkney continued to increase.

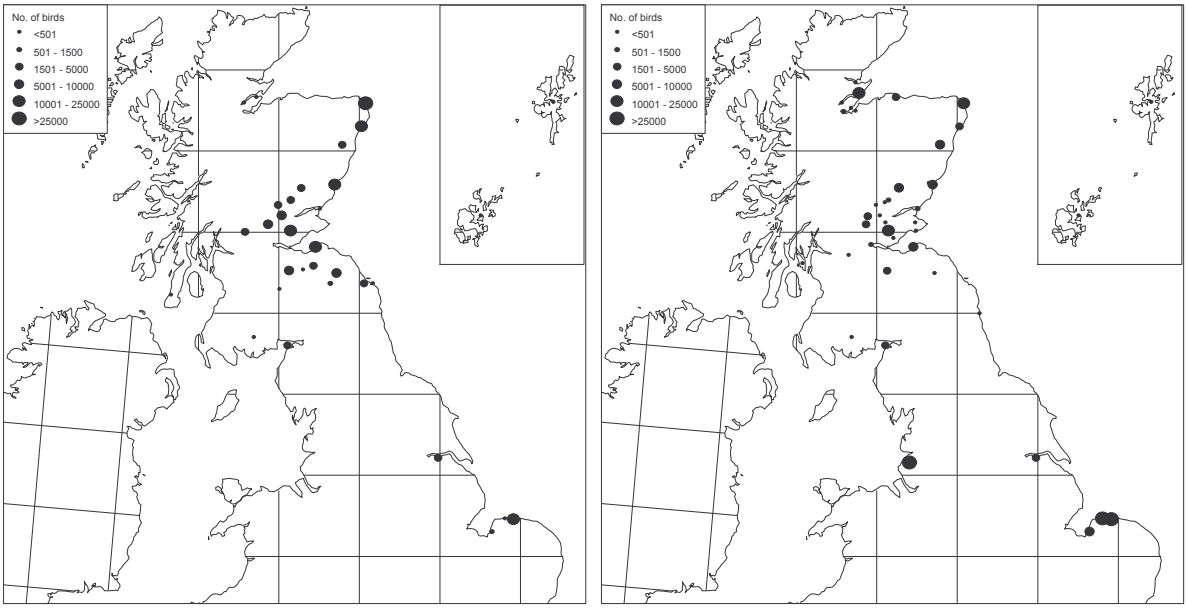


Figure 2. The distribution of Pink-footed Geese counted in Britain in October (left) and November (right) 2002.

