The 2003 Icelandic-breeding Goose Census

WWT/JNCC Report

Authors

Helen Rowell & Richard Hearn

April 2005

Published by:

The Wildfowl & Wetlands Trust
Slimbridge
Gloucestershire
GL2 7BT

Tel 01453 891900
Fax 01453 890827
Email goose@wwt.org.uk

Joint Nature Conservation Committee
Monkstone House
City Road
Peterborough
PE1 1JY

Tel 01733 562626
Fax 01733 555948
Email communiations@jncc.gov.uk

Reg. charity no. 1030884

This publication should be cited as:

Rowell, H.E. & Hearn, R.D. 2005. The 2003 Icelandic-breeding Goose Census. The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.

Contents

Summary

The 44th consecutive census of Iceland/Greenland Pink-footed Geese and Iceland Greylag Geese took place during autumn and early winter 2003. Two discrete counts were undertaken, one in October and another in November. Some sites were also counted during September. Coverage was good, although some important sites were not surveyed, and was again extended beyond Britain and Ireland, with a number of sites in Norway counted, and comprehensive coverage achieved in the Faeroe Islands.

Weather conditions were generally considered favourable. Maxima of 274,594 Pink-footed Geese and 80,143 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 280,998 Pink-footed Geese and 81,131 Greylag Geese. Both population estimates were higher than those calculated for 2002: the Pink-footed Goose estimate represents an increase of 22.3% and that for Greylag Goose, an increase of 11.0%. However, counts in 2002 were highly likely to have considerably underestimated true abundance for both species; comparing the 5-year running means for 2002 and 2003, the population estimate for Pink-footed Goose increased by 4.3%, and that for Greylag Goose decreased by 0.5%.

Pink-footed Geese had a good breeding season in 2003: autumn flocks contained 19.0% young (mean proportion of young 1993-2002: 18.3%, 0.79 s.e.) and mean brood size was 2.2 goslings per successful pair (mean brood size 1993-2002: 2.3, 0.05 s.e.). Breeding success in Greylag Geese was also above average: autumn flocks contained 20.5% young (mean 1993-2002: 17.7%, 1.19 s.e.) and mean brood size was 2.7 goslings per successful pair (mean 1993-2002: 2.6, 0.06 s.e.).

1 Introduction

The aim of the Icelandic-breeding Goose Census (IGC) is to estimate the size and monitor the distribution of Iceland/Greenland Pink-footed Geese *Anser brachyrhynchus* and Iceland Greylag Geese *A. anser*. The methods used followed those of previous censuses (e.g. Hearn 2004), 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 of the 44th consecutive census.

2 Methods

Counts were conducted by a network of largely volunteer observers over the weekends of 18/19 October and 15/16 November 2003. In a few 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. They were timed to coincide with the new moons (25 October and 23 November), 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 that an individual count can be attributed to.

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 2003 census, numbers were estimated from the mean of the counts made during the relevant month during 1998-2002. 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.

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 were collected between mid-September and mid-November and used to determine the proportion of young and the mean brood size of successful pairs.

3 Results

3.1 Coverage and conditions

A total of 158 sites were covered during the two counts: 112 (71%) of these were counted in both months, 11 only in October and 35 only in November. This is an increase of 32% in the number of sites counted compared to the 2002 census. Outside Britain, several sites in Norway and the Faeroes were counted, and an aerial survey of East Canadian High Arctic Light-bellied Brent Geese in west Iceland provided some limited information on numbers of Greylag Geese in October.

In all, two sites not counted during October 2003 met the criteria for the calculation of an estimated count: for Pink-footed Geese, the River Forth at Skinflats (mean 1998-2002: 2,426), and for Greylag Geese, Stranraer Lochs (mean 1998-2002: 439). For November, estimates of Greylag Geese were calculated for five sites: Dinnet Lochs (3,740), Stranraer Lochs (665), Long Loch (549), Loch Ken (467) and Ballo Reservoir (420). In addition, the late arrival of Pink-footed Geese into Britain during 2003 meant that the peak count did not occur during October, therefore estimated counts of Pink-footed Geese were calculated for two sites for November: Long Loch (5,022) and the River Forth at Skinflats (1,381).

Counts of UK Greylag Geese during September were received from 45 sites and these were used to adjust the co-ordinated October and November counts at six sites or regions: Orkney Islands (-4,000), East Chevington (-307), Hedgeley/Branton GP (-200), Loch of Skene (-170), Aberlady Bay (-165), Holywell Pond (-74), Haddo House Lakes (-40), Loch Clunie (-1) and the Solway Estuary (-1).

Supplementary counts, made in addition to the co-ordinated IGC counts, were received from 57 sites, most notably Aberlady Bay, Breydon Water, Cameron Reservoir, Carsebreck and Rhynd Lochs, Dun's Dish, Haddo House Lakes, Humber Estuary, Isle of Bute, Loch of Skene, Loch of Strathbeg, Loch of the Lowes, the north Norfolk roosts, the Orkney Isles, Southwest Lancashire and Westwater Reservoir.

Weather conditions and disturbance levels were reported by counters as good at 96% of sites and are not considered to have appreciably affected the census results. Low counts (where counters felt they had underestimated the number of birds, for example because of poor visibility) were reported from three sites during October and three sites during November, mainly due to the arrival of geese during dusk counts when it was too dark to accurately count the birds, or to the birds being in tightly packed flocks making it difficult to count them accurately. Of the latter, one held important numbers (7,980) of Pink-footed Geese (Loch of Lintrathen).

3.2 Total numbers

3.2.1 Pink-footed Goose

The November count total of 274,594 is an increase of 63,671 (30.2%) on the previous year (Fig. 1). After the inclusion of estimated counts, the adjusted population estimate is 280,998, an increase of 51,174 (22.3%) on the previous estimate. During October 2003, 255,003 Pink-footed Geese were counted (Fig. 1), 92.9% of the total November count.

3.2.2 Greylag Goose

The November count total of 80,143 is an increase of 17,998 (29.0%) on the previous count in November 2002 (Fig. 1). After adjustments and the inclusion of estimated counts, a population estimate of 81,131 was derived, an increase of 8,016 (11.0%) over the previous adjusted estimate.

Pre-adjusted counts in October suggest that the arrival of Greylags at wintering areas in autumn 2003 was typical, with 48.0% 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.

