



Plate 164. Greylag Goose, Loch of Clumlie, Shetland, June 2007. © Jim Nicolson

The status of the Greylag Goose in Shetland

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The past 30 years has seen a fundamental change in the status of the Greylag Goose in Shetland. Once an autumn migrant and localised winter visitor in small numbers, the species has become much more common in both seasons, and breeding birds considered to be of Icelandic origin colonised the islands in the 1980s. In 2011, the post-breeding population numbered around 5,250 individuals suggesting a breeding population of between 700 and 1,000 pairs, while the peak wintering population exceeded 7,600 individuals. These increases are expected to continue. Reports of neck-collared individuals suggest that the Shetland wintering population comprises both resident birds and migrants from Iceland, and there is evidence to suggest that in cold winters a proportion of these birds move further south. As the population of Greylag Geese continues to increase in both abundance and distribution in Shetland, conflict with the agricultural sector can be expected to increase.

Introduction

The only native wild goose breeding in Britain is the Greylag Goose *Anser anser*. The nominate subspecies breeds in Iceland, north-west and central Europe and Scandinavia, with a second subspecies *A. a. rubirostris* breeding from eastern Europe across Asia. Ring recoveries and sightings of marked birds have established that the migrants passing through Shetland and some wintering birds originate from Iceland (Pennington *et al.* 2004). The number of autumn migrant and wintering Greylag Geese has increased markedly in Shetland since the 1960s and birds, presumed to be of Icelandic origin, colonised the islands in the mid-1980s (Pennington 2000).

The breeding population has also increased markedly in recent years, and in parallel with these increases, conflict between geese and the Shetland agricultural sector has heightened. This culminated with applications for six licences to shoot geese in the close season in spring 2010, four of which were granted, and two licences issued in 2011 (Scottish Government Rural Payments and Inspections Department (SGRPID)). In order to try and inform this debate and consider possible future management of Greylag Geese in Shetland it was considered important to try and gain accurate estimates of both the post-breeding and wintering population size, and to establish whether Shetland's breeding Greylags are resident in the islands. This paper attempts to answer these questions by reporting on these surveys and the preliminary results from a sample of birds marked with neck collars in July 2011.

Changing status in Shetland: autumn and winter

As the Icelandic breeding population of Greylag Geese increased markedly from the 1960s to the early 1990s (Hearn & Mitchell 2004) the number of autumn migrants recorded in Shetland also increased. On Fair Isle, where the observatory maintains a daily log, the number of migrants passing over/through the island has increased markedly, although with some annual variation probably as a result of differing weather patterns during migration.

As the number of migrants passing through Shetland increased, so did the wintering population. During the 1970s, small flocks of up to 60 wintering birds were recorded, usually in the south Mainland in the vicinity of the Loch of Spiggie. Numbers showed a slight increase during the 1980s, with the first significant wintering flock of 250 birds in the south Mainland during the winter of 1990/91. The south Mainland wintering flock increased, with 620 present in 1998/99, by which time smaller wintering flocks had become established elsewhere (Pennington *et al.* 2004). In 2005–06, the Shetland-wide wintering population was estimated to be between 2,000 and 3,000 birds (Harvey 2007).



Plate 165. Clutch of six eggs in Greylag Goose nest, Unst, Shetland. © Mike Pennington

Breeding history

The initial colonisation of Shetland by the Greylag Goose is described in detail by Pennington (2000). There is no historical evidence to suggest that the Greylag Goose bred in the islands until a pair probably nested on Foula in 1970. The first confirmed breeding record was on Unst in 1985, although it is likely that the species had bred there previously in at least 1981 and 1983. By 1998–99, breeding had also been confirmed on Fetlar, Yell and in the north, west, central and south of Mainland, with a total of between 80 and 100 breeding pairs and a post-breeding population of about 500 individuals (Pennington 2000). This had increased to around 120 breeding pairs in 2003 (Pennington *et al.* 2004) and a conservative estimate of between 150 and 200 breeding pairs, and a post-breeding population of c.1,500–2,000 individuals in 2006 (Harvey 2007).

