



Status and distribution of Icelandic-breeding geese: results of the 2017 international census

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Summary

The 58th consecutive annual census of Greenland/Iceland Pink-footed Geese and Iceland Greylag Geese took place during autumn and early winter 2017. Sites holding Pink-footed Geese were primarily checked in October and November, whilst those holding Greylag Geese were checked primarily in November. An additional spring census was carried out in March 2018. Coverage in Britain was good, with most of the key sites covered. Count data were also received from Ireland, and Southwest Norway, and from Iceland where an aerial census was conducted in favourable flying conditions; however, much of the ground was covered by snow at the time. Weather conditions were generally considered good during the October and November census periods with very few sites reporting underestimated counts.

Maxima of 515,852 Pink-footed Geese and 89,874 Greylag Geese were counted in October and November, respectively. The Greylag Goose figure was adjusted to account for the number of British/Irish Greylag Geese likely to be present prior to this census, resulting in population estimates of 515,852 Pink-footed Geese and 60,962 Iceland Greylag Geese. Compared to the previous year, the 2017 figures represent an increase of 7.2% in the Pink-footed Goose population and a decrease of 32.6% in the Iceland Greylag Goose population. The possible explanations for these changes in population size are discussed in this report.

Fifteen sites in Britain held 10,000 or more Pink-footed Geese in October, with Montrose Basin, Angus, holding the largest number at the time of the census (80,000 birds). Combined counts from 27 sites that supported numbers exceeding 1% of the 2017 Pink-footed Goose population estimate accounted for 82.9% of the total October count. During the November census, more than three quarters of the Iceland Greylag Goose population (79.2%) was present in North Scotland, principally in Orkney.

The percentage of young Pink-footed Geese assessed in Britain was 17.1%, slightly lower than the previous year and lower than the previous ten-year mean of 18.4%. The mean brood size of successful pairs was 1.85 goslings. The percentage of young Iceland Greylag Geese assessed in northern Scotland was 19.9%, slightly lower than the previous ten-year mean of 22.1%, and the mean brood size was 1.97 goslings per successful pair.

1. Introduction

The Pink-footed Goose *Anser brachyrhynchus* population which breeds in Iceland and along the east coast of Greenland, winter almost exclusively in Britain (Mitchell 2002), while Greylag Geese *Anser anser* breeding in Iceland principally winter in northern Britain, with small numbers in Ireland and Southwest Norway (Swann & Brockway 2002). Large concentrations of both species occur during the autumn, particularly in East Central Scotland, Southwest Lancashire and Norfolk (Pink-footed Goose) and North Scotland (Greylag Goose), notably in Orkney. As winter progresses, redistribution to other parts of the wintering range occurs; therefore, an estimation of the size of these populations is most effective in the autumn (Mitchell & Hearn 2004, Hearn & Mitchell 2004).

The Icelandic-breeding Goose Census (IGC) has been undertaken annually since 1960 and aims to assess the size, distribution and breeding success of Greenland/Iceland Pink-footed Geese and Iceland Greylag Geese. Since 1990, two coordinated counts have been undertaken, the first in October and the second in November. These are timed to coincide with periods when these geese are most concentrated after their arrival in Britain. Pink-footed Geese arrive earlier than Greylag Geese and are, therefore, usually best counted in October. The November count allows for the later migration of Greylag Geese to be completed. Every three years, a coordinated spring count is also undertaken in order to map the distribution of birds during this important part of the annual cycle.

This report represents an overview of the 58th consecutive annual census and an update on the population size and breeding success of Greenland/Iceland Pink-footed Geese and Iceland Greylag Geese following the 2017 breeding season, and the results of the latest spring count carried out in March 2018. We have also included a summary of the latest information on harvest of both species in Iceland.

2. Methods

Counts were conducted by a network of experienced volunteer observers and professional conservation staff over the weekends of 21/22 October and 18/19 November 2017. An additional early spring count was conducted over the weekend of 10/11 March 2018 in order to assess distribution at this time of year. In some cases, counts made close to these dates were included in the coordinated census if there was no reason to suspect they duplicated other counts. Most counts were of roosting geese, made either at dusk, when the birds were flying in, or at dawn, as they departed to feeding areas. Dates of the coordinated counts were chosen to avoid periods of full moon as far as possible (3 October and 4 November 2017, and 2 March 2018), in an attempt to minimise the likelihood of geese remaining in feeding areas overnight. In a small number of areas where roost sites were poorly known, inaccessible or infrequently used, daytime counts of feeding birds were made. Consequently, in this report the term 'site' is applied to a range of geographical areas. Most are individual waterbodies where a goose roost occurs, whilst some are feeding areas around known roosts, and others are a mixture of these two. All sites are, however, areas to which an individual count can be attributed. For the purpose of analysis, counts from the Solway Firth, Orkney, Shetland, Southwest Norway, Faroe Islands and Iceland are treated as consolidated sites. Up to 2012, geese in Caithness were counted during the daytime when they were feeding on agricultural land and the county was treated as a consolidated site. However, since 2012, roost counts have been undertaken and these are now reported separately.

If necessary, adjustments are applied to the count totals in order to generate the population estimates for the Pink-footed Goose and Greylag Goose populations. These adjustments take in to consideration estimated counts, for sites that were not visited at the time of the census (for both populations), and numbers of British/Irish Greylag Geese (for the Iceland Greylag Goose).

Where a count is not undertaken, an estimate of the number of geese present may be provided by local counters. For regularly monitored sites (those counted in at least three of the previous five years) that were not counted during the current census, and no estimate was provided by a local counter, numbers are estimated using the mean of the counts made during the relevant month during the previous five years (e.g. the mean from 2012–2016 would be used in 2017). Estimated numbers (from either source) that exceed 0.5% of the current IGC peak count total for the relevant population will be added to the peak count to give the adjusted population estimate.