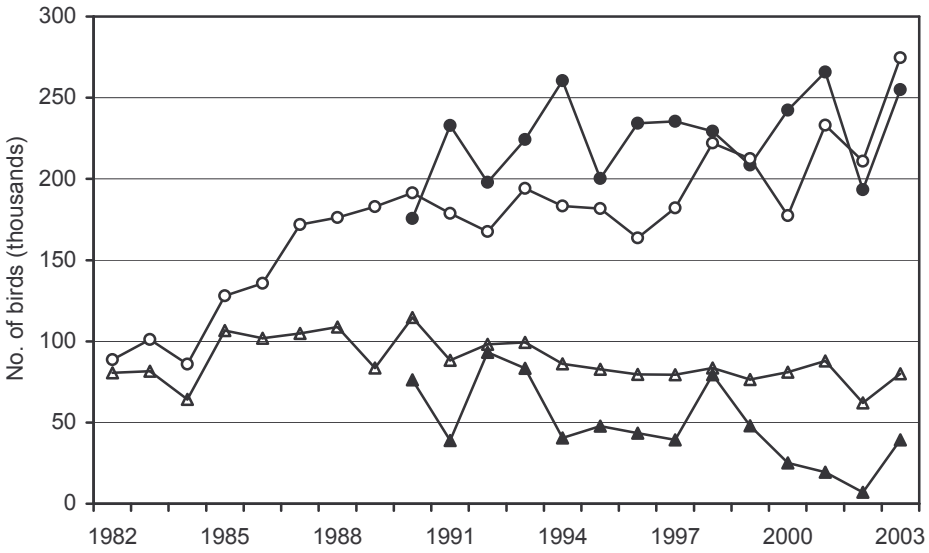


Figure 1. Peak counts of Pink-footed Geese (circles) and Iceland Greylag Geese (triangles) counted in October (filled) and November (open) as part of the Icelandic-breeding Goose Census, 1982 to 2003.

Table 1. The regional distribution of Pink-footed Geese and Iceland Greylag Geese in October and November 2003. Figures in square brackets show adjusted or estimated totals.

Region	October			November		
	Sites	Pinkfoot	Greylag	Sites	Pinkfoot	Greylag
Iceland+	1	0	919	0	nc	nc
Norway	0	nc	nc	7	0	1,181
Faeroe Islands	5	10	1,009	5	0	574
Ireland	0	nc	nc	3	0	318
Shetland+	2	1	192	5	0	1,056
Orkney	11	0	16,299 [-4,000]	15	0	43,547 [-4,000]
Caithness+	1	12	2,971	1	1	2,688
Sutherland	2	0	374	2	0	1,015
Ross & Cromarty	10	126	5,344	10	3,135	7,432
Inverness/Nairn	2	0	0	2	618	200
Badenoch & Strathspey	3	5	927	3	1	1,843
Moray	2	28,100	1,484	2	22,600	2,390
Banff & Buchan	1	28,520	145	1	23,390	295
Gordon/Aberdeen	4	29,400	3,234 [-210]	4	6,870	1,672 [-210]
Kincardine & Deeside	1	0	920	0 [1]	nc	nc [+3,740]
Angus/Dundee	4	17,721	730	2 [1]	18,129 [+5,022]	490 [+549]
Perth & Kinross	14	27,043	1,700 [-1]	16	22,156	5,916 [-1]
Stirling/Falkirk/ Clackmannan	4 [1]	5,176 [+2,426]	0	3 [1]	0 [+1,381]	8
Fife	7	5,400	425	8 [1]	13,712	2,347 [+420]
Argyll & Bute	3	1	432	3	1	1,832
Glasgow area*	2	44	380	2	45	351
Clydesdale	1	1	0	1	150	0
Stewartry/Wigtown	1 [1]	0	0 [+439]	2 [2]	0	148 [+1,132]
Annandale & Eskdale/Nithsdale**	7	2,609	271 [-1]	7	3,398	135 [-1]
East/Midlothian	6	9,047	171 [-165]	6	9,908	345 [-60][1]
Edinburgh/West Lothian	2	17	162	3	0	359
West Borders/ Tweedale/East Borders***	6	24,898	179	6	11,680	938
NE England****	13	10,232	1,089 [-263][1]	19	4,436	3,063 [-581]
Humberside	1	2,106	0	1	3,850	0
Cumbria**	1	0	0	1	0	0
Lancashire & Merseyside+	1	27,025	0	1	25,295	0
Lincolnshire	0	nc	nc	0	nc	nc
Norfolk	5	37,509	0	6	105,220	0
Totals	123 [2] 125	255,003 [+2,426] 257,429	39,357 [+439] [-4,640] 35,156	147 [6] 153	274,594 [+6,404] 280,998	80,143 [+5,841] [-4,853] 81,131

* 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

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

+ several feeding sites consolidated

nc no count received

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

3.3 Regional distribution

3.3.1 Pink-footed Goose

The regional distribution of Pink-footed Geese during autumn 2003 was typical, with key concentrations during October in Northeast, East Central and Southeast 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, although numbers in Northeast Scotland had shown the greatest decline over this time (Table 2 and Fig. 2).

3.3.2 Greylag Goose

A higher proportion of the Greylag Goose population was present during the October 2003 census than had been in recent years. Those birds found were typically in usual arrival areas, namely North and Northeast Scotland. By November, almost three-quarters of the population were in North Scotland, with most of the remainder in Northeast, East Central and Southeast Scotland (Table 2 and Fig. 3). These proportions are skewed, however, by the lack of counts from some important roosts in Northeast and East Central Scotland, although numbers in Orkney continued to increase.

Table 2. Gross regional distribution of Pink-footed Geese and Iceland Greylag Geese in Britain and Ireland during October and November 2003, expressed as a percentage of the maximum count for each species.

