

The newsletter of the Goose & Swan Monitoring Programme

goosenews

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Researching the Greenland White-fronted Goose



**The novel challenges of
managing abundant goose populations**

Latest news from GSMP surveys





Editorial

Welcome to the latest edition of *GooseNews*.

I am pleased to report that 2017 sees the start of a renewed GSMP agreement between WWT, JNCC and SNH. The agreement covers the next five years and we are looking forward to working with our partners to ensure that monitoring of the UK's migratory goose and swan populations continues.

Indeed, the assurance of the scheme's continuation comes at a crucial time for goose monitoring, as information is sought to better inform on population changes to those involved in goose management. Over recent decades, a number of European goose populations have been growing exponentially, leading to conflict with various sectors of our society, such as agriculture and aviation. Whilst a few solutions have been implemented locally, it has become increasingly evident that more needs to be done at both a national and international level. In the article on page 9, Jesper Madsen *et al.* provide an overview of how countries

have been working together to develop a collaborative international approach to adaptive goose management.

Whilst some goose populations may be increasing, the Greenland White-fronted Goose has declined by 47% in the last 18 years. Consequently, various research projects are being undertaken to try to get a better understanding of the drivers behind this decline. On page 6, Ed Burrell and colleagues report on some of the current and innovative research that involves the use of tracking devices to monitor not only where the whitefronts go, but also what they are doing.

This edition also brings you the latest news from the GSMP surveys, with highlights including: Pink-footed Goose numbers, though below the record of 2015, remained remarkably high, whilst the Svalbard Barnacle Goose population also continues to grow, remaining above 40,000 for the second consecutive year.

The keen eyed amongst you will notice that Carl Mitchell's name does not appear at the end of the editorial as usual. Carl has become increasingly involved in other conservation projects at WWT, which have inevitably required more of his time; therefore, it seemed timely for him to pass on the baton of GSMP project manager. Carl will remain an integral part of the GSMP team, with his extensive knowledge of goose monitoring and conservation enabling him to provide invaluable guidance and support.

As always, we thank everyone for their contributions to *GooseNews*. We welcome any relevant articles that you may wish to submit to future editions and please also feel free to provide feedback on the content.

Thank you for your continued support of the GSMP.

Colette Hall

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Survey dates for 2017/18

Icelandic–breeding Goose Census (IGC)

The following dates have been chosen for coordinated counts in 2017/18, including an additional spring count:

Pink-footed Goose: 21/22 October, 18/19 November 2017 and 10/11 March 2018

Iceland Greylag Goose: 18/19 November 2017 and 10/11 March 2018

The above dates include an additional spring count, following the three-yearly cycle reinstated in 2012. The aim of this count is to map the distribution of birds during this critical period in their life cycle, when they are accumulating body reserves for migration and breeding.

Please remember that, ideally, all sites supporting Pink-footed Geese should be covered during the October and November counts, whilst those holding Iceland Greylag Geese should be counted in November. Please count both species during the spring survey in March.

If you are unable to count on the above dates, please contact either your Local Organiser or Kane Brides (see back cover for contact details), so that we can try to arrange cover of your site by another counter.

As usual, we would like to encourage all counters to also carry out a count during September at those sites where British Greylag Geese occur alongside Icelandic migrants later in the winter. September counts are not strictly coordinated but should be carried out during the middle of that month, although any counts made during September will be of value.

Age assessments

Age assessments will continue during 2017/18 as usual. If you are interested in helping with these surveys, please contact WWT's Monitoring Unit at monitoring@wwt.org.uk

Population	Period	Notes
Whooper Swan	Oct – Jan	focus on mid-Jan
Bewick's Swan	Nov – Feb	focus on Dec and mid-Jan
Iceland Greylag Goose	Oct – mid Nov	care needed with age identification
British Greylag Goose	Aug – Sep	
Pink-footed Goose	mid Sep – mid Nov	
Bean Goose	Oct – Nov	
European White-fronted Goose	Oct – Jan	focus on Jan
Greenland White-fronted Goose	Oct – Jan	focus on Dec
Dark-bellied Brent Goose	Sep – Mar	focus on Oct – Nov
Light-bellied Brent Goose (both populations)	Sep – Mar	focus on Oct – Nov
Barnacle Goose (both populations)	Oct – Dec	

Greenland White-fronted Goose Census

The counts for the coming season will be:

16–20 December 2017 and 17–21 March 2018

Other preferential dates for local site monitoring are: **18–22 November 2017, 13–17 January 2018, 17–21 February 2018**

However, all your counts whenever, wherever are always very welcome!