Surveys in 2009–2011

In order to produce accurate estimates of both the post-breeding and wintering Greylag Geese in Shetland, the Shetland Biological Records Centre, in conjunction with the Shetland Bird Club and the Wildfowl & Wetlands Trust, organised a series of surveys. Post-breeding birds were counted during 24–29 August 2009 and 6–10 September 2011 and surveys of wintering birds were conducted on 4–5 December 2010 and between 29 November and 2 December 2011.

Count methodology

It is not practical to census breeding Greylag Geese in Shetland. Many breeding sites are relatively inaccessible and in some breeding areas it can be difficult to establish whether individuals refer to breeding birds or non-breeding birds. Such a census could also result in unacceptable disturbance to several Schedule 1 species that breed in Shetland.

However, several years of observations indicated that in late summer (August and September), after adults complete their wing moult and before any Icelandic migrants arrived, post-breeding flocks gather on areas of permanent pasture and re-seeds, often in the vicinity of breeding areas. Casual observations also indicated that many of these same fields are also used for feeding during the winter months. In addition, fieldwork on moorland habitats in August and September (during Red-throated Diver *Gavia stellata* survey work and in response to development proposals) and winter atlas work suggested that few Greylag Geese use moorland for feeding during the late summer and winter. A small number do occur on offshore holms during the winter months, but for logistical reasons these were not covered during these surveys.

Table 1. Numbers of Greylag Geese recorded on surveys undertaken on Shetland in 2009–11.

Area	24–29 Aug. 2009	4–5 Dec. 2010	6–10 Sep. 2011	29 Nov.–2 Dec. 2011
Unst	981	736	788	728
Fetlar	387	290	209	322
Yell	266	109	404	679
North Mainland	894	237	889	595
Muckle Roe	83	58	66	126
Central Mainland	438	173	1,330	993
Whalsay	51	73	93	176
Bressay & Noss	37	8	0	0
West Mainland	796	215	1,034	960
Papa Stour	0	81	26	55
Foula	0	116	8	137
Burra & Trondra	27	26	34	103
South Mainland	669	1,712	365	2,555
Fair Isle	4	104	1	244
Total	4,633	3,938	5,247	7,673

Most areas of grassland in Shetland are viewable from tarmac roads, while large areas of re-seeded ground are usually serviced by passable hill tracks. Therefore it was decided to focus efforts on counting these areas in late summer and winter. This had the added advantage of making counts repeatable in future years, so that future trends can be more accurately estimated. As re-seeding of hill land in Shetland has now stopped, it seems likely geese will favour these areas in forthcoming years, although we acknowledge that this 'look-see' approach to monitoring is less statistically robust than undertaking a random stratified survey across Shetland.

A team of between 15 and 20 volunteers was assembled to undertake each of the four surveys reported on in this paper. Each counter was given a specific area to survey. All areas visible from the roads and passable tracks were checked for geese and, where possible, counts were made on the same day to minimise duplication. Table 1 shows the results of these counts, with the distribution of post-breeding and wintering Greylag Goose in 2011 shown in Figures 1 and 2 respectively.



Figure 1. Distribution of Greylag Geese in Shetland on 6–10 September 2011.

Figure 2. Distribution of Greylag Geese in Shetland on 29 November–2 December 2011.