	Pink-footed Goose		Greylag Goose	
Area*	**October**	**November**	**October**	**November**
Ireland	0	0	0	0.4
North Scotland	0.1	1.4	32.6	72.1
Northeast Scotland	31.3	19.2	7.2	5.4
East Central Scotland	20.2	19.7	3.6	10.9
Southeast Scotland/ Northeast England	16.1	9.5	2.0	5.9
Southwest Scotland/ Northwest England	1.0	1.3	1.4	3.1
West England	9.8	9.2	0	0
East England	14.4	39.7	0	0
Total	**92.9**	**100.0**	**46.8**	**97.8^**

* 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

^ Does not equal 100% because some birds are also present in other countries (Faeroe Islands, Norway and Iceland)

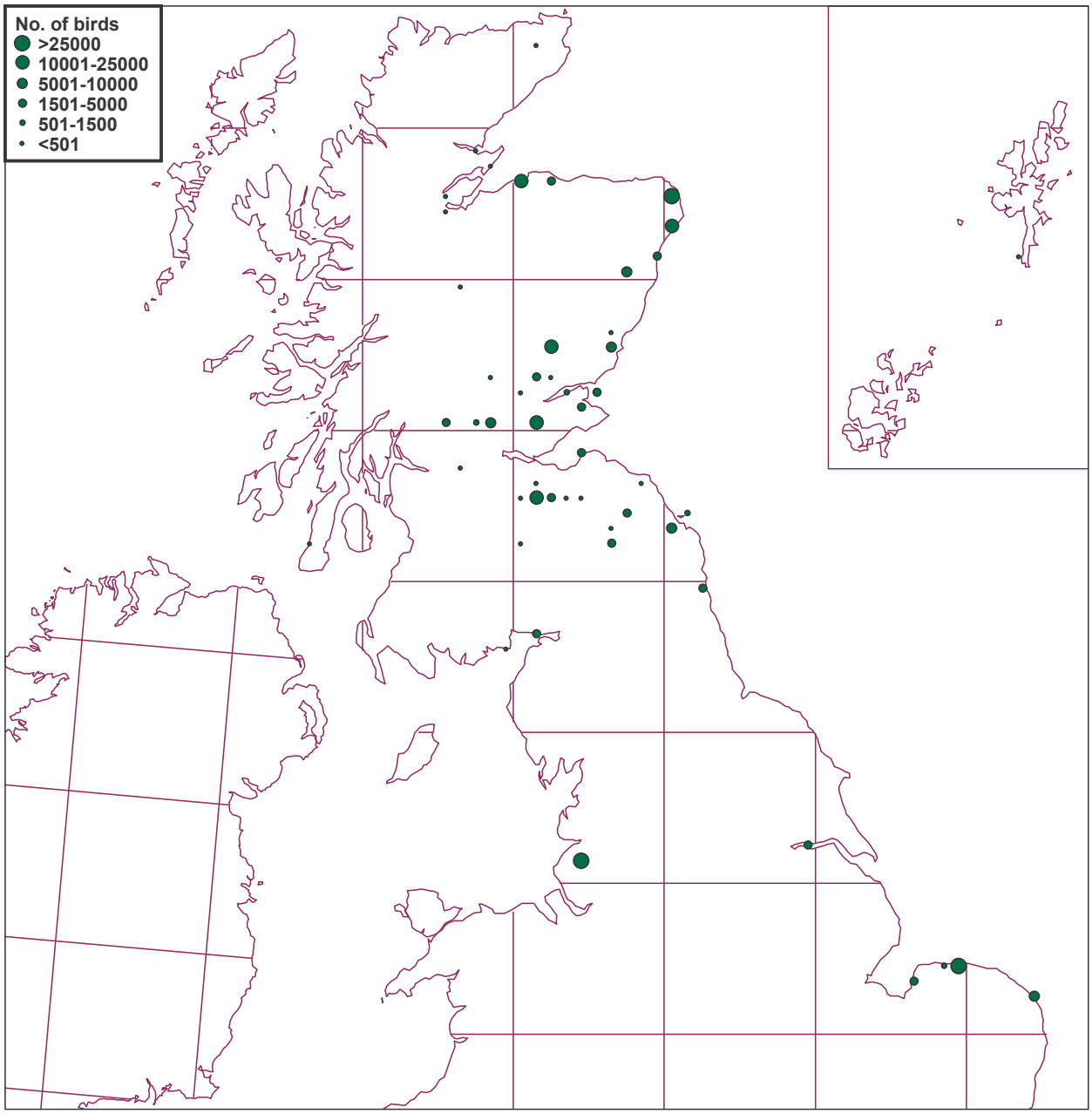


Figure 2a. The distribution of Pink-footed Geese counted in Britain in October 2003.