The census is organised by the Greenland White-fronted Goose Study (<http://greenlandwhitefront.org/>). Please contact the organiser Tony Fox (see back cover for contact details) for further details about the census.

New IGC organiser

After a decade of coordinating the IGC (not to mention many years in the 1990s too), Carl Mitchell has retired from the role of IGC national organiser. Carl's role at WWT has changed in recent years and he is now more involved in research projects (mostly on geese!). Therefore, from this coming season

Kane Brides will be the new organiser (see back page for contact details). Many of you will know of Kane as he has been helping Carl collate IGC data in the past few years, so he is well placed to take on this role. Kane will try to get out and meet as many of you as possible in the next few winters and looks forward to working with you all to continue monitoring our migratory Pinkfeet and Greylags.

Find out more

Visit WWT's Waterbird Monitoring website at <http://monitoring.wwt.org.uk/our-work/goose-swan-monitoring-programme/> to find out more about the Goose & Swan Monitoring Programme (GSMP), including detailed survey results and all editions of GooseNews.

Details about all the GSMP surveys, including how to get involved, can be found on the website at <http://monitoring.wwt.org.uk/get-involved/>.

Reporting sightings of colour-marked birds

To report a sighting of a colour-marked bird, please first refer to the European Colour-ring Birding website (<http://www.cr-birding.org/>) where a list of project coordinators can be found, including for all WWT projects. Observations of marked birds can be submitted directly to the relevant project coordinator or in some cases by submitting sightings into online databases. If you are unable to find a project that matches the bird you observed, please submit your details to the EURING Web Recovery Form (<http://blx1.bto.org/euring/main/index.jsp>).

If you would like to report a sighting of a colour-marked bird that has been ringed as part of a WWT project, please email your sighting to colourmarkedwildfowl@wwt.org.uk.

Further information about submitting a sighting of a colour-marked bird can be found on the WWT monitoring website at <http://monitoring.wwt.org.uk/our-work/uk-waterbirds/goose-swan-monitoring-programme/colour-marking>.

GooseNews – paper or download?

In an effort to be more sustainable, we would like to reduce the number of *GooseNews* printed each year. Therefore, we are keen to encourage as many readers as possible to download a pdf from our website at <http://monitoring.wwt.org.uk/our-work/goose-swan-monitoring-programme/reports-newsletter/>.

If you wish to change your preference – to paper or download – please let us know by emailing monitoring@wwt.org.uk.

If you didn't receive a paper copy of this edition and would like one, we may still have a few spare, although numbers will be limited. Please contact us to find out.

Waterbird Monitoring Online

Enter your IGC and age assessment counts online!

A reminder to all IGC and age assessment counters that you can now submit your counts online at <http://monitoring.wwt.org.uk/recording/>.

A big thank you to everyone who uses the online system, as doing so greatly helps improve the efficiency and accuracy of data entry, as the system includes built in data validation and the time spent processing forms is much reduced. And of course, entering online also saves paper!

Counters will need to register to use the system and help pages are available on the site to guide users through the process of registering and entering counts. If you need any help using the system or encounter any problems please email us at monitoring@wwt.org.uk.

A Call for Help Local Organiser needed for Icelandic-breeding Goose Census



We are looking for a Local Organiser (LO) in Scotland to help with coordinating IGC counts in Lothians. If you are interested in being the LO for this region, please get in touch with Kane Brides (see back page for contact details) for further information.

Photo: James Lees / WWT

Researching the Greenland White-fronted Goose

Ed Burrell, Larry Griffin, Carl Mitchell
& Mitch Weegman

Across the world, many migratory species are experiencing population declines. Long-distance migrants, such as Greenland White-fronted Geese, and those with restricted ranges tend to be especially vulnerable.



Photo: Tony Fox

Despite increasing conservation effort, the global Greenland White-fronted Goose population has declined from 35,600 individuals in 1999 to just 18,879 individuals in 2016. Here we report on some aspects of ongoing research designed to help address the decline of this population.