Increasing numbers of British/Irish Greylag Geese in core wintering areas for the Icelandic migrants, such as Orkney and the Moray Firth and Ireland means that assessing the abundance of the Iceland population at wintering sites is difficult. Where there are reasonable estimates of abundance of British/Irish Greylag Geese (for example on Orkney) these are subtracted from winter counts. However, up to date information on the abundance of British Greylag Geese south and east of an arbitrary line from Bute to Aberdeen is largely lacking and, simply as a precaution, any counts obtained through IGC from this area are discounted, as it is likely that the majority of birds in this area during November are from the British population. This is carried out as a precautionary measure but is unsatisfactory as it will likely lead to the Iceland Greylag Goose population being underestimated. An analysis of movements of Iceland Greylag Geese based on sightings of individually marked birds in the late 1990s/early 2000s showed that some Icelandic migrants moved south within Scotland as winter progressed (Swann *et al.* 2005). As recently as winter 2017/18 sightings of colour-marked Iceland Greylag Geese have been reported as far south as Dumfries and Galloway (B. Swann pers. comm.). It is therefore likely that a small proportion of Icelandic migrants do winter as far south as southwest Scotland, but since the proportion is unknown, a precautionary approach has been adopted.

To assess breeding success, experienced observers made assessments of the proportion of young (first-winter birds are separable from older birds by differences in plumage characteristics) in goose flocks and of brood size during the autumn. Data collected from October to late November were used to determine the percentage of young and the mean brood size of successful pairs.

3. Results

3.1. Coverage and conditions

The number of sites covered in each month is shown in Table 1. Compared to previous years, coverage throughout the range of both species during late 2017 was considered reasonable. All important sites for Pink-footed Geese and Greylag Geese were checked in 2017. In 2017, four fewer sites were covered for Pink-footed Geese in October, whilst the same number of sites were covered for Greylag Geese in November as in the previous year. (See section 3.6 for details of the spring census in March 2018.)

Table 1. The number of sites counted and the number of sites holding Pink-footed and Greylag Geese in October and November 2017, and March 2018.

	October	November	March
Number of Pink-footed Goose sites counted	98	106	110
Total number of sites holding Pink-footed Geese	77	77	57
Number of Greylag Goose sites counted	-	102	105
Total number of sites holding Greylag Geese	-	56	38

In November, an aerial survey of Greylag Geese was carried out in southern Iceland. Data from this survey were combined with ground counts undertaken elsewhere in Iceland and non-systematic information from hunters to provide an estimate of the number of Greylag Geese present.

No counts of Iceland Greylag Geese were undertaken during November in Southwest Norway. However, 750 birds were counted there in January 2018 and this was used as an estimate for the November census period. This approach has been adopted for several years; guidance from local counters in Southwest Norway suggests that the winter influx of Iceland migrants (determined by the presence of marked individuals from Iceland) occurs in late October or early November and they remain there throughout the winter (A. Follestad pers. comm.).

An attempt was made to account for the presence of British/Irish Greylag Geese in areas where Iceland Greylag Geese were also known to winter. Treatment of the principal locations was discussed in the 2009 IGC report (Mitchell 2010) and involves sites in Ireland (1,147 geese), Orkney (21,000 birds, see Discussion), Caithness (1,000) and Highland (750). British Greylag Geese also occur throughout southern Scotland and northern England and where counts were thought to involve British birds, these have been deducted (see Methods).

Good weather conditions were reported for most sites in both survey periods and no counters reported problems with poor visibility. Disturbance during counting was reported from two sites holding Pink-footed Geese in October, but was not thought to have adversely affected the counts at either site.

3.2. Total numbers

3.2.1. Pink-footed Goose

Totals of 515,852 and 376,798 Pink-footed Geese were counted in October and November 2017, respectively (Figure 1, Table 2). These represent increases of 7.2% and 3.6%, respectively, compared to the unadjusted total counts in the same months in the preceding year. Coverage was good and no estimated counts needed to be added to the unadjusted total and so the total count for October 2017 (515,852) was used as the population estimate.

3.2.2. Greylag Goose

In November 2017, 89,874 Greylag Geese were counted (Figure 1, Table 2). The unadjusted November count was 25.8% lower than that recorded in the previous year. Following adjustments for British/Irish Greylag Geese likely to be included in this count, a population estimate of 60,962 Iceland Greylag Geese was derived. This represents a decrease of 32.8% compared to the previous estimate of 90,741 geese in 2016.

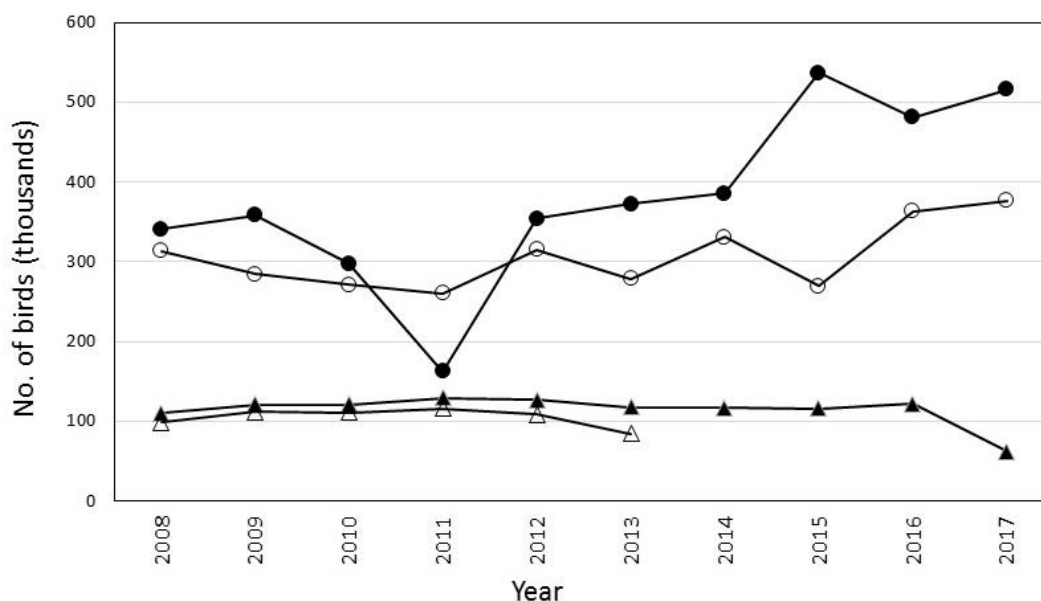


Figure 1. Peak (unadjusted) counts of Pink-footed Geese (circles) in October (filled) and November (open) and Iceland Greylag Geese (triangles) in November (filled) and December (open) counted during the Icelandic-breeding Goose Census, 2008 to 2017. Coordinated counts of Icelandic Greylag Geese have not been undertaken in December since 2013 (see Mitchell 2015).