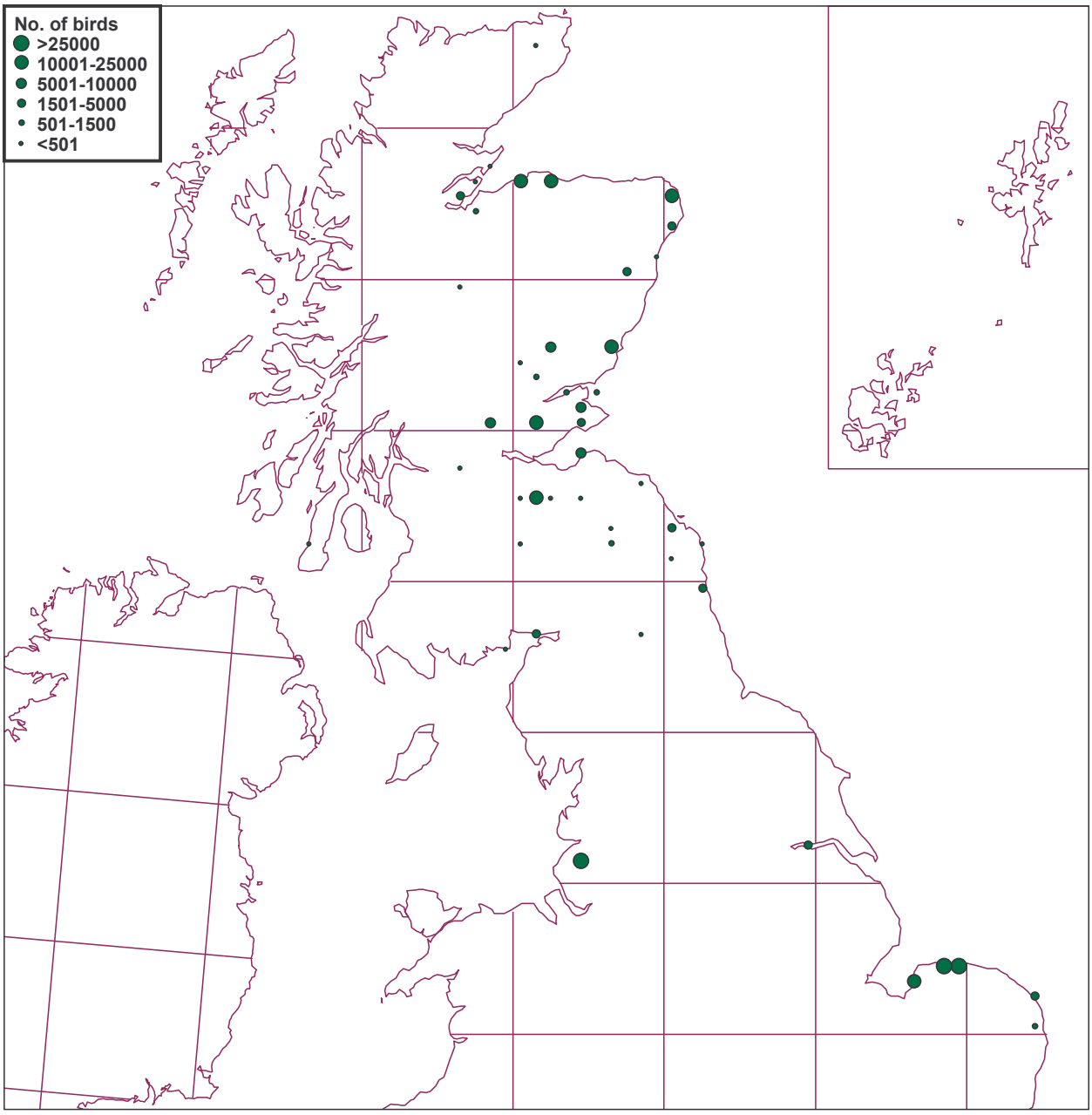


Figure 2b. The distribution of Pink-footed Geese counted in Britain in November 2003.

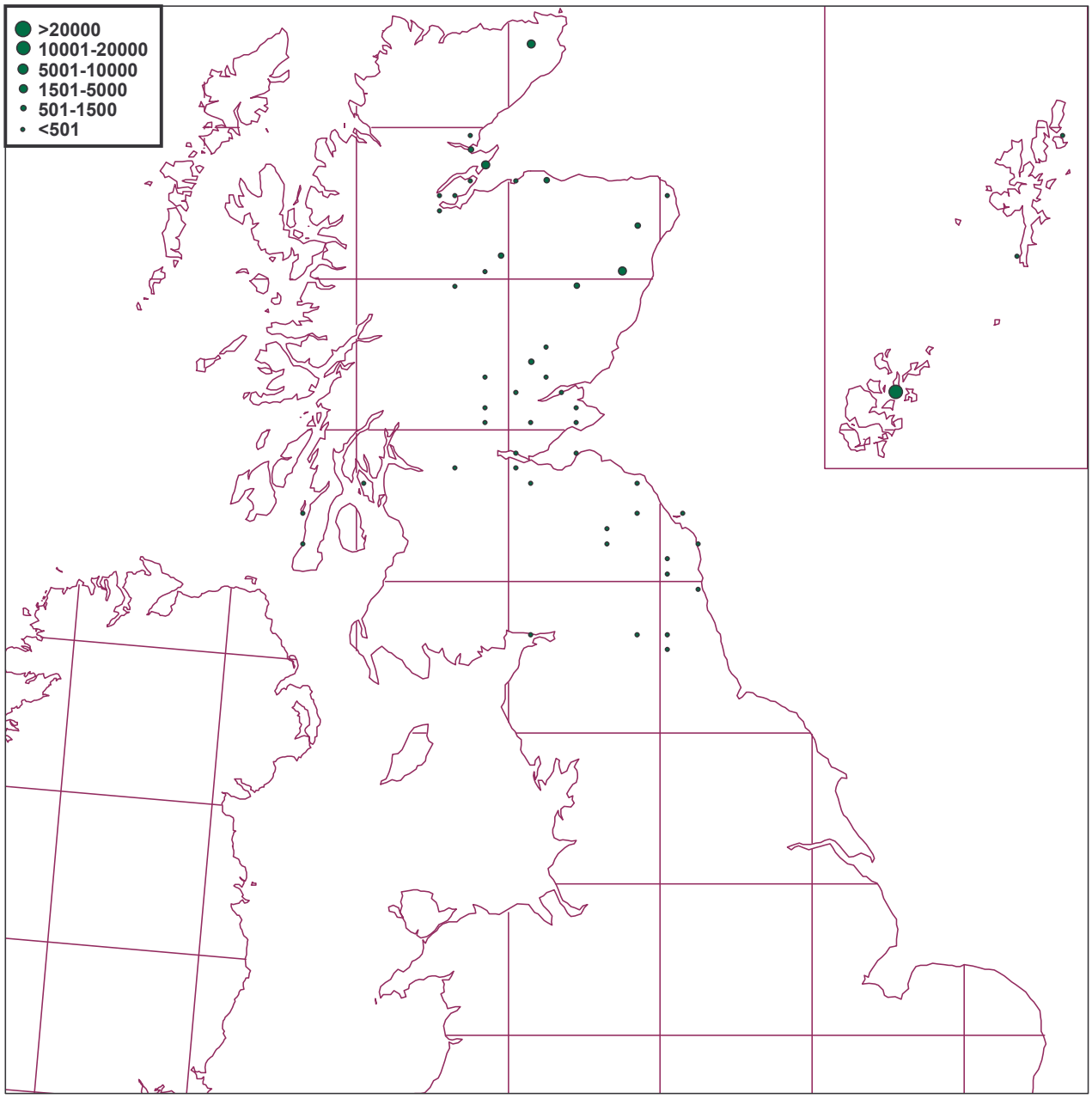


Figure 3a. The distribution of Iceland Greylag Geese counted in Britain in October 2003.