From Scotland to Greenland: understanding the drivers of population change

We understand well that the overall demographic driver of the decline is a lack of productivity, as measured by the proportion of young in the wintering flocks each year. There is also a strong negative correlation between the amount of spring precipitation at their breeding grounds, west Greenland, (typically falling as snow) and the number of young birds produced. Further, recent work (Weegman *et al.* 2016) suggests that environmental conditions on the breeding areas have worsened between the 1980s and 2010s, contributing to an increase in the age of first successful reproduction, at least for Irish-wintering Greenland White-fronted Geese. Birds experiencing poor environmental conditions are making decisions to either delay nesting attempts within a season or defer altogether to a subsequent year.

Studying the breeding ecology of Greenland White-fronted Geese in remote west Greenland has proven

exceptionally difficult; it is a vast place, birds are thinly scattered and fewer than 10% breed successfully in their lifetime anyway! To date, we have relied on long-term capture-recapture information from neck-collared birds that are resighted during winter. However, these data do not provide information on what goes on in the breeding areas, such as patterns between weather conditions and whether birds decide to attempt or defer nesting. We think the answer lies with technology.

Since 2013, WWT have been deploying Global Positioning System (GPS) tags mounted on neck collars onto female Greenland White-fronted Geese wintering in Scotland. Hourly fixes (GPS points) suggest that incubating birds can be identified by a cluster of points (**Figure 1**). A successful nest (confirmed by subsequent winter sightings of the female with juveniles) is identifiable as a cluster of points spread continuously over a 26-day period. Fewer points suggest incubation failure. Identifying short-lived incubation bouts is very difficult though and

most nests don't seem to last very long, which begs the question: is a small cluster of points recorded in one or two days actually a nest or intensive feeding in a small patch?

During winter 2016/17, we deployed 14 new tags which record an hourly GPS fix and a 1.6 second burst of acceleration information every 20 minutes, the latter of which measures movement in three dimensions (e.g. shown as axes X, Y and Z in **Figure 2**). This will allow us to categorise GPS data into whether the bird was active or not (*i.e.* was the bird actively feeding or on a nest?). We hope we might even start to pick out daily laying visits to a nest site prior to the onset of incubation! But that's not all; because the head and neck of a goose moves in different ways in order to perform distinct behaviours, we see patterns in the acceleration data according to the specific behaviour of an individual during the sample (**Figure 2**). So we can use GPS and acceleration data in combination to accurately identify nesting attempts, and we can begin to determine, at any given point, not only where in the world that bird was, but precisely what it was doing. Which is pretty amazing!

We plan to overlay this information onto high-resolution satellite imagery of west Greenland to investigate how environmental factors like patterns and duration of snow cover in spring influence Greenland Whitefront distribution and behaviour from their arrival on the breeding grounds in early May through to their probability of nesting success by the end of June. In other words, we hope to start answering some of the big questions underlying the lack of productivity that is driving their decline. From 2,000 miles away!

Comparing Greater White-fronted Goose decision-making on two continents, with insights into a puzzling population decline

Alyn Walsh (National Parks and Wildlife Service, Ireland), Bart Ballard (Texas A & M University-Kingsville) and Dan Collins (U.S. Fish and Wildlife Service) joined Mitch in deploying ten GPS-acceleration tracking devices on adult female Greenland White-fronted Geese at the Agricultural University of Iceland at Hvanneyri in September 2016. Stephanie Cunningham, a Masters by Research student at the University of Missouri who started work in January 2017, will tackle questions related to individual decision-making and breeding success using the tracking device data. She will compare inferences to those from data collected on Greater White-fronted Geese in mid-continent North America, the population of which has been stable in number over the period of the Greenland White-fronted Goose population decline. Thus, a comparative study of the decisions of individuals in these populations could provide insights into the puzzling Greenland White-fronted Goose decline. Watch this space!

The Welsh connection

The Greenland White-fronted Goose population has seen some of its smaller flocks decrease in number most rapidly. In Wales, two wintering flocks have gone extinct and the last two flocks number fewer than 20 birds each: one on the Dyfi Estuary and one in Anglesey. The Dyfi flock has declined from 167 birds as recently as 1999.