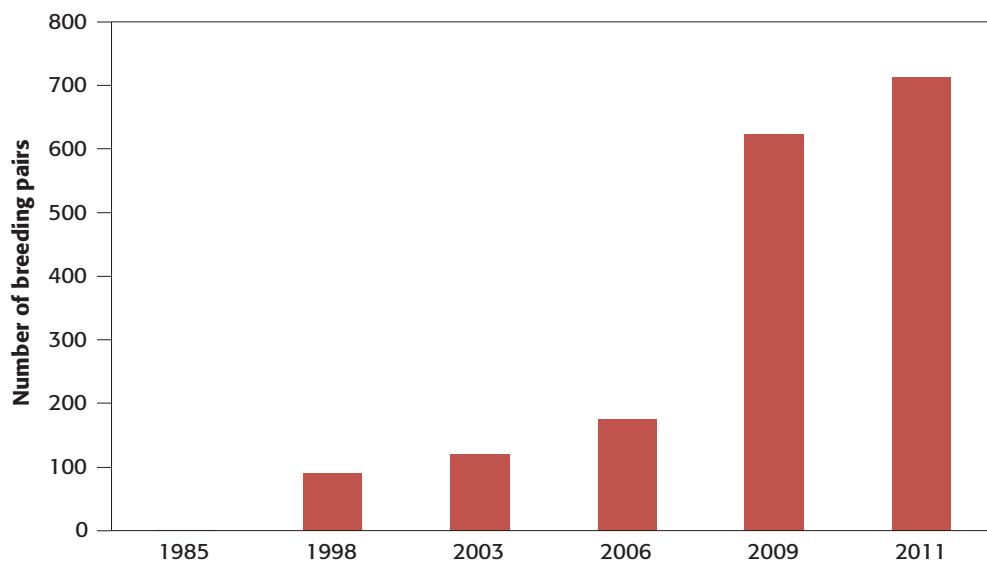


Figure 3. Estimated number of pairs of Greylag Geese breeding in Shetland (see text for details).

Post breeding counts and distribution

The post-breeding totals of 4,633 geese in 2009 and 5,247 in 2011 suggest a continued increase in the breeding population and that the geese are widely distributed throughout Shetland. However, the 2011 count is only 13% higher than the 2009 count. Considering the potential variability in counts undertaken using the 'look-see' approach (see methodology), this apparent increase needs to be treated with caution.

Small samples of geese were studied in more detail by CM to provide data on the proportion of juveniles and the average brood size. In 2009, 41.6% were juveniles ($n = 238$), and extrapolating from this figure suggests that 1,927 goslings were present among the total 4,633 birds. The mean brood size was 3.09 suggesting the total breeding population numbered around 624 successful pairs in 2009. In 2011, 23.9% were juveniles ($n = 109$), with a mean brood size of 1.76 young. This confirmed casual observations that 2011 had been a less successful year for breeding Greylag Geese in Shetland. Extrapolating in the same way would suggest a breeding population of around 713 successful pairs in 2011 (Figure 3). These estimates, however, take no account of failed breeders and as such they represent minimum estimates for the number of breeding pairs.

In a detailed study of Greylag Geese breeding on South Uist in the Outer Hebrides, it was found that the proportion of failed nests (pairs) varied between 30 to 50% annually (Newton & Kerbes 1974). We need to exercise caution in applying these figures generated 40 years ago in another area of Scotland to Shetland but if we use a failure rate of 30% then the post-breeding surveys would suggest that the total number of breeding pairs in Shetland was c.900 in 2009 and c.1,000 in 2011.

Casual observations made in spring by PVH during moorland breeding bird surveys in various parts of mainland Shetland suggest that the non-breeding population in the islands is higher than these estimates of breeding pairs would suggest. Flocks of 10–30 birds, occasionally larger, are often associated with areas of moorland where several pairs of Greylag Geese breed in relatively close proximity. We therefore consider that the current breeding population in Shetland is somewhere between 700 and 1,000 pairs. This suggests that the Greylag Goose breeding population in the islands increased at the rate of c.17–20% per annum between 1999 and 2011.

Wintering counts and distribution

Winter counts were undertaken using the same methodology and routes as the post-breeding counts. In 2010, snow fell in Shetland in the last week of November, and December was an exceptionally cold month by recent standards with a series of snowfalls and heavy frosts. It was evident that by the count date of 4 December many geese had moved from their normal winter haunts. The hard weather also limited access on some roads, but good coverage was still obtained. The final tally of 3,938 birds was much lower than expected and it seems highly likely that some birds had already moved south from Shetland in response to the hard weather.

In contrast, the weather in November 2011 was exceptionally mild and there is no evidence to suggest that wintering birds had left Shetland. The total count of 7,673 individuals was considered to be a good indication of the peak wintering population in the islands. Counts of sample areas made on 25 February 2012 produced a total of 3,475 Greylag Geese. This is just 15% lower than counts of the same areas undertaken in the full census in November 2011 (4,096 geese). These counts suggest that in mild winters most geese remain in Shetland throughout the winter; winter mortality might be expected to account for the 15% difference noted.