Table 2. Totals of Pink-footed Geese and Iceland Greylag Geese by country and region in October and November 2017, and March 2018. Raw counts are shown with adjustments for non-Icelandic birds [-x]. Figures in parentheses indicate the number of sites counted.

Region/area	October 2017	November 2017		March 2018	
	Pinkfoot	Pinkfoot	Greylag	Pinkfoot	Greylag
Iceland*	6,000 (1)	0	9,313 (1)	nc	nc
Norway*†	nc	0	750 (1)	nc	nc
Faroe Islands*	nc	nc	nc	nc	nc
Ireland	0	0	2,212 (8)	0 (2)	1,032 (3)
			[-1,147]		[-300]
Shetland*	nc	nc	nc	nc	nc
Orkney*	nc	286 (1)	63,045 (1)	nc	nc
			[-21,000]		
Caithness	nc	128 (5)	5,020 (10)	1,300 (9)	2,200 (9)
			[-1,000]		[-1,000]
Highland	62,043 (12)	52,452 (12)	2,997 (12)	25,422 (19)	1,688 (19)
			[-750]		[-750]
Moray	16,130 (2)	4,240 (2)	1,522 (2)	191 (2)	1 (2)
Aberdeenshire	42,792 (6)	36,621 (6)	509 (6)	9,450 (6)	161 (6)
			[-509]		[-161]

Region/area	October 2017	November 2017		March 2018	
	Pinkfoot	Pinkfoot	Greylag	Pinkfoot	Greylag
Angus/Dundee	86,900 (2)	10,872 (2)	34 (1) [-34]	856 (2)	12 (2) [-12]
Perth & Kinross	41,870 (9)	35,491 (12)	2,462 (12) [-2,462]	9,322 (9)	1,098 (9) [-1,098]
Stirling/Falkirk/Clackmannan	14,579 (4)	3,161 (4)	249 (4) [-249]	3,290 (4)	0 (4)
Fife	6,555 (8)	11,366 (7)	9 (7) [-9]	6,650 (5)	26 (5) [-26]
Argyll & Bute	nc	nc	nc	nc	1,440 (1) [-1,440]
Clyde	nc	nc	nc	0 (1)	nc
Ayrshire	nc	nc	nc	nc	nc
Dumfries & Galloway **	10,499 (7)	20,182 (9)	0 (7)	23,482 (6)	2 (6)
Cumbria **	5,126 (6)	5,541 (6)	31 (6) [-31]	14,136 (6)	67 (6) [-67]
Lothians	15,899 (8)	7,814 (10)	1,261 (10) [-1,261]	14 (10)	60 (10) [-60]
Borders	45,162 (10)	31,290 (12)	128 (12) [-128]	7,485 (11)	399 (11) [-399]
Northumberland	8,900 (4)	nc	332 (3) [-332]	1,000 (5)	0 (5)
Lancashire & Merseyside	94,435 (7)	54,596 (6)	nc	10,467 (5)	0 (5)
N Wales/Dee Estuary	1,900 (1)	4,150 (2)	nc	8,500 (2)	0 (2)
Humberside	27,800 (2)	16,380 (2)	nc	nc	nc
Lincolnshire	nc	nc	nc	nc	nc
Norfolk	29,262 (9)	82,228 (8)	nc	822 (6)	nc
<i>Raw total counts</i>	515,852	376,798	89,874	122,387	8,186
<i>Adjustment for non-Icelandic birds</i>			-28,912		-5,313
Population Estimate	515,852		60,962		

* Several feeding sites consolidated.

** Counts from the Solway Firth have been split between birds counted in Dumfries & Galloway and Cumbria.

† The count in Norway was undertaken in January 2018.

nc No count received.

3.3. Regional Distribution

3.3.1. Pink-footed Goose

By the time of the October census, 29.0% of the population had arrived in East Central Scotland with 18.7% and 13.6% found in West England and Southeast Scotland / Northwest England, respectively (Table 3, Figure 2). By November, all regions held fewer birds, apart from Southwest

Scotland / Northwest England where numbers had increased from 3.0% to 5.0%, and East England where numbers had increased from 11.1% in October to 19.1% in November.

3.3.2. Greylag Goose

During November, 79.2% of the population was found in North Scotland, primarily on Orkney, whilst 15.3% was still in Iceland (Table 3, Figure 3). Overlap between the British/Irish and Icelandic populations make it difficult to determine the origin of individuals; however, it is doubtful that many Greylag Geese encountered south and east of a line drawn from Bute to Aberdeen (see Figure 3) in November are of Icelandic origin (but see Discussion).

Table 3. National and regional distribution (within Britain) of Pink-footed Geese and Iceland Greylag Geese counted during October and November 2017, expressed as a percentage of the maximum count for each species.

	Pink-footed Goose		Greylag Goose
	October	November	November
Iceland	1.2	0	15.3
Faroes	0	0	0
Norway	0	0	1.3
Ireland	0	0	1.7
North Scotland	12.0	10.2	79.2
Northeast Scotland	11.4	7.9	2.5
East Central Scotland	29.0	11.8	0
Southwest Scotland/ Northwest England	3.0	5.0	0
Southeast Scotland/ Northeast England	13.6	7.6	0
West England	18.7	11.4	0
East England	11.1	19.1	0
Total	100	73.0	100