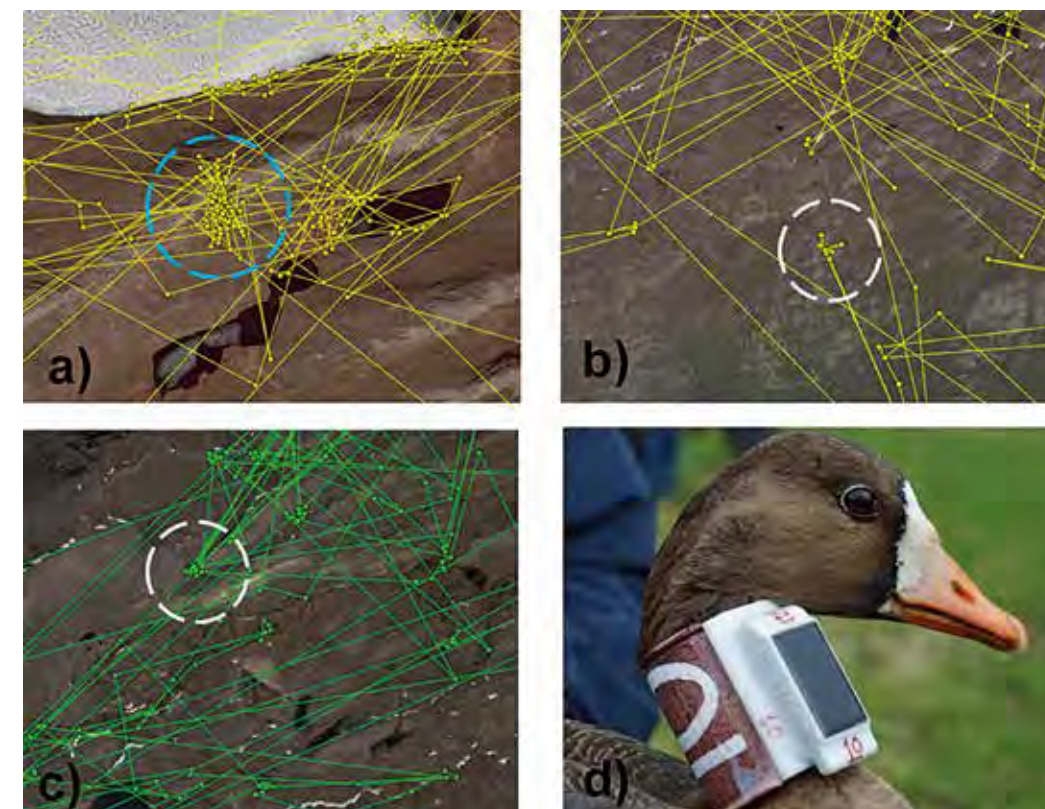


Figure 1: a) GPS signature of a successful nest (26 days incubation) circled blue; b) a presumed nesting attempt (duration 3 days) circled white; c) presumed nesting attempt (duration 4 days) circled white – note the similarity between these clusters of GPS fixes and other presumed feeding fixes nearby; and d) Ecotone IBIS GPS-GSM/UHF ACC tag deployed at Cornabus Farm, Islay, Feb 2017.