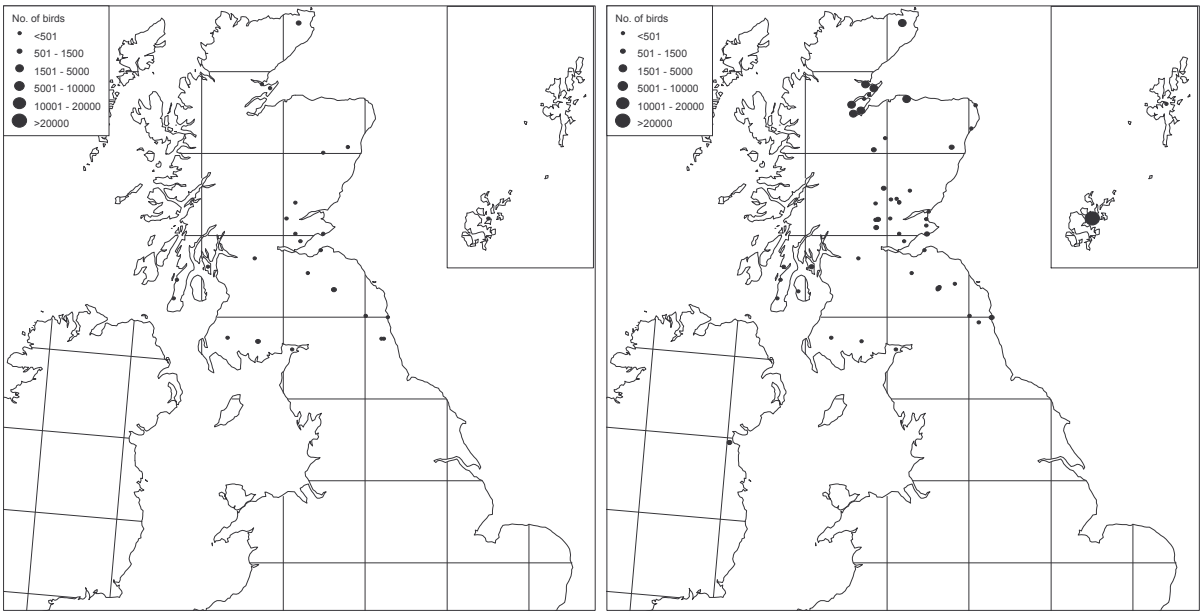


Figure 3. The distribution of Iceland Greylag Geese counted in Britain in October (left) and November (right) 2002.

Principal Concentrations

All sites that supported more than 1% of the Pink-footed Goose or Greylag Goose population estimates during the relevant month in 2002 are shown in Table 3.

Pink-footed Goose

During November, Pinkfeet were reported from a total of 42 sites, of which 36 held more than ten birds. Seventeen of these held more than 1% (2,298) of the population estimate and six supported 10,000 or more birds (Table 3). Exactly 40% of the population estimate was recorded at the top three sites during November. In October, Pinkfeet were found at slightly fewer sites, 35 in total, of which 29 held ten or more birds. Seventeen held more than 1% of the population estimate, with 10,000 or more counted at six of these. The top six sites held 48% of the population estimate. In total, Pinkfeet were recorded at 53 sites during both counts.

As the peak count occurred during November, after the peak concentration at many important sites, a number of these appear to have had low counts during 2002, such as Loch of Strathbeg, Montrose Basin, Meikle Loch, Carsebreck and Rhynd Lochs, and Westwater Reservoir (Table 3, column C). October counts at most of these sites were generally considerably larger, although numbers were low at Westwater Reservoir. Furthermore, low numbers, particularly during November, at Dupplin Lochs means that this key roost site does not feature in Table 3. During November, the large count at Nigg Bay was exceptional, whilst other atypically large counts were reported from two sites more typically associated with Greylag Geese, namely Loch of Skene and Loch of Lintrathen. Numbers on the Humber Estuary also continued to increase.

Greylag Goose

During October 2002, very few Greylag Geese were located, with low numbers at all typical arrival sites in north Scotland. The proportion of the population estimate present in Britain (11.5%) was well below the average for the October count (mean 1998-2002: 44.5%). In all, they were reported from a total of just 32 sites (including six in Orkney), of which 28 held more than ten birds.

By November, Greylags were found at 66 sites (including ten in Orkney), of which 61 held ten or more birds. Taking Orkney as a consolidated site, 15 of these held more than 1% (731) of the population estimate and four held more than 3,000 (Table 3), comprising 48% of the total. In all, Greylags were recorded at a total of 69 sites during both counts, 38 fewer than the previous year.

A larger than average count was recorded from a number of sites during November, most notably at Dingwall Bay and Whitrig Bog, Munlochy Bay and the Beauly Firth. The number on Orkney also continued to increase, with a record count for the seventh time in eight years.

Table 3. Principal Pink-footed Goose and Iceland Greylag Goose resorts in autumn 2002. Columns show: (A) counts (from October for Pink-footed Geese and November for Greylag Geese) exceeding 1% of the 2002 population estimate; (B) the site count as a percentage of the population estimate; (C) the site count as a percentage of the mean 5-year peak count; (D) the 5-year peak mean count. Five-year peak mean counts are calculated using all available data, thus may appear larger than counts recorded by this census if higher counts are made at other times of the year.

PINK-FOOTED GOOSE				
2002 population estimate	**229,824**			
	A	B	C	D
Southwest Lancashire	31,645	13.8	107	29,585
Scolt Head	31,625	13.8	79	40,218
Holkham/Wells Bay	28,600	12.4	73	39,400
Loch of Strathbeg	19,575	8.5	52	37,316
Cromarty Firth: Nigg Bay	14,000	6.1	500	2,800
Loch Leven	12,773	5.6	92	13,883
Snettisham	9,020	3.9	31	29,061
Aberlady Bay	8,550	3.7	60	14,158
Loch of Skene	8,420	3.7	175	4,805
Montrose Basin	8,332	3.6	32	26,317
Loch of Lintrathen	6,440	2.8	114	5,666
Humber Estuary	4,620	2.0	132	3,508
Meikle Loch, Slains	4,400	1.9	20	21,550
Carsebreck and Rhynd Lochs	4,150	1.8	28	15,044
West Strathearn	4,100	1.8	100	4,100
Westwater Reservoir	2,822	1.2	10	27,888
Loch Spynie	2,800	1.2	44	6,360