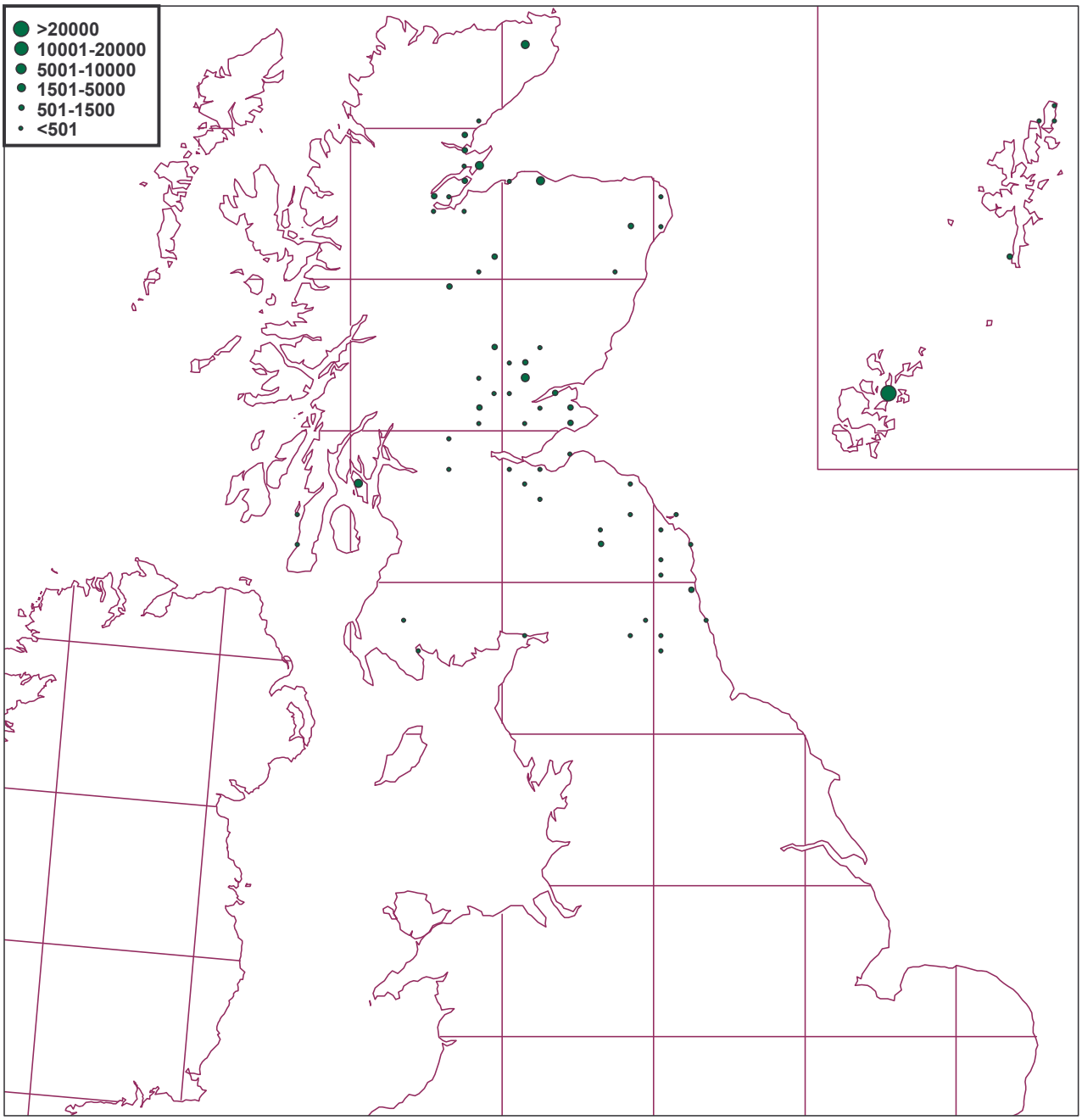


Figure 3b. The distribution of Iceland Greylag Geese counted in Britain in November 2003.

3.4 Principal concentrations

3.4.1 Pink-footed Goose

During November, Pink-footed Geese were reported from a total of 52 sites, of which 46 held more than ten birds. Eighteen held more than 1% (2,810) of the population estimate and ten supported 10,000 or more birds (Table 3). More than 49% of the estimate was recorded at the top four sites during November. In October, Pink-footed Geese were found at more sites, 60 in total, of which 47 held ten or more birds. Twenty held more than 1% of the population estimate, with 10,000 or more counted at eight of these. The top four sites held 38.5% of the population estimate. In total, Pink-footed Geese were recorded at 73 sites during both counts.

As the peak count occurred during November, after the main concentration at many important sites, a number of these appear to have had low counts during 2003, such as Snettisham, Westwater Reservoir, Montrose Basin and Meikle Loch (Table 3). October counts at most of these sites were generally considerably larger, although numbers were low at Snettisham. Furthermore, extremely low numbers, particularly during November, at Dupplin Lochs means that this key roost site does not feature in Table 3. During November, the top two sites both held greater than average numbers of Pink-footed Geese and an atypically large count was reported from Cameron Reservoir. Numbers on the Humber Estuary also continued to increase.

3.4.2 Greylag Goose

During October 2003, Greylag Geese were concentrated at typical arrival sites in North Scotland, and the proportion of the population present in Britain (46.8%) was above average for the October count (mean 1999-2003: 34.0%). In all, they were reported from a total of 69 sites (including 11 in Orkney), of which 62 held more than ten birds.

By November, Greylag Geese were found at 105 sites (including 15 in Orkney), of which 99 held ten or more birds. Taking Orkney as a consolidated site, 14 of these held more than 1% (811) of the population estimate and two held more than 3,000 (Table 4), comprising over 54% of the total. Within the Orkney total, nine individual sites supported 1% or more of the population estimate (Table 3), although it is not possible to adjust these individual counts to account for the number of Re-established Greylag Geese, because such data are only available for Orkney as a whole.

In all, Greylags were recorded at a total of 111 sites during both counts, 42 more than the previous year. A larger than average count was recorded from a number of sites during November, with an exceptionally high count recorded at the River Tay at Bloody Inches (Haughs of Kercock). The number on Orkney also continued to increase, with a record count for the eighth time in nine years.

Table 3. Greylag Goose counts at individual sites on Orkney in November 2003 (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	Site count as % of the total November count	5-year peak mean
West Mainland	21,135	26.4	12,901
East Mainland	9,019	11.3	5,217
Island of Shapinsay	3,500	4.4	2,101
Island of Stronsay	2,119	2.6	1,623
Island of Sanday	1,865	2.3	1,150
Island of Eday	1,200	1.5	658
Island of Egilsay	1,025	1.3	1,190
Island of South Ronaldsay	903	1.1	745
Island of Papa Westray	839	1.0	585
Island of Wyre	450	0.6	260
Island of Westray	442	0.6	229
Isles of Hoy and Walls	330	0.4	319
Island of Rousay	283	0.4	214
Island of Burray	282	0.4	192
Island of North Ronaldsay	155	0.2	91
Total	**43,547**	**54.3**	

Table 4. Pink-footed Goose and Iceland Greylag Goose sites that supported more than 1% of the population estimates in autumn 2003.