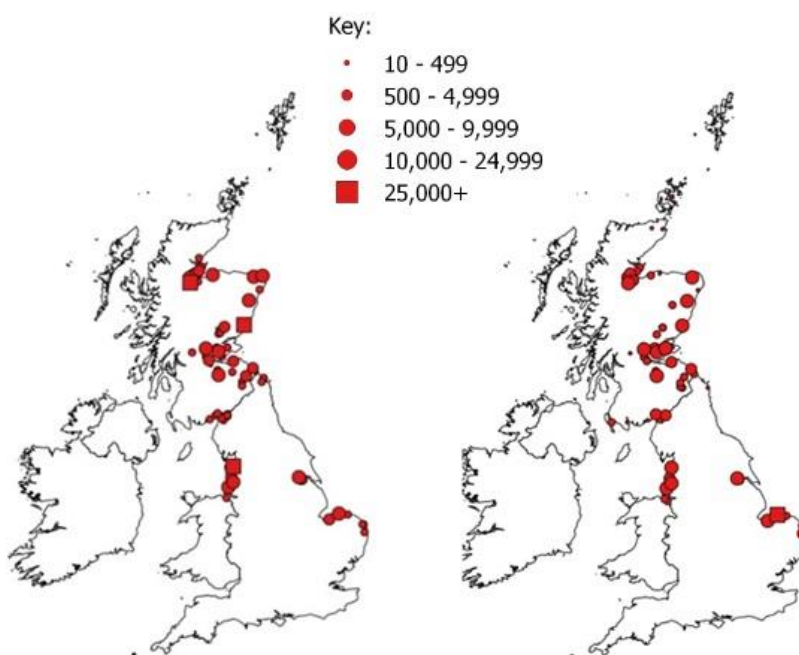


Figure 2. Distribution of Pink-footed Geese in Britain and Ireland in October (left) and November (right) 2017.

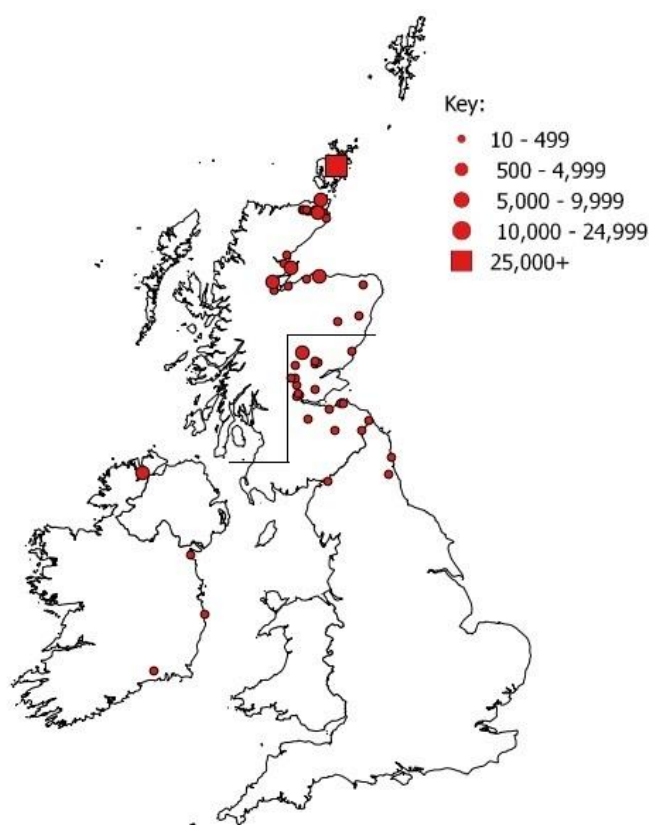


Figure 3. Distribution of Iceland Greylag Geese in Britain and Ireland in November 2017. Where the status is unknown, the mapped counts do not differentiate between Icelandic and British/Irish birds. It is unlikely that many Iceland birds are present in Britain south and east of the dashed line in November (see also Table 2).

3.4. Principal concentrations

3.4.1. Pink-footed Goose

Pink-footed Geese were recorded at 77 sites, both in October and November (Table 1, Figure 2). Fifteen sites held more than 10,000 birds in October (Table 4) and 12 sites held this many in November. The number of sites holding more than 1% of the 2017 population estimate (5,158 birds) was 27 in October (Table 4) and 30 in November. In October, combined counts from the top 27 sites accounted for 82.9% of the total population and numbers at the top five sites held 37.5% of the population (Table 4).

During the October census, high numbers were recorded at Montrose Basin, Angus, which held 80,000 birds (15.5% of the population estimate), Morecambe Bay, Lancashire (38,600, 7.5%), Beaulieu Firth, Highland (29,500, 5.7%), WWT Martin Mere, Lancashire (25,000, 4.8%), West Water Reservoir, Borders (20,150, 3.9%), Carsebreck and Rhynd Lochs, Perth and Kinross (19,500, 3.8%), Whitton Sands, Humber (18,100, 3.5%), Findhorn, Moray (16,130, 3.1%) and Loch of Skene, Aberdeenshire (16,000, 3.1%) (Table 4).

3.4.2. Greylag Goose

Greylag Geese were recorded at 56 sites in November (Table 1, Figure 3), eight of which held more than 1% of the 2017 population estimate (60,962 birds) (this considers Orkney, Iceland, Ireland and Norway as single consolidated sites) (Table 4). The two sites supporting the highest counts were Orkney, which held 42,045 birds (69.0% of the population estimate) and Iceland,

which held 9,313 birds (15.3%). The most recent peak IGC counts for these two sites, are shown in Figure 4.

In recent censuses there has been a noticeable trend in increasing numbers of Greylag Geese in Iceland and decreasing numbers counted in Orkney in November suggesting that the migration of birds from Iceland is getting later each year. However, during the 2017 November census, there were notably fewer birds counted in Iceland (Figure 4) (see Discussion).

For the purposes of this report, Orkney is treated as a consolidated site. Appendix 1 shows the individual totals for the islands; 13 of the islands held numbers exceeding 1% of the population estimate in November (610 birds), although these individual counts are not adjusted for the presence of Greylag Geese breeding in Orkney (thought to number c. 21,000 birds in total, but see Discussion).