GREYLAG GOOSE				
2002 population estimate	**73,115**			
	A	B	C	D
Orkney (all sites)	25,005	34.2	126	19,914
Loch Eye	4,000	5.5	78	5,119
Loch Spynie	3,200	4.4	69	4,640
Munlochy Bay	3,130	4.3	193	1,621
Inner Cromarty Firth: Dingwall Bay	2,800	3.8	203	1,380
Caithness	2,792	3.8	35	7,936
Beauly Firth	2,010	2.7	160	1,255
Dornoch Firth	1,782	2.4	77	2,307
Island of Bute	1,302	1.8	72	1,803
West Strathearn	1,050	1.4	100	1,050
Loch of Skene	1,021	1.4	18	5,756
Whitrig Bog	1,000	1.4	200	500
Sites in Upper Tay	943	1.3	99	951
Stabannon/Braganstown	760	1.0	133	570
Kilconquhar Loch	752	1.0	89	842

Breeding Success

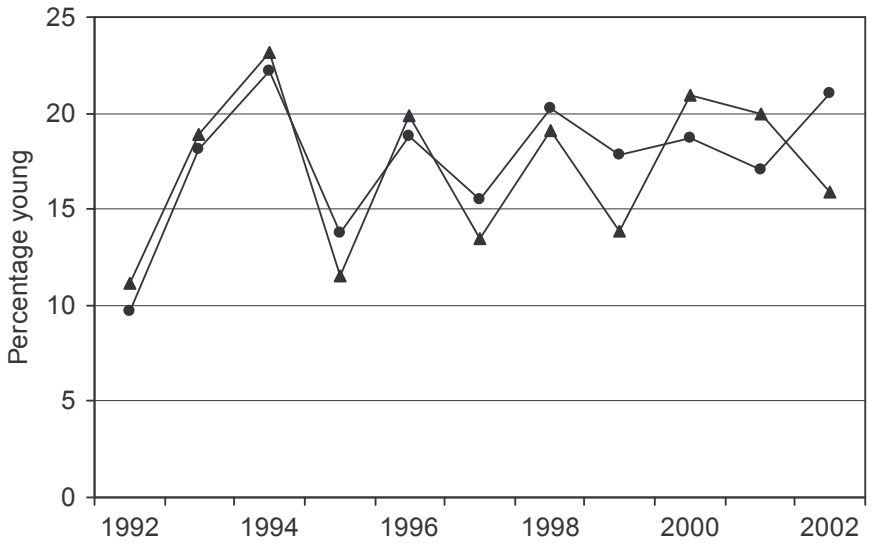
Totals of 16,023 Pink-footed Geese and 11,030 Greylag Geese were aged at various localities throughout Scotland and England between 10 September and 13 November. In addition, brood sizes were collected for 187 broods of Pinkfeet and 62 broods of Greylag Goose.

Pink-footed Goose flocks contained 21.0% young and the average brood size of successful pairs was 2.3 goslings. Greylag Goose flocks contained 15.9% young and the average brood size was 2.8 goslings per successful pair (Table 4). The estimate for Pink-footed Goose is more than the average for the previous decade (mean proportion of young 1992-2001: 17.2%, 1.11 s.e.), whilst the estimate for Iceland Greylag Goose is below average (mean for 1992-2001: 17.2%, 1.36 s.e.) (Figure 4a). Average brood sizes during the same period were 2.2 (0.08 s.e.) and 2.5 (0.08 s.e.), respectively (Figure 4b).

Table 4. The proportion of young and mean brood size of Pink-footed and Greylag Goose flocks in autumn 2002 (regions defined in Table 2).