PINK-FOOTED GOOSE 2003 population estimate: 280,998	**November count**	**Site count as % of the population estimate^**	**5-year peak mean***
Holkham/Wells Bay	47,750	17.0	42,183
Scolt Head	42,400	15.1	37,656
Southwest Lancashire	25,295	9.0	28,861
Loch of Strathbeg	23,390	8.3	43,442
Loch Leven	12,915	4.6	14,086
Findhorn Bay	11,500	4.1	11,312
Loch Spynie	11,100	4.0	8,180
Snettisham	10,770	3.8	27,420
Westwater Reservoir	10,160	3.6	30,396
Montrose Basin	10,149	3.6	21,744
Aberlady Bay	9,550	3.4	14,514
Cameron Reservoir	8,900	3.2	5,560
Carsebreck and Rhynd Lochs	8,570	3.0	13,634
Loch of Lintrathen	7,980	2.8	7,216
Humber Estuary	3,850	1.4	4,108
Solway Estuary	3,398	1.2	4,180
Loch of Skene	3,370	1.2	6,205
Meikle Loch, Slains	3,200	1.1	20,767
GREYLAG GOOSE 2003 population estimate: 81,131	**November count**	**Site count as % of the population estimate^**	**5-year peak mean***
Orkney (all sites)	39,547	48.7	24,201
Loch Eye	4,638	5.7	4,233
Caithness	2,688	3.3	5,984
Loch Spynie	2,200	2.7	3,780
River Tay: Bloody Inches	1,825	2.2	663
Island of Bute	1,622	2.0	1,992
Sites in Upper Tay	1,197	1.5	945
Haddo House Lakes	1,060	1.3	957
West Strathearn	1,050	1.3	1,050
Loch Garten	1,000	1.2	1,830
Kilconquhar Loch	992	1.2	888
Cromarty Firth: Udale Bay	950	1.2	2,084
Loch Fleet	905	1.1	1,722
Inner Cromarty Firth: Dingwall Bay	880	1.1	1,280

* 5-year peak means 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

^ 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).

3.5 Breeding success

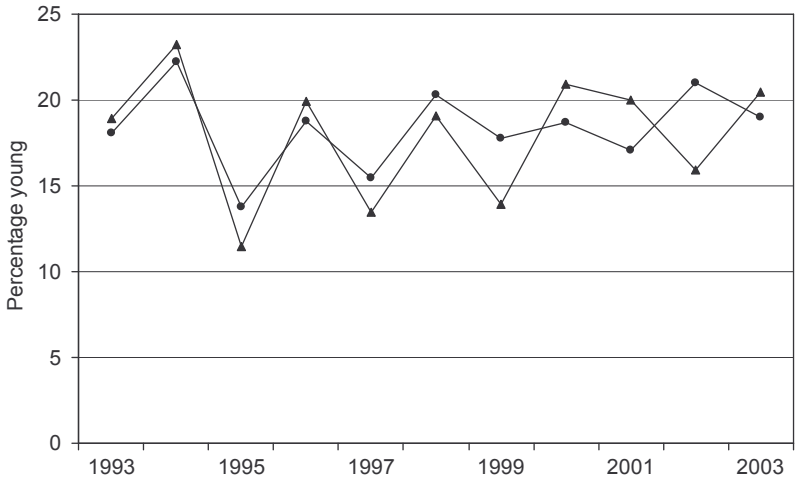
Totals of 15,745 Pink-footed Geese and 7,229 Greylag Geese were aged at various localities throughout Scotland and England between 17 September and 16 November. In addition, brood sizes were collected for 256 broods of Pink-footed Goose and 37 broods of Greylag Goose.

The breeding success of the Pink-footed Goose flocks slightly above average for the previous decade at 19.0% young (mean proportion of young 1993-2002: 18.3%, 0.79 s.e.) (Table 5). The mean brood size of successful pairs was 2.2 goslings (mean brood size 1993-2002: 2.3, 0.05 s.e.) (Fig 4b). Breeding success of the Icelandic Greylag Goose was also above average, with flocks containing 20.5% young (mean 1993-2002: 17.7%, 1.19 s.e.) (Fig. 4a), and the mean brood size was 2.7 goslings per successful pair (mean 1993-2002: 2.6, 0.06 s.e.) (Fig. 4b).

Table 5. The proportion of young and mean brood size of Pink-footed and Greylag Goose flocks in autumn 2003 (regions defined in Table 2).

	Region	Total aged	% young	No. of broods	Mean brood size
Pink-footed Goose	North Scotland	747	23.3	2	3.0
	Northeast Scotland	7,772	20.2	197	2.2
	East Central Scotland	4,860	18.2	34	2.1
	Southeast Scotland	307	14.7	7	1.6
	West England	2,059	15.6	16	2.2
	Total	**15,745**	**19.0**	**256**	**2.2**
Greylag Goose	North Scotland	6,174	20.3	25	2.3
	Northeast Scotland	946	21.1	10	3.8
	East Central Scotland	109	22.9	2	3.0
	Total	**7,229**	**20.5**	**37**	**2.7**

(a)



(b)

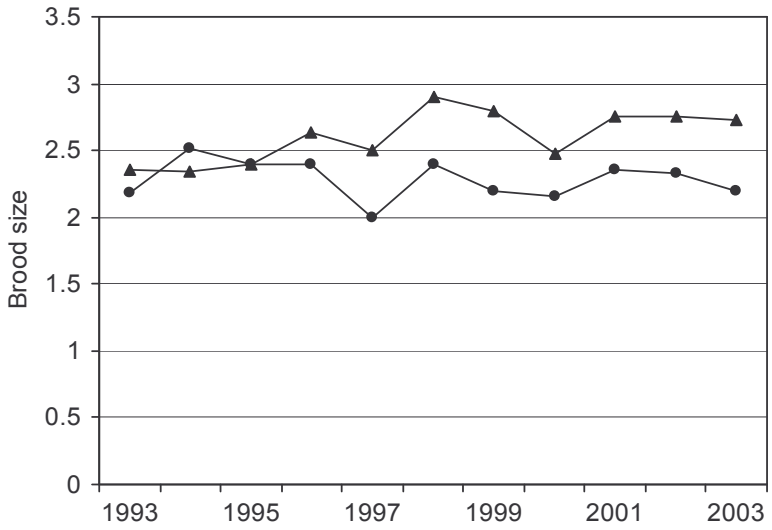


Figure 4. (a) The mean percentage of young Pink-footed Geese (●) and Iceland Greylag Geese (▲) in Britain, 1993-2003, (b) The mean brood size of successful pairs of Pink-footed Geese (●) and Iceland Greylag Geese (▲) in Britain, 1993-2003.