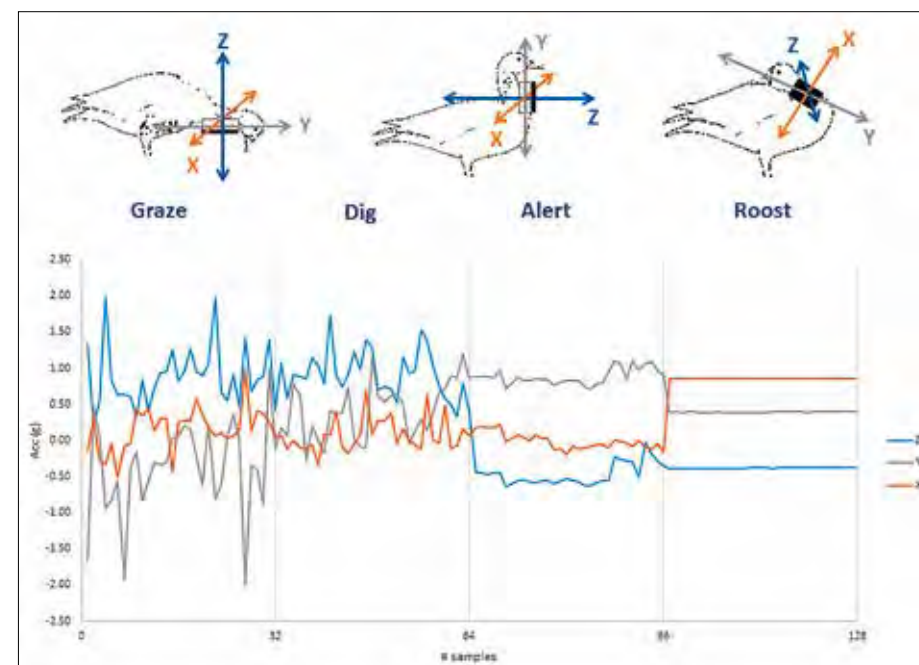


Funding from the Welsh Government has enabled detailed study of both flocks since 2015/16, carried out through a partnership consisting of Welsh Government, WWT, RSPB Cymru, Mick Green, NRW, BASC and the Dyfi, Mawddach & Dysynni Wildfowling Association.

In December 2016, 14 birds were caught on the Dyfi and two adult females were fitted with GPS collars. After one week, one of the tagged geese, together with its partner, moved to Wexford, Ireland where it remained until early March before returning to the Dyfi. This connectivity could help explain why this flock has decreased so rapidly – are some birds simply shifting wintering site? The other tagged bird

stayed the whole winter on the Dyfi and mapped out the feeding and roosting distribution of the flock – useful information for potential land management changes and protection measures.

Both tagged geese, and we suspect the entire Dyfi flock, flew up the west coast of Britain on 2 April and arrived in Iceland on 3 April. Here, the two tagged geese separated and fed in different areas. The geese then departed to west Greenland and we next hope to hear from them in September 2017 when they return to Iceland from their breeding quarters. Further information and movements of the geese can be found at http://telemetry.wikispaces.com/Greenfront_Wales.



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Figure 2: Graph showing example acceleration traces for four distinct behaviours – with schematic showing axis orientations when a bird is in head-down (graze, dig), head-up (alert) and roost (sitting/standing, head under wing) postures.

The novel challenges of managing abundant goose populations

Jesper Madsen, David Stroud & Tony Fox

Ardent readers of *GooseNews* will be all too familiar with the rapid increases in some European goose populations that have taken place in recent decades, resulting in at least five million wild geese in Europe each winter. It is hard to imagine that 60–70 years ago, European goose populations were extremely scarce, largely because of human persecution and habitat loss. Thanks to the efforts of many pioneers, reserve creation and hunting restrictions supported slow recoveries in numbers through the 1960s and 1970s. These have increased even more since then (Fox & Madsen 2017), as agricultural intensification in wintering areas has offered almost unlimited feeding opportunities. Consequently, many geese no longer feed on natural grasslands and wetlands and instead forage on farmland where grasses and crops with much improved nutritional quality can be found and where rates of food intake can be significantly increased (Fox & Abraham 2017).

On the Arctic breeding grounds, human persecution has tended to diminish and global warming has provided better breeding conditions, extending the extent of potential breeding areas (e.g. Jensen *et al.* 2008). Barnacle Geese (previously considered as “hard-wired” Arctic breeders) have extended their remote Greenland and Russian Arctic breeding areas into temperate areas, now nesting in Iceland, the Faroes, throughout the Baltic and around southern North Sea coasts (Fiege *et al.* 2008).

These changes seem to be in stark contrast to populations of the same species that winter in China, where they remain confined to natural wetlands for both daytime feeding and night roosting (Yu *et al.* 2017). These have declined in area and quality and these populations are thus mainly showing declines, in contrast to the same species in adjacent Korea and Japan, which increasingly exploit agricultural grassland, rice and wheat and where numbers have been increasing (Jia *et al.* 2016). Coupled with dramatic increases in North American goose populations that also increasingly exploit farmland (Fox & Leafloor in press), there is gathering evidence to suggest the shift to agricultural land has contributed to recent dramatic increases in goose numbers in the Northern Hemisphere.

Readers of *GooseNews* will also be familiar with the increasing levels of conflict occurring with other sectors of our society as a result of increases in goose numbers. Many of course celebrate this as an outstanding nature conservation success story. However, continued goose population growth and expansion of range, with their concentration on agricultural land, has led to increasing conflicts, especially through agricultural damage (Fox *et al.* 2017), impacts upon other features of biodiversity conservation (Buij *et al.* 2017) and threats to aviation safety at airports where heavy goose movements use



Photo: Adam Freeman / WWT

the same airspace as intensive human air traffic (Bradbeer *et al.* 2017).