	Region	Total aged	% young	No. of broods	Mean brood size
Pink-footed Goose	North Scotland	0	-	1	2.0
	Northeast Scotland	6,928	21.4	141	2.3
	East Central Scotland	7,190	19.8	45	2.4
	West England	1,905	23.8	0	-
	Total	16,023	21.0	187	2.3
Greylag Goose	North Scotland	7,138	15.6	38	2.8
	Northeast Scotland	3,790	16.4	22	2.7
	East Central Scotland	102	12.7	2	2.0
	Total	11,030	15.9	62	2.8

(a)



(b)

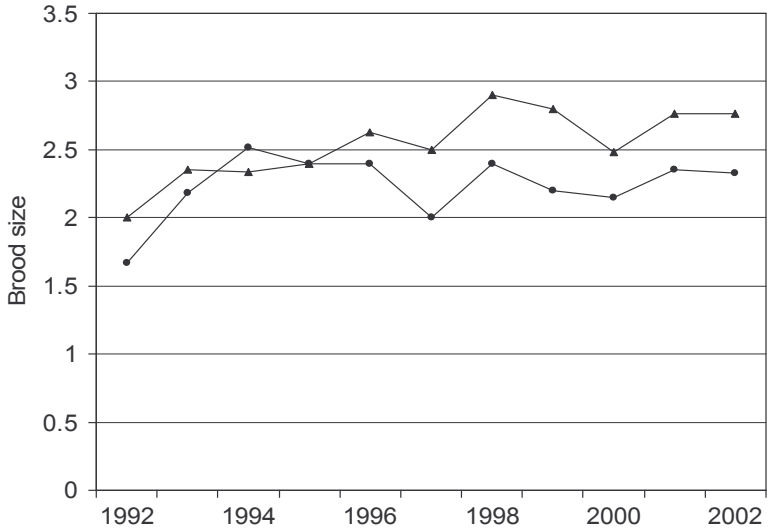


Figure 4. (a) The average percentage of young Pink-footed Geese (●) and Iceland Greylag Geese (▲) in Britain, 1992-2002, (b) The average brood size of successful pairs of Pink-footed Geese (●) and Iceland Greylag Geese (▲) in Britain, 1992-2002.

Most Pinkfeet were aged in Northeast and East Central Scotland and only in the former region was the sample spread throughout the autumn period. The temporal range in other regions was limited and varied between them (Figure 5).

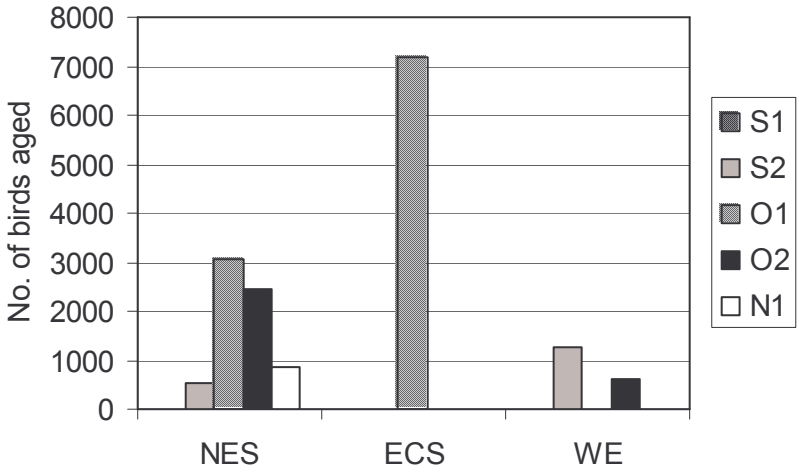


Figure 5. The temporal distribution of Pink-footed Goose age samples in each region during autumn 2002. Periods: S1 = early September, S2 = late September, O1 = early October, O2 = late October, N1 = early November (regions defined in Table 2).

Due to their later migration and more limited range, the temporal and spatial distribution of Greylag Goose age samples was more limited. Samples were collected in three regions, all in late October (Figure 6).