Most Pink-footed Geese were aged in Northeast and East Central Scotland and West England. Only in Northeast Scotland was the sample spread throughout the autumn period. The temporal range in other regions was limited, with birds being aged during late October (Fig. 5).

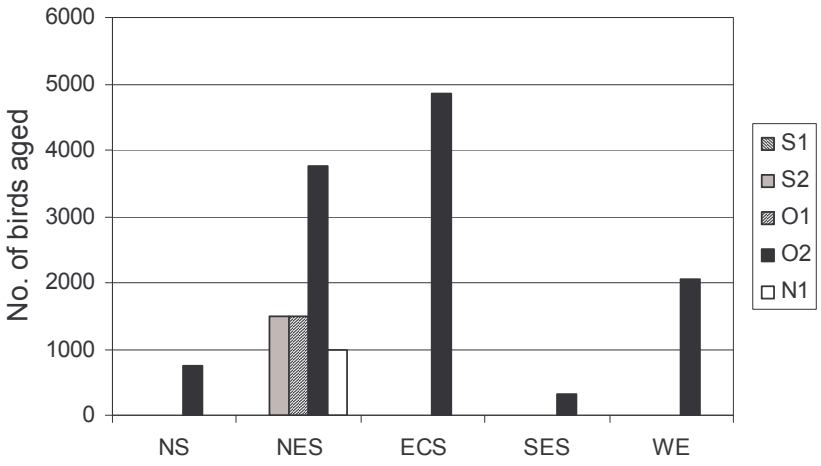


Figure 5. The temporal distribution of Pink-footed Goose age samples in each region during autumn 2003. Periods: S1 = early September, S2 = late September, O1 = early October, O2 = late October, N1 = early November (regions defined in Table 2).

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 between late October and early November, the vast majority in North Scotland during late October (Fig. 6).

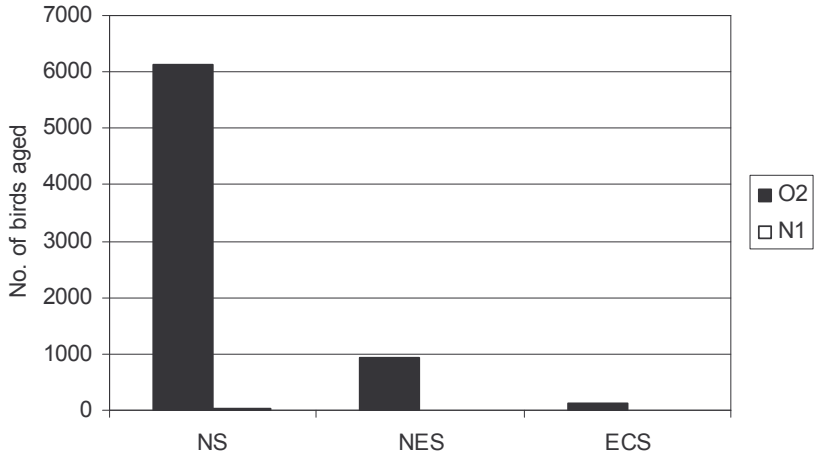


Figure 6. The temporal distribution of Greylag Goose age samples in each region during autumn 2003. Periods: O2 = late October, N1 = early November (regions defined in Table 2).

4 Discussion

The 2003 Icelandic-breeding Goose Census revealed large increases in the numbers of Pink-footed Geese and Iceland Greylag Geese counted compared to the previous year. Notably, the November count of Pink-footed Goose was the largest since monitoring began (Fig. 7). However, counts in 2002 were highly likely to have considerably underestimated true abundance for both species (see Hearn 2004); comparing the 5-year running means for the periods ending in 2002 and 2003, the population estimate for Pink-footed Goose increases by 4.3%, and that for Greylag Goose decreased by 0.5%.

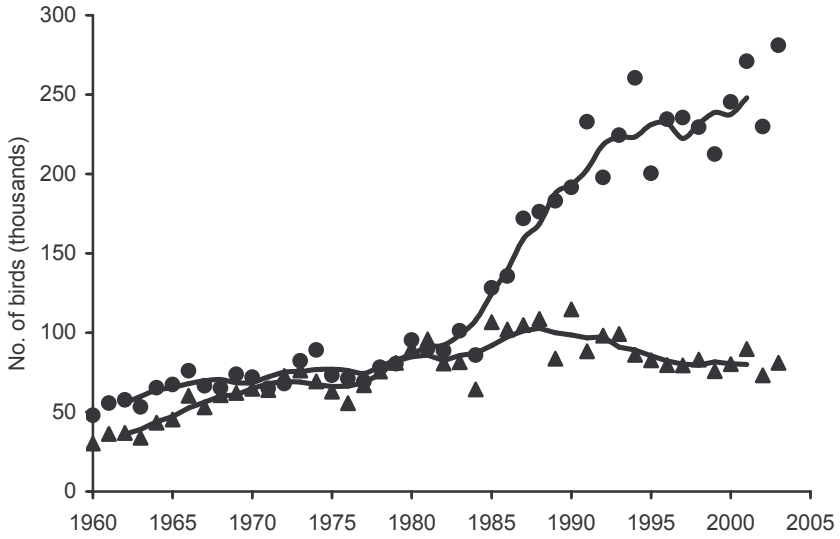


Figure 7. Population estimates of Pink-footed Goose (●) and Iceland Greylag Goose (▲), 1960 to 2003. The 5-year running means (e.g. mean for 2001 is from population estimates for 1999-2003) are shown as lines.

Reproductive success in 2003 was generally above average for both species, although the mean brood size of Pink-footed Geese was slightly below the average for the previous ten year period. For the second successive year, the estimates of the proportion of young moved in the opposite direction, with Greylag Geese having a higher proportion than in 2002, and Pink-footed Geese having a lower proportion. The explanation for this recent divergence in productivity trends is currently unknown.