Table 4. Sites that supported >1% of the (a) Pink-footed Goose (>5,158) and (b) Iceland Greylag Goose (>610) population estimates in October and November 2017, respectively. Note that these values are not the same as the internationally accepted threshold values for these populations that are used to identify sites of international importance: currently 5,400 for Pink-footed Goose and 980 for Iceland Greylag Goose (Wetlands International 2018). Greylag Goose counts are adjusted (*i.e.* British/Irish birds have been deducted).

a) Pink-footed Goose

Site	October count	Percentage of population estimate
Montrose Basin, Angus	80,000	15.5
Morecambe Bay, Lancashire	38,600	7.5
Beaully Firth, Highland	29,500	5.7
WWT Martin Mere, Lancashire	25,000	4.8
West Water Reservoir, Borders	20,150	3.9
Carsebreck & Rhynd Lochs, Perth & Kinross	19,500	3.8
Whitton Sands, Humberside	18,100	3.5
Findhorn Bay, Moray	16,130	3.1
Loch of Skene, Aberdeenshire	16,000	3.1
Loch Leven, Perth & Kinross	14,060	2.7
Loch of Strathbeg, Aberdeenshire	11,992	2.3
Alt Estuary, Lancashire	11,500	2.2
Overy Marshes, Holkham, Norfolk	11,271	2.2
Middlemuir, Aberdeenshire	10,200	2.0
Ribble Estuary, Lancashire	10,000	1.9
Read's Island Flats, Humberside	9,700	1.9
Skinflats, Upper Forth	9,593	1.9
Aberlady Bay, East Lothian	9,295	1.8
Bog Bank, Borders	8,980	1.7
Nigg Bay, Cromarty Firth, Highland	8,070	1.6
Hule Moss, Borders	7,950	1.5
Snettisham, Norfolk	7,665	1.5
Wyre Estuary, Lancashire	7,350	1.4

Site	October count	Percentage of population estimate
Udale Bay, Cromarty Firth, Highland	7,200	1.4
Loch of Lintrathen, Angus	6,900	1.3
Inner Cromarty Firth: Dingwall Bay, Highland	6,750	1.3
Iceland	6,000	1.2

b) Greylag Goose

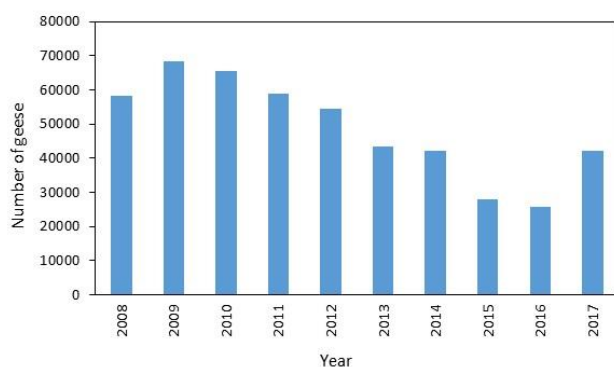
Site	November count ¹	Percentage of population estimate
Orkney Islands (all sites)	42,045	69.0
Iceland	9,313	15.3
Loch Watten, Caithness	2,082	3.4
Loch Spynie, Moray	1,500	2.5
Loch Eye, Highland ²	1,492	2.4
Loch of Mey, Caithness ³	1,440	2.4
Ireland (all sites)	1,065	1.7
Inner Cromarty Firth: Dingwall, Highland ²	752	1.2
Norway	750	1.2

¹ Adjusted counts (see text and Table 2).

² Highland includes an estimated 750 British birds (Table 2) that cannot be allocated to individual sites.

³ Caithness includes an estimated 1,000 British birds (Table 2) that cannot be allocated to individual sites.

a) Orkney



b) Iceland

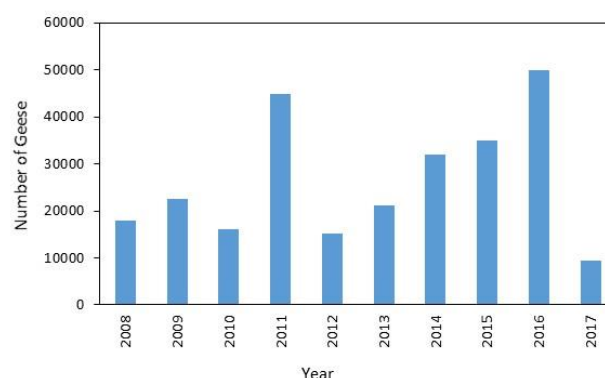


Figure 4. Peak IGC counts of Iceland Greylag Geese at a) Orkney (excludes British birds) and b) Iceland 2008 to 2017.

3.5. Breeding success

3.5.1. Pink-footed Goose

Between early October and late November, a total of 24,590 Pink-footed Geese, in 34 flocks, was aged at various locations throughout Scotland and England. This represented 4.8% of the 2017/18 population estimate. The brood size of 448 families was also determined during this period.

Breeding success was similar to the mean for the previous decade, with flocks containing 17.1% young birds (mean 2007–2016: 18.4% \pm 1.2 SE) (Table 5, Figure 5). The mean brood size of

successful pairs was 1.85 juveniles, which was also similar to the mean recorded during the previous ten years (mean 2007–2016: 2.05 ± 0.06 SE).

3.5.2. Greylag Goose

From mid-October to mid-November, 1,650 Greylag Geese from ten flocks were aged at various locations in Caithness, Scotland. This represented 2.7% of the 2017/18 population estimate. The brood size of 30 families was also determined during this period.

The percentage of young found amongst flocks (19.9%) was lower than the previous year (23.5% in 2016) and slightly lower than the recent ten-year mean (mean 2007–2016: $22.1\% \pm 0.47$ SE) (Table 5, Figure 5). The mean brood size of 1.97 goslings per successful pair was lower than that of the recent ten-year mean (mean 2007–2016: 2.31 ± 0.08 SE).

The percentage of young reported in the Iceland harvest bag, an independent measure of annual breeding success, was 56% in 2017, which mirrored the 2016 result (56% young) and was higher than the previous ten-year average of 48% (A. Sigfússon in litt).