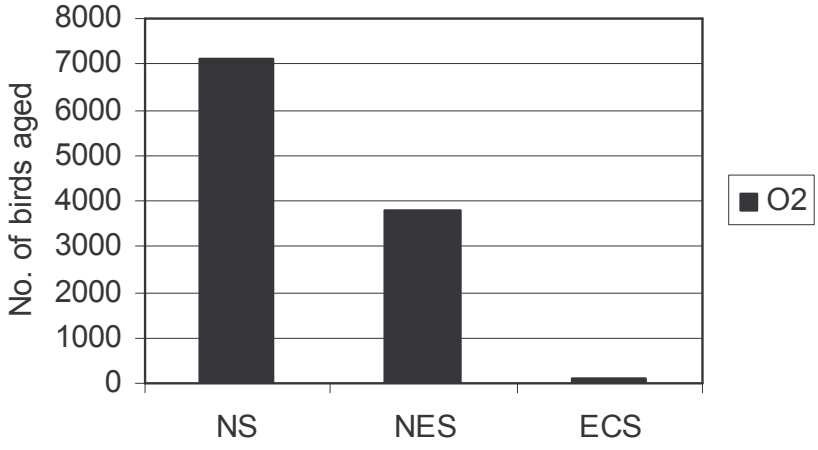


Figure 6. The temporal distribution of Greylag Goose age samples in each region during autumn 2002. Periods: O2 = late October (regions defined in Table 2).

DISCUSSION

The 2002 Icelandic-breeding Goose Census revealed large decreases in the numbers of Pink-footed Geese and Iceland Greylag Geese counted compared to the previous year. This was partly because of a number of key sites were not counted, particularly for Greylag Geese, but even allowing for numbers of birds missed at these sites, the population estimates still remained considerably lower than in 2001 (Figure 7).

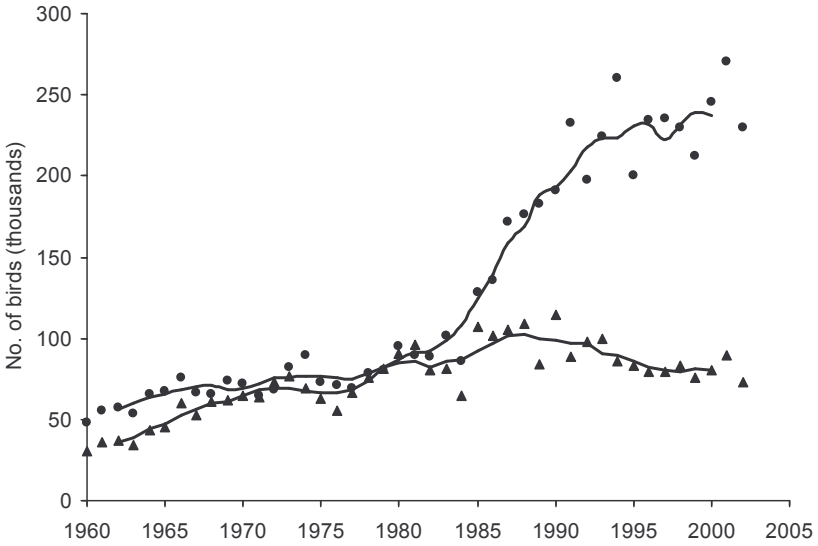


Figure 7. Population estimates of Pink-footed Goose (●) and Iceland Greylag Goose (▲), 1960 to 2002. The 5-year running means (e.g. mean for 2000 is from population estimates for 1998-2002) are shown as lines.

The Icelandic hunting bags for Greylag and Pink-footed Geese during 2002/03 (of which almost all are taken before migration and therefore before the IGC) were estimated as 30,471 and 11,406, respectively (Figure 8).

Both of these estimates are below the long-term average (means since 1995 are: 35,270, 1.21 s.e. and 13,117, 0.58 s.e., respectively), and are in fact are the lowest since monitoring began for Greylag Goose, and the lowest since 1995 for Pink-footed Goose. They may be less accurate than in previous years, however, as some difficulties with compliance have been experienced following a ban on Ptarmigan hunting (A. A. Jónsson pers. comm.). Given that hunting is the main cause of mortality in both of these populations, particularly Greylag Geese (Frederiksen *et al.* in press), the below average hunting mortality reported in Iceland in 2002 suggests that a large decrease in abundance in these populations since the 2001 census is unlikely.