It is interesting to compare the post-breeding and wintering abundance and distribution of Greylag Geese in Shetland (Figures 1 and 2). The main change in abundance occurred in the south Mainland where far more winter than were present in post-breeding flocks. This is perhaps not surprising as flocks have traditionally wintered here, where relatively rich soils influenced by calcium rich wind-blown shell sand and/or underlying Old Red Sandstone give rise to some of the best grazing in Shetland, and several large freshwater lochs are present where the birds can roost.

Neck-collared birds

On 16 July 2011, a small sample of moulting adult and juvenile Greylag Geese were captured at Loch of Clumlie in the south Mainland by CM and members of the Shetland Ringing Group (Okill 2011). Of these, nine were marked with neck collars, the other four being too small, were fitted with coloured leg rings. Eight of the nine collared birds were recorded subsequently. Two were shot on 2 September, the day after the start of the shooting season. A further five were recorded in September, with two still being reported in late November and one present until at least mid-February. All these sightings were within 5 km of the ringing site and no reports have been received from elsewhere. These observations along with the post-breeding and wintering counts undertaken in 2011 suggest that the wintering population of Greylag Geese in Shetland comprises both presumed resident birds and immigrants from Iceland. Results from marking breeding Greylag Geese in the Inner and Outer Hebrides indicate that birds there are essentially sedentary tending to winter close to breeding areas (Trinder *et al.* 2010a).

It is planned to undertake further catches of post-breeding geese in the next few years to build up a bigger sample of neck-collared individuals. This should help us understand what proportion of our summering birds, if any, leave Shetland during the winter.

Reasons for change in status

There are several factors that may account for the increase in the number of migrant and wintering Greylag Geese in Shetland and the establishment and subsequent success of a breeding population in the islands.

The increase in the Icelandic population of Greylag Geese led to more migrants occurring in Shetland, although the Icelandic population stabilised and declined during the 1990s, before increasing again between 2000 and 2010. The tendency towards milder winters in Shetland since the late 1980s (D. Wheeler pers. com.) will have rendered conditions more favourable for geese to

remain for the winter by increasing the amount of food available by extending the growing season for food plants. In addition, more intensive management of in-bye grassland, especially in the vicinity of some of Shetland's larger mesotrophic lochs e.g. the Loch of Spiggie, will have proved attractive to migrating geese, encouraging them to winter in the islands.

Changes in agricultural practice were also a key factor in encouraging colonisation and the subsequent growth of the breeding population. Between the late 1970s and mid-1990s, grants for re-seeding hill land were available to crofters from the Government (Crofting Counties Agricultural Grant Scheme) and the Local Authority (Agricultural Improvement Grants). This resulted in the apportionment of land from common grazings and its subsequent improvement. As a consequence, the area of grassland in Shetland, excluding rough grazing, increased from 7,338 ha in 1971 to 18,618 ha in 1994 (Shetland Islands Council 1996). Many of these apportionments were set in relatively undisturbed areas of hill land throughout the islands. This created a mosaic of heather moorland, improved grassland and freshwater lochs, perfect habitat for breeding Greylag Geese: moorland for nesting, good grazing in relatively undisturbed areas to feed goslings and freshwater bodies for safety. In effect the landscape could not have been managed in a more effective way to encourage Greylag Geese to breed in Shetland.

Conflict with agriculture

After the initial colonisation of Unst and the subsequent population increase there, local crofters expressed a degree of discontent regarding the use of re-seeds by post-breeding and wintering geese and some illegal shooting of Greylag Geese during the close season occurred (Pennington 2000). In recent years, the agricultural community have made representations regarding goose damage to a number of organisations including the SGRPID, Scottish Natural Heritage (SNH) and the Royal Society for the Protection of Birds (RSPB). Grazing damage to permanent and re-seeded grassland, a reduction in soil quality and/or loss of vegetation due to foot-paddling, damage to commercial root crops (carrots and neeps) and forage crops (neeps) have all been cited. Various scaring mechanisms and shooting during the open season have been undertaken, and in 2010 four licences to shoot geese in the spring, during the close season, were issued to farmers.