Finding solutions to such goose problems have hitherto mostly been tackled through local or national initiatives, many of which were pioneered in the UK through the early activities of Janet Kear and Myrfyn Owen at WWT and the Nature Conservancy, and which included the provision of disturbance-free refuge areas at key wintering sites. More recently, the scope of these have been further developed with local goose scaring schemes that aim to move birds from vulnerable areas and the provision of subsidy or compensation schemes to try to resolve local conflicts.

Such initiatives have enjoyed varying levels of success. For instance, on the Inner Hebridean island of Islay, solutions have been sought to balance the high degree of responsibility the island has to provide winter habitat for internationally important numbers of Barnacle and Greenland White-fronted Geese in the context of both the damage they do to agriculture and the tourist revenues they attract to a delicate island economy (McKenzie & Shaw 2017; also see *GooseNews* 14:10). Experiences on Islay, however, have shown that solutions for solving local conflict there need to sit within a broader, nationally coordinated strategic programme of goose management, such as that developed over many years by the Scottish government (Bainbridge 2017). Local measures alone may simply shift the problem around and while taxpayers may be willing to support subsidy schemes and sacrificial crops for geese in the short term, there are direct economic implications if these mechanisms fuel continued population growth by creating yet more energy-rich food for geese to thrive in perfect undisturbed circumstances.

Different sectors of society also have very different success criteria for solving goose conflicts and even initially successful schemes may end up being considered by some as unfair or inappropriate mechanisms for solving underlying conflicts. For these many reasons, there is a growing political and administrative awareness that local solutions may not always deliver necessary solutions even at their own scale and certainly do not scale up to be effective at regional, national or international levels. There is thus an urgent need to better use our existing knowledge and experiences to improve the current situation.



Photo: John Anderson

In order to advance the development of such coordinated management, goose conflicts and their resolution was the topic of a major international conference 'Goose Management: Challenges 2015' held at Gram Slot in southern Jutland, Denmark in October 2015, organised by the Danish Environmental Protection Agency and Aarhus University, supported by the Wadden Sea National Park, Norwegian Environment Directorate and Dutch Fauna Fund. Thirteen of the contributions and a summary of the conference findings have recently been published as a special issue of the Swedish journal *Ambio*.

These papers describe the increase and expansion in numbers of European geese, addressing the underlying causes, local and regional conflict with agricultural interests and the mechanisms implemented to resolve such conflict. Analysis also considered the interrelations between farming practice, weather conditions and agricultural damage, the effectiveness of different support schemes and farmers' perceptions of the extent of the damage they suffer from geese. The consensus coming from gathered experts from Europe and North America recognised the need for regional and international agreements, and measures to manage burgeoning goose numbers. The obvious way forward was to tackle management issues in a coordinated fashion for discrete flyway populations of geese that constitute logical management units (Stroud *et al.* 2017).

It is clear from our understanding of their demography that numbers of Barnacle, Greylag, Pink-footed and Russian breeding White-fronted Geese are very likely to continue to increase in the immediate future. From several countries, positive reports of experiences involving relevant stakeholders with the appropriate statutory agencies and administration to reach agreement on how to resolve the issues were forthcoming - from local to international level. While conflicts will inevitably arise between different interests, all agreed that broad stakeholder involvement ensures that different voices are heard in the debate, have the opportunity to influence outcomes and the chance to become part of the ultimate solution (Stroud *et al.* 2017).

Positive experiences were forthcoming from the application of internationally coordinated adaptive management plans to two northern hemisphere goose populations, which enshrine in-built flexibility to respond to changing circumstances.

Burgeoning numbers of Greater Snow Geese in North America precipitated the development of an adaptive management plan to maintain the population at around 800,000 individuals. Key targets were to reduce agricultural conflicts in Canada and prevent potential damage to vulnerable ecosystems, at the same time maintaining a viable population within the traditional range. Lefebvre *et al.* (2017) described the successes and failures of the plan for this population, which successfully coordinated the hunt between Canada and the United States, despite overall abundance remaining above target.