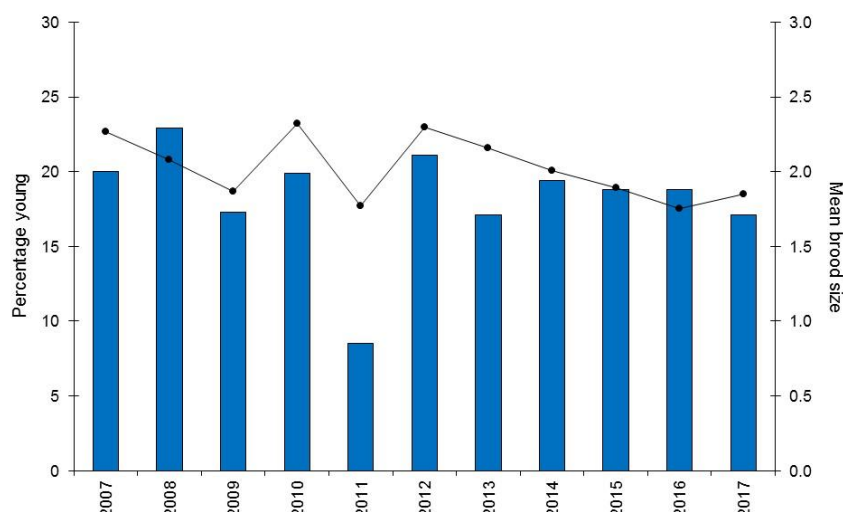
Table 5. The percentage young and mean brood size of Pink-footed and Iceland Greylag Geese in 2017.

	Region	Time period	Total aged	% young	No. of broods counted	Mean brood size
Pink-footed Goose ¹	N Scotland	Late Oct	500	17.8	2	1
	NE Scotland	Early Oct	1,200	16.6	76	2.01
		Late Oct	1,329	17.9	27	2.07
		Late Nov	400	16.5	-	-
	EC Scotland	Early Oct	400	23.3	7	3.14
		Late Oct	3,650	12.5	14	2
		Early Nov	400	17.8	3	2
	Late Nov	1,750	9.6	-	-	
	SW Scotland	Early Oct	596	31.9	121	1.48
	West England	Early Oct	582	16.2	16	1.5
		Late Oct	1,016	26.5	33	1.76
		Early Nov	124	45.2	34	1.65
	E England	Late Oct	4,681	21.3	64	1.98
		Early Nov	7,962	15.3	51	2.18
	Total		24,590	17.1	448	1.85
Greylag Goose ²	N Scotland	Mid-Oct	50	28.0	2	1.50
		Mid-Nov	1,600	19.6	28	2.00
	Total		1,650	19.9	30	1.97

¹ Pink-footed Geese were aged between 2 October to 29 November 2017.

² Greylag Geese were aged between 20 October and 20 November 2017.

a) Pink-footed Goose



b) Greylag Goose

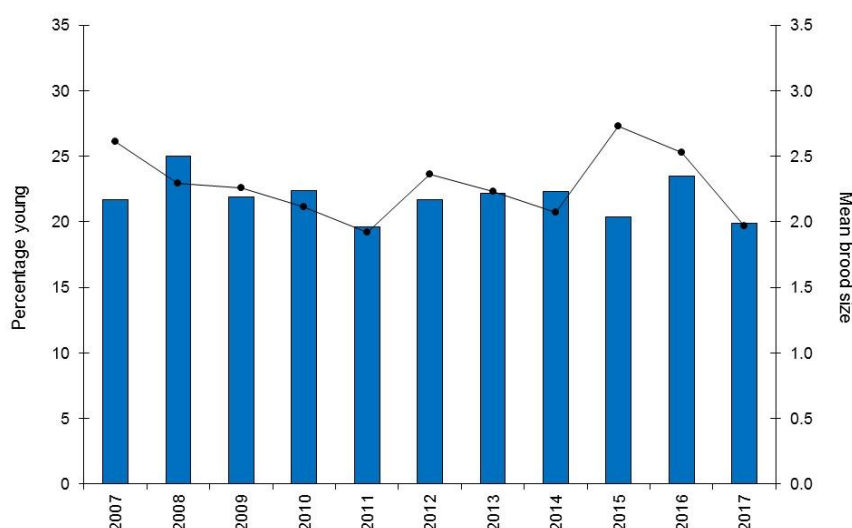


Figure 5. The percentage young (column) and mean brood size (line) found in flocks of (a) Pink-footed Goose and (b) Iceland Greylag Goose, 2007 to 2017.

3.6. Spring 2018 census

Periodic spring censuses organised by WWT between 1982 and 1996, took place on dates in mid-March (although in 1995 it was as late as 8 April). However, evidence from arrival dates of spring migrants recorded in Iceland, suggests that both Pink-footed and Greylag Geese have been arriving earlier in the year, by approximately 0.7 to 0.8 days per year between 1988 and 2009, or by up to 16 days over the 21-year study period (Gunnarsson & Tómasson 2011). Therefore, the March 2018 census dates were chosen to avoid the possibility that large numbers of Greylag Geese had migrated to Iceland before the census took place.

During the March 2018 spring census, 110 sites were checked for Pink-footed Geese, of which 57 held geese; and 105 sites were checked for Greylag Geese, of which 38 held geese. No counts of Greylag Geese were undertaken on Orkney, the main wintering location for the species. In total, 122,387 Pink-footed Geese and 4,311 Greylag Geese were counted during the spring census. Redkirk Point in Dumfries and Galloway, and Burton Marsh in Cheshire held the highest numbers of Pink-footed Geese, with 12,500 and 8,000 birds reported, respectively (Table 6).

Table 6. The top ten largest Pink-footed and Greylag Goose counts at individual sites in early March 2018.

Pink-footed Goose		Greylag Goose	
Redkirk Point, Dumfries	12,500	Bute	1,440
Burton Marsh, Cheshire	8,000	Lough Swilly	968
Munlochy Bay, Highland	7,250	Loch of Mey	800
Middlemuir, Aberdeenshire	6,800	Dornoch Firth	688
Loch Leven, Fife	5,990	Loch Scrabster	580
Beaully Firth, Highland	5,650	Loch Watten	550
Campfield Marsh, Cumbria	4,863	Loch Eye	470
Alt Estuary, SW Lancashire	4,757	Devon Valley	399
Moricambe, Cumbria	4,573	Upper Tay / Tummel Sites	392
Carsebreck/Rhynd Lochs, Perth & Kinross	4,450	Bemersyde-Smailholm	250

4. Harvest in Iceland

Since 1995, the Environment Agency of Iceland has annually collected hunting bag information from all holders of a hunting licence. The reporting of this is carried out on a species by species basis and the country has been divided into six hunting areas. Data on hunting are available at the website of Statistics Iceland (<https://statice.is>).