Hunting

Greylag Geese are certainly targeted by wildfowlers during the open season. In the winters 2009/10 and 2010/11, over 100 were shot on Fetlar, while in the south Mainland in the region of 500 are shot annually (J. Adamson, G. Fraser, P. Sawford pers. comm.).

Trends elsewhere

Over 95% of the Icelandic population of Greylag Geese are considered to winter in Scotland (Mitchell 2011). This population increased markedly from the 1960s, almost doubling by the early 1990s but it then decreased slightly during the 1990s before recovering in the late 2000s (Trinder *et al.* 2010b). The decline was probably as a result of increased shooting pressure in Iceland, where c.30,000 to 60,000 per annum are shot in late summer and autumn (Mitchell 2011) and the subsequent recovery partly a result of the reduction of shooting in Scotland since the bulk of the wintering population has moved to Orkney (Trinder *et al.* 2010b) where hunting pressure is thought to be less than the areas further south that the birds had vacated.

There has been a major change in the distribution of wintering birds in Scotland since the 1960s with a general redistribution northwards. A rapid increase occurred in north-east Scotland in the 1980s, but key sites there have now been abandoned and this has fuelled a recent spectacular increase in Orkney (Meek 2003 and 2008, Forrester *et al.* 2007). On Orkney, numbers first exceeded 1,000 birds in the winter 1986/87 had increased to 30,126 in November 2002, 67,540 in December 2007 and 80,744 in December 2010 (Orkney Bird

Reports). Meek (2008) suggested that a combination of a steady warming of the winter climate meant that the high quality grass in Orkney now grows throughout the winter providing the geese with ideal foraging opportunities encouraging them to cut short their autumn migration by 300–500 km.

The breeding population in Orkney is also increasing but at a slower rate than the wintering population. In 2007, it was estimated to be 580 breeding pairs, with a post-breeding population of c.5,000 individuals (Meek 2008) but a dedicated post-breeding survey in 2008 yielded a total of c.10,000 individuals suggesting that the 2007 figure was an under-estimate with a true figure lying closer to 1,500 breeding pairs (Orkney Bird Report 2008).

It was estimated that Scotland's native post-breeding populations, largely based on the Inner and Outer Hebrides, increased at 12% per annum from the 1980s to 1997 (Mitchell *et al.* 2011) although these populations have decreased since 2004/05, despite high breeding success, as a result of the increasing number shot under licence to reduce agricultural conflict.

In the Faroe Islands, lying some 350 km north of Shetland, the breeding population of Greylag Geese numbered just 2–10 pairs in 1981. In the late 1980s, a steady increase began with a total of c.250 pairs present by 2005 (Jensen 2006) and c.300–350 breeding pairs by 2011. The wintering population also increased, numbering c.500 to 1,000 in 2005/06 but geese are heavily persecuted in Faroe with adults, goslings and eggs all taken by humans (Jensen 2006).

Future population size in Shetland

Surveys undertaken in 2011 suggest that the post-breeding population of the Greylag Goose in Shetland now numbers a minimum of 5,250 individuals and the peak wintering population some 7,600 individuals. It seems likely that these populations will continue to increase in the future unless management measures are introduced, possibly including the issuing of licences to shoot in the close season, or hunting pressure increases in the open season. We consider it unlikely, however, that the increase in the wintering population will match that shown in the adjacent island group of Orkney.

Whether Scottish wintering birds continue to winter further north remains to be seen. The area of improved grassland in Orkney is around 49,000 ha (Churchill *et al.* 2009) nearly twice that in Shetland; Orkney lies on Old Red Sandstone, so the quality of much of this grassland far exceeds that available in most of Shetland. It therefore seems unlikely that Shetland will face similar increases in the wintering population to those experienced in Orkney.

The presence of both resident breeding Greylag Geese and wintering birds from Iceland in Shetland also poses problem for future monitoring. Establishing the number of both populations necessitates two surveys; one at the end of the summer (before the Icelandic migrants arrive) and another during mid-winter. Both are labour intensive and probably only likely to be carried out periodically unless funding is secured to cover costs. Further marking will help establish what proportion (if any) of the summer population leaves the islands.

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