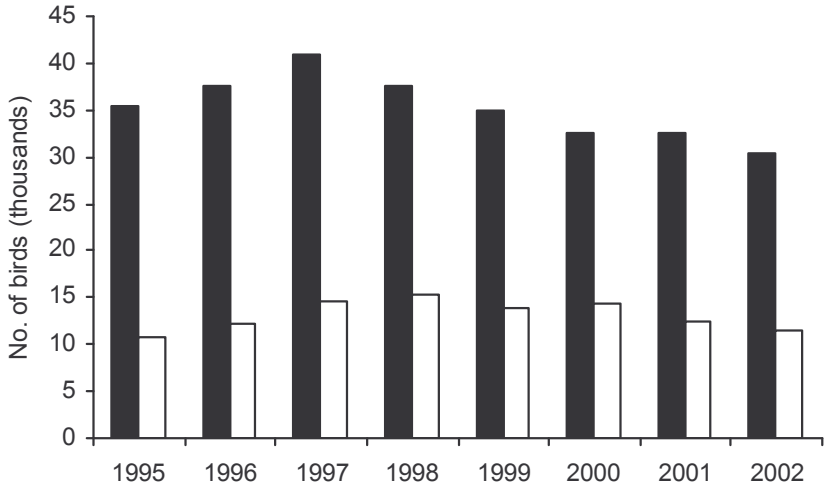


Figure 8. Numbers of Pink-footed Geese (open columns) and Iceland Greylag Geese (solid columns) shot in Iceland, 1995-2002. Source: Icelandic Wildlife Management Institute (http://www.ni.is/veidi/).

Furthermore, although the proportion of young in autumn flocks in 2002 was high for Pink-footed Geese and just below average for Greylag Geese, these estimates were unusual for two reasons. In most years, Greylag Geese show a higher proportion of young in autumn flocks than do Pink-footed Geese. Pink-footed Geese do, however, breed more successfully than Greylag Geese in some years, but the difference in 2002 was the greatest since 1970 (Figure 9).

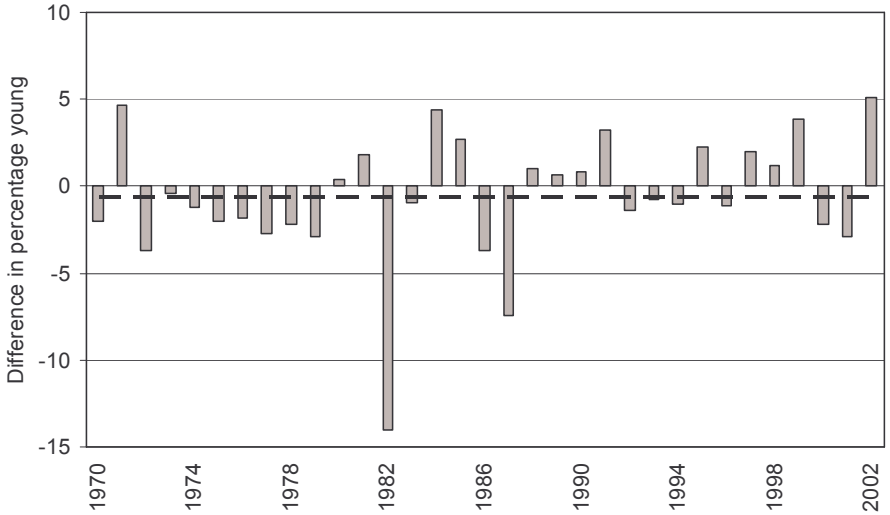


Figure 9. The difference in the percentage of young in autumn flocks between Pink-footed Geese and Iceland Greylag Geese, 1970-2002 (columns). Values >0 show years in which Pink-footed Goose flocks held a greater percentage of young than Greylag Geese, columns <0 show years in which Greylag Goose flocks held a greater percentage of young than Pink-footed Geese. The dashed line shows the mean difference for the period.

More unusually, the directions of change from the previous year for each species were in the opposite direction in 2002. Productivity in these species is largely affected by the same factors (Fox

et al. 1989), and therefore in most years the proportion of young is highly positively correlated (1970-2001: r = 0.797). Consequently, the increase shown by Pink-footed Geese and the decrease shown by Greylag Geese in 2002 is atypical and, in fact, has only been recorded in one other year since 1970 (Figure 10).