The reporting of hunting bag information is compulsory in Iceland and thus, the yearly hunting licence cannot be renewed unless information on the previous year has been submitted by the hunter; therefore, the reporting rate is usually high. Only hunters that have stopped hunting do not issue their hunting bag information and some reports may be delayed if hunters take a break from hunting and restart again at a later date.

Since the start of hunting bag reporting, the average total bag for Greylag Goose has been 39,859 birds (± 1.49 SE) and for the Pink-footed Goose, the average has been 14,759 (± 6.36 SE). The total bag for each species is shown in Figure 6.

Hunting bag information for 2017 is not yet available; however, during 2016, 43,000 Greylag Geese and 19,000 Pink-footed Geese were reported shot in Iceland, this being above average for both species, whereas the 2015 bag, for both species, was below average.

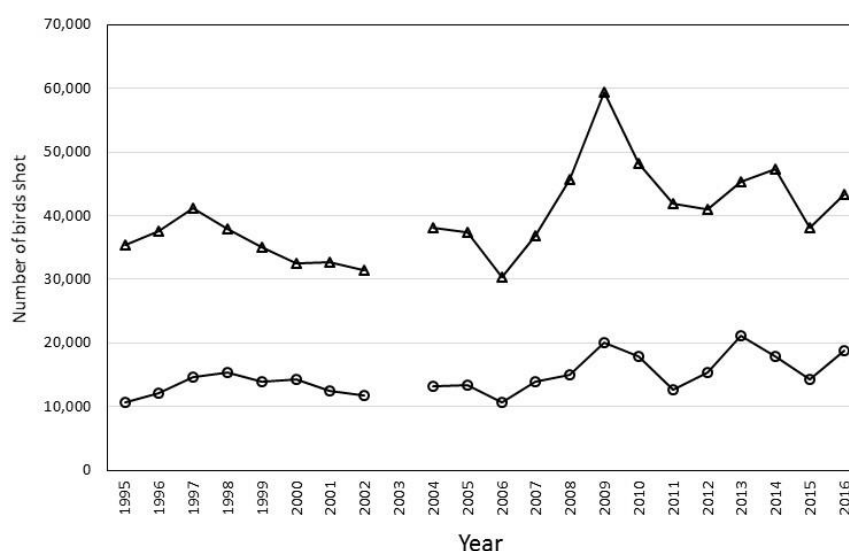


Figure 6. Hunting bag information for Greylag Geese (triangles) and Pink-footed Geese (circles) in Iceland from 1995–2016 based on data from the Environment Agency of Iceland. No data are available for 2003.

5. Discussion

The 2017 Pink-footed Goose population estimate of 515,852 was 7.2% higher than the 2016 estimate (481,341) and the second highest population estimate ever recorded, following that from 2015 when the population surpassed half a million birds for the first time (536,871) (Figure 7). It now also seems clearer that the 2016 population estimate was affected by a degree of undercounting as suggested by Mitchell & Brides (2017).

During the October 2017 census, counts at Middlemuir (New Pitsligo Moss), Aberdeenshire, which can hold large numbers of Pink-footed Geese during October, was undertaken a week later than the census dates. Due to turnover at individual sites during a short period of time, this can lead to a lack of synchrony and thus holds potential for missing or duplicating the counting of large numbers of birds during the census weekend. It is therefore important to aim to undertake counts on the set census dates in order to archive maximum coverage and avoid duplicate counting due to the movement of large numbers of birds.

Roosts where no counts are currently being undertaken, have recently been identified by the tracking of Pink-footed Geese using Global Positioning System (GPS) tags. It is possible that this could have had an impact on recent censuses and adding to the likelihood that the 2016 population estimate was an under count. In order to try to reduce the possibility of missing birds during future censuses, the information gained from the Pink-footed Goose tracking project will be used to identify any new sites that, ideally, should be covered.

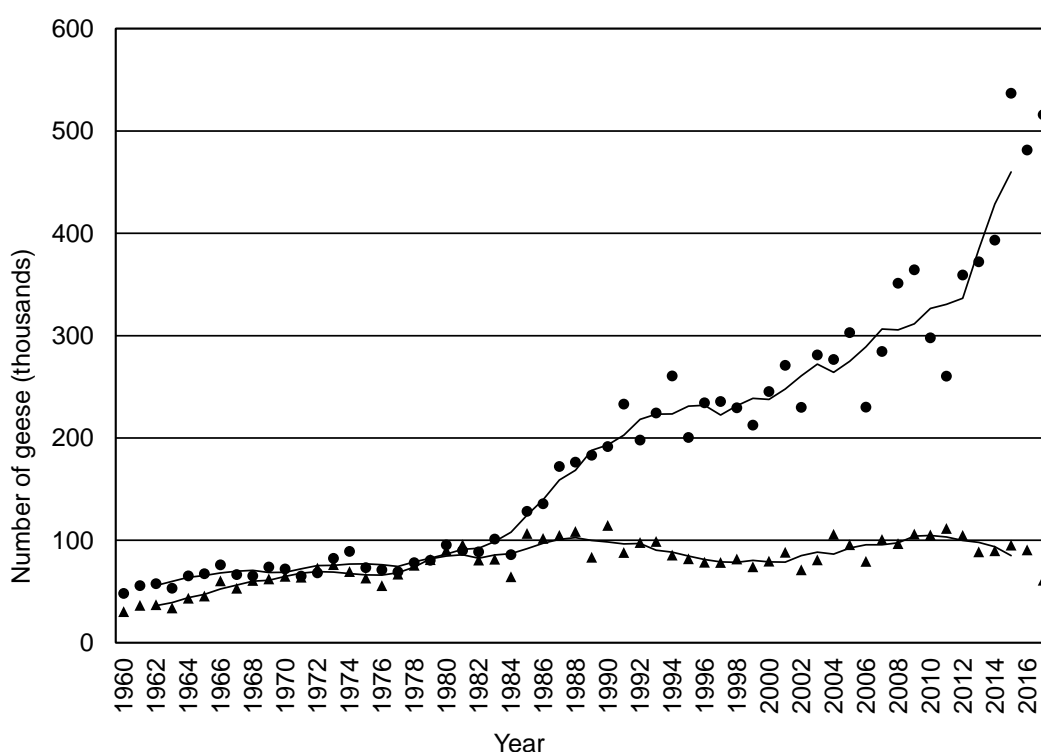


Figure 7. Population estimates for Pink-footed Goose (circles) and Iceland Grey Lag Goose (triangles), 1960–2017. The five-year running means (e.g. mean for 2015 is from population estimates for 2013 to 2017) are shown as lines. Both population estimates follow revisions set out in Mitchell (2013).