The arrival of both species at their wintering grounds in 2003 was more typical than the late arrival in 2002. However, for the third time in five years, the peak count of Pink-footed Geese occurred in November, rather than the more usual peak in October. This suggests that a gradual trend towards a later average departure from Iceland. The consequences of this for the monitoring of this population need to be carefully considered in the coming years.

The proportion of the annual peak count of Greylag Geese present in wintering areas in October 2003 (49%) was more similar to the long-term average (1990-2002; 55%) than recent years, when there has been a trend of decreasing proportions present at that time. However, reports from many hunters in Iceland still suggested that Greylag Geese remained long into the winter on the south coast, with hunting taking place as late as December. It is possible that as many as 20,000 were present at the time of the November count, with 12,000 in the south from Þykkvibær to Eyjafjöll (A. Sigfússon pers. comm.). Early winter weather in Iceland has been very mild in recent years and, in addition, the acreage of barley grown there has increased considerably in this time (G. Gudmundsson pers. comm.). Given these factors, it would seem surprising if Greylag Geese, and other geese, were not remaining in Iceland for longer. Therefore, as with Pink-footed Geese, it is important that these biological changes are reflected in methodological adjustments to the IGC that maintain the effectiveness of the census.

A later departure from Iceland, where hunting pressure is known to be high, may also result in a larger proportion of the Greylag Goose population being harvested each year. Given the fine balance between increase and decline that this population currently experiences (Frederiksen *et al.* 2004), it is vital that such potential

effects are measured. However, the monitoring of hunting bags in Iceland is currently unreliable because of a breakdown in the relationship between the hunting community and those deciding hunting policy in Iceland. Thus, any such increase in the hunting bag of Greylag Geese that may occur as a result of later migration is currently undetectable.

Another effect likely to be a consequence of milder winter weather and improved agricultural habitats in northern parts of the wintering range is the northward redistribution of Iceland Greylag Geese within the UK. Approximately three quarters of the population is now found in North Scotland during November, with around half in Orkney. This redistribution has important consequences for the protection of this population and its important sites, since most of the redistribution has been away from protected sites to unprotected ones; for example, no Special Protection Areas exist in Orkney for Iceland Greylag Goose.

In order for protected area networks to adapt to these biological changes, it is first essential that monitoring protocols do the same, so that new important areas can be identified and placed into context against the best possible assessment of conservation status. Thus, the questions regarding the abundance, distribution and productivity of Iceland Greylag Geese in particular, that are highlighted here and discussed in more detail by Frederiksen (2001) and Hearn (2004), should be addressed at the earliest opportunity. Among the most important of these are: i) the need for comprehensive counts in Iceland and Norway that are co-ordinated with the IGC counts; ii) improvements in the understanding of delimitation between different Greylag Goose populations in the UK and Ireland; iii) a robust assessment of the methodological efficacy of the IGC; iv) productivity estimates from Iceland. The development of these priorities is underway and their completion should ensure the continued effectiveness of the IGC in the future.

5 Acknowledgements

This census is part of the long-term Goose Monitoring Programme organised by The Wildfowl & Wetlands Trust and funded by the Joint Nature Conservation Committee and WWT. The support of JNCC is gratefully acknowledged.

This census would not be possible without the support of a large number of dedicated goose enthusiasts. Enormous thanks go to them and the regional co-ordinators for all their hard work and effort, advice and comments on their local goose situations. These include (with apologies for any omissions or mis-spellings):

John Allen, Richard Averiss, Sarah Barratt, Chris Bauer, Mike Bell, Keith Blundell, Lynnette Borradaile, Ivan Brockway, Paul Brooks, Allan Brown, David Bryant, Rhys Bullman, John Burrow, Graeme Bowman, Euan Cameron, Mike Carrier, Graham Catley, Paul Collin, Sheila Cormack, Olivia Crowe, Tom Cunningham, Phil Davey, Ian Davidson, Keith Duncan, Raymond Duncan, Stephen Dunstan, Dave Fairlamb, P Fletcher, Derek Forshaw *et al.*, Alexander Gordon, David Graham, Hugh Gray, Martin Gray, Andrew Grieve, Sandra Hacker, Clive Hartley, Paul Harvey *et al.*, Les Hatton, Bill Hay, Phil Heath, Malcolm Henderson, Ben Herschell, Fiona Hewlett, Brian Hodgson, Norman Holton, Ian Hopkins, Duncan Irving, Martin Kitching, David Law, Allan Lawrence, Stan Laybourne, James Lough, Leigh Marshall, Paul Massey, Wendy Mattingley, Frank Mawby, J & R McCutcheon, Patrick McHugh, Eric Meek *et al.*, Carl Mitchell, Petur Mortensen, Andrew Mossop, Donald Muir, Malcolm Muir, Ray Murray, M Nattrass, Eddie Nixon, Roger Norman, Elaine Ogston, John Palfery, David Parkinson, Scott Paterson, Ian Patterson, David Pickett, Mike Ramage, K Redgrave, Michael Richardson, Alastair Robertson, Keith Robeson, Martin Robinson, Malcolm Ross, Nick Rossiter, Jim Scott *et al.*, Stephanie Smith, Trevor Smith, Alan Steel, Logan Steele, Pam Tateson, Neale Taylor, Ian Thomson, Vivienne Underwood, Andrew Wight, Andrea Williams, John Wills, Tony Wilson, Ron Youngman and Bernie Zonfrillo.

Age assessments were provided by Ian Patterson, Ian Hutchison and Carl Mitchell.

6 References

Frederiksen, M. 2001. *Icelandic-British workshop on grey geese, Hvanneyri, Iceland, 28-30 September 2001.* Náttúrufræðistofnun Íslands, Reykjavík.

Frederiksen, M., Hearn, R.D., Mitchell, C., Sigfússon, A.Þ., Swann, R.L. & Fox, A.D. 2004. The size and dynamics of Icelandic-breeding goose populations: a reassessment of the evidence. *Journal of Applied Ecology* 41: 315-334.

Hearn, R.D. 2004. *The 2002 Icelandic-breeding Goose Census.* Wildfowl & Wetlands Trust Report, Slimbridge.

Wetlands International. 2002. *Waterbird Population Estimates - Third Edition.* Wetlands International Global Series No.12, Wageningen, The Netherlands.