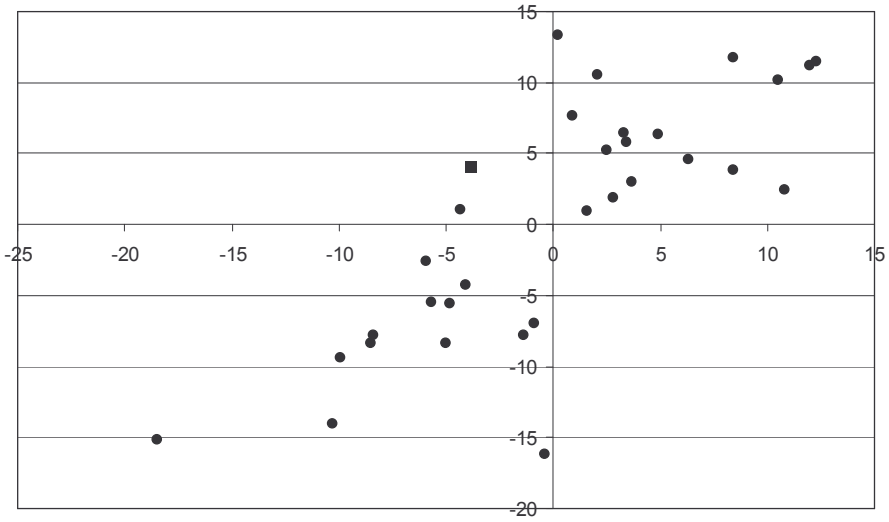


Figure 10. Scatter plot (x axis = Pink-footed Goose, y axis = Greylag Goose) showing the change in the proportion of young from year x to year x+1, 1970-2002. The data point for 2002 is shown as a square.

Several other factors suggest that it is more likely that the counts underestimated the true population size in 2002. Firstly, in addition to the sites that were not counted but where estimates could be made based on counts in previous years, there were a number of others that were likely to have supported large numbers of one species or the other, but for which there were insufficient data to allow the calculation of estimates. These include Horsey Mere, where several thousand Pink-footed Geese are likely to have been in October and November, and Endrick Mouth (Loch Lomond), where Iceland Greylag Geese were known to occur in internationally important numbers until the last counts that were made. Furthermore, a number of islands in the Orkney Islands were not counted on the co-ordinated date and thus the estimate from there may be low.

Secondly, there appears to have been a very late departure of geese from Iceland during 2002, and it is a possibility that large numbers remained there uncounted. An estimate of Pink-footed Geese still present at the time of the October count, based upon reports from hunters, was included in the census, but little information was available for November. This may suggest that there were few geese to report there - since no surveys are carried out there, nil counts are extremely unlikely to be reported - but reports from Norway also suggest few had arrived there by the November count.

Counts of Greylag Geese during October do suggest that departures from Iceland are becoming later (see Figure 1). Since the very early arrival in 1998, the proportion of the November peak count recorded during October has decreased steadily. It is possible, although currently unknown, that this later departure may now be extending into November, and thus affecting the November count. A more detailed examination of this is urgently needed.

If there is a likelihood of later departures from Iceland, it is now increasingly important to ensure

comprehensive coverage of all areas (both within and outwith Britain) during the census if accurate population estimates are to be made in the future. This may mean reassessing the best period in which to carry out the census if, for example, an increasing proportion of the Greylag Goose population is in inaccessible parts of Iceland during November making it better to conduct surveys later in the winter (e.g. December), when we can be more confident that the whole population has left Iceland, even if the population is more dispersed in Britain by this time.

This is just one of a number of questions that needs to be addressed in order to ensure the continued viability of the IGC. Other key issues include the need for increased confidence in the detection rate of Greylag Geese during the census (most likely to be achieved through a stratified sample survey), and the need to improve our understanding of the population status of Greylag Geese at individual sites in Britain. A stratified sample survey may also help to overcome the problems presented by surveying these populations later in the year. WWT are currently preparing a series of recommendations that encompass these requirements.

One relatively straightforward way in which a better idea can be obtained of whether Greylag Geese at a particular site are from the Iceland, NW Scotland or re-established population, is to carry out a count prior to the arrival of the migratory Iceland Greylag Geese. Counters were first encouraged to do this in 2001, and the data that have so far been obtained have proved extremely valuable in improving estimates of the number of Iceland Greylag Geese. Whilst the validity of this method for adjusting counts of Greylag Geese has not yet been rigorously tested, it is providing a useful guide to the number of UK-breeding Greylag Geese in some regions. Further information about this can be obtained from the Waterbird Monitoring Unit at WWT.

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