Results from the 2017 census show that Montrose Basin continues to have the highest occupancy of Pink-footed Geese during October, having held the highest number of geese every year since the 2013 census. Similarly, combined counts from sites in Lancashire show that the county

continues to hold high numbers of Pink-footed Geese during the October census, with over 90,000 birds reported each year since 2014.

The population estimate of 60,962 Iceland Greylag Geese is considerably lower than that in 2016 (Figure 7), and whilst suggestions of a recent population decline have been given in previous reports (Mitchell & Brides 2017) it is likely that in some areas a degree of undercounting took place in November 2017, which will have affected the overall 2017 population estimate.

The departure of Greylag Geese from Iceland is highly variable from year to year due to the influence of weather conditions. In November 2016, counts identified 50,000 Greylag Geese present in Iceland during the census, which is markedly higher than the total counted there in November 2017 (9,313 birds). However, in 2017, birders in Iceland reported an early departure of Greylag Geese at the time of the November census. Therefore, depending on the timing of the counts in Iceland and in Orkney (where a high proportion of the geese first arrive in Britain), it is possible that some birds may still have been on migration at the time of the count.

Given that the annual breeding success of Iceland Greylag Geese was good during 2017, this suggests that a degree of undercounting has taken place, or that the harvest in Iceland during 2017 was notably higher than average. However, although information on harvest in Iceland during 2017 are not yet available, the annual figures tend not to vary massively and it is, therefore, thought unlikely that a large increase in harvest has caused such a large observed decrease in the number of birds counted.

The monitoring of annual breeding success for this population in Britain is becoming more difficult because the main wintering areas (Orkney and around the Moray Firth) hold ever larger numbers of British Greylag Geese and separating birds from each population is impossible in the field. However, the results from summer counts suggest that the bulk of the birds found in Caithness in winter are from Iceland and it is in this county that age counts were undertaken.

Orkney continues to hold the largest proportion of the Iceland Greylag Goose population. As geese from both the Icelandic and British populations of Greylags are present at the time of the census, an estimated number for the latter was deducted from the census count in order to estimate the number of Icelandic birds. However, as no summer survey was undertaken in Orkney during 2017, the estimated number of British Greylag Geese used in 2016 (21,000 birds; see Mitchell & Brides 2017) was deducted from the overall November 2017 total, which resulted in an estimated 42,045 Icelandic birds. However, if numbers of British Greylags have decreased on Orkney due to hunting, then underestimation of the total number of Iceland birds in Orkney during November could also have taken place.

Up to 2012, geese in Caithness were counted during the daytime when they were feeding on agricultural land, and for the purpose of reporting, the county was treated as a consolidated site. However, since 2012, roost counts have been undertaken and these are now reported separately. In November 2017, 5,020 Greylag Geese were counted leaving the roosts during the roost counts in Caithness. However, feeding counts undertaken on the same day totalled 8,000 Greylag Geese, which suggests that geese are roosting on other waterbodies not being covered by the roost counts. However, due to the possibility of duplicate counting during the feeding counts, the total number of birds counted during the roost counts (5,020 birds) was used in the population estimate.

As previously reported, large numbers of British Greylag Geese in core wintering areas for the Iceland population, such as Orkney, the Moray Firth and Ireland, means that assessing the abundance of the Icelandic geese remains very difficult. Up to date information on the abundance of British Greylag south and east of an arbitrary line from Bute east to Aberdeen is largely lacking and, therefore, simply as a precaution, any counts obtained through the IGC from this area are matched by subtracting that figure (assuming that the majority of birds counted are British). Further to this, as recently as winter 2017/18 sightings of colour-marked Iceland Greylag Geese were

sighted as far south as Dumfries and Galloway (B. Swann pers. comm.) showing some overlap in the wintering population south of the arbitrary line as described above.

As the overlap between the two Greylag Goose populations continues to make it difficult to census the migratory Icelandic population, ways in which surveillance of Greylag Geese in Iceland, prior to autumn migration commencing, should be explored. However, this lends itself to problems too, since surveillance in Iceland relies on relatively few dedicated volunteers and the area in which the geese can be located is large.

6. Acknowledgements

This census is part of the long-term Goose & Swan Monitoring Programme (GSMP), which monitors the abundance and breeding success of the UK's native geese and migratory swans during the non-breeding season. GSMP is organised by the Wildfowl & Wetlands Trust (WWT) in partnership with the Joint Nature Conservation Committee (JNCC) and Scottish Natural Heritage (SNH).

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Appendix 1. Greylag Goose counts at individual sites in Orkney in November 2017.

Counts have not been adjusted to take into account the estimated number of British Greylag Geese in Orkney.

Site	November count	% of 2017 population estimate
West Mainland	25,338	41.6
East Mainland	7,165	11.8
Shapinsay	4,391	7.2
Sanday	4,067	6.7
Stronsay	3,883	6.4
South Ronaldsay	5,706	9.4
Westray	2,441	4.0
Eday	1,660	2.7
Rousay	1,446	2.4
Holm, Lamb Holb & Glimps Holm	1,446	2.4
North Ronaldsay	1,443	2.4
Papa Westray	1,084	1.8
Egilsay	630	1.0
Graemsay	535	0.9
Burray & Hunda	531	0.9
South Walls, Switha, Melsetter	410	0.7
Gairsay	257	0.4
Flotta	225	0.4
Wyre	200	0.3
Hoy and North Walls	187	0.3
Total	63,045	