The first European international adaptive management plan was established for the Svalbard Pink-footed



Photo: Sean Gray

Goose, which stages in Norway and winters in Denmark, the Netherlands and Belgium (Madsen *et al.* 2017). This plan has multiple goals, including maintaining the population at approximately 60,000 individuals to avoid increasing damage to the tundra vegetation on the breeding grounds and agricultural damage in the wintering areas, achieved via hunting regulation in Denmark and Norway, where the population is legal quarry. Population models developed to predict the rate of change in population size are based on parameters affecting reproductive success (e.g. extent of spring snow cover on the nesting grounds) and survival, with particular emphasis on predicted responses to increased levels of hunting. Actions initiated under the plan are tightly linked to results supplied from coordinated monitoring of population size, reproductive success, hunting harvest and Svalbard spring weather conditions. Annual recommendations for hunting levels in the coming season are based on expected reproductive success and other factors so that the adaptive nature of the plan ensures hunting does not over-exploit the population.

The plan seems to work to date and modest relaxation of hunting regulation has stopped the rate of increase in line with model predictions, bringing the flyway population size towards its long-term target.

With several goose species increasing in a way that will likely require future internationally coordinated actions to resolve rising conflicts in the future, the conference recommended that a pan-European process for the management of geese should be developed. It was recognized that some flyway populations, notably the Taiga Bean Goose, were in unfavourable conservation status, despite being legal quarry in many of the states in which it occurs. This population required an approach that above all restored its favourable conservation status, rather than addressing negative impacts from its abundance, though it was recognised that this needed to be achieved within an adaptive management approach that also allowed for some continued recreational hunting at a level that did not jeopardise its recovery. These recommendations were taken forward at the November 2015 Meeting of the Parties to the African Eurasian Migratory Waterbird Agreement (AEWA), resulting in agreement to establish an 'AEWA

European Goose Management Platform', as an innovative umbrella organisation with which to coordinate the management of relevant goose populations (see *GooseNews* 15:30). Aarhus University will play a central role in this work, providing the data centre to coordinate, collate and report on the monitoring elements that supply the knowledge base to the decision making of the system.

At the first meeting to discuss actions of the Platform in Sweden in December 2016, it was agreed that the platform would initially work on the Svalbard Pink-footed Goose, Taiga Bean Goose, Barnacle Goose and northwest European Greylag Goose. The scaling up of the process from the Svalbard Pink-footed Goose and its four range states to four different species with many more countries and stakeholder interests involved, and far greater complexity of prevailing biological, regulatory and social conditions will create some exciting challenges. It is evident that keeping the process running in the most effective way will not be an easy task. It will require all parties to come to the negotiating table with open-minded attitudes to address the common challenges and search for common solutions. The first major meeting of the Platform took place in Copenhagen in mid-June 2017, where progress on the AEWA plans for Svalbard Pink-footed Goose and Taiga Bean Goose were discussed and a new process for the three flyway populations of the Barnacle Goose in Europe was set in train. The foundations were also laid for developing an agreement on the northwest European Greylag Goose population, which will be discussed and launched at a meeting in Paris in October 2017.

References

- More detailed discussion of many of the themes in this article can be found in the special issue of *Ambio*: Fox, A.D. & Madsen, J. (eds.) 2017. Goose management: From local to flyway scale. *Ambio* 46 (Supplement 2). <https://link.springer.com/journal/13280/46/2/suppl/page/1>.
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Counter profile

Photo: David Darrell-Lambert

Derek Wood, Dark-bellied Brent Goose age assessor, mainly at estuaries in southeast England

Derek, along with his wife Glenys, has been undertaking age assessments of geese for the GSMP for over thirty years. Here, Derek provides an insight in to what first sparked his interest in Dark-bellied Brent Geese and the many projects he has since been involved with, including working with WWT's founder Sir Peter Scott.

In 1947 I began to see small skeins of Dark-bellied Brent Geese on the Thames Estuary. They were very scarce in those days, as in the 1930s *Zostera*, their main food plant had been almost wiped out by a virus and they subsisted on *Enteromorpha* and *Ulva* algae growing on the mud flats – but at the end of the shooting season they were able to feed on the saltings, drifting in on the tide. During Easter 1948, I had watched 500 at close range on the Dengie shore. The world population was probably around 10,000 birds at that time and a life-long interest began.

My army service brought me in reasonable distance of Slimbridge where I could study White-fronted Geese under ideal conditions and I began to understand goose biology. I was also able to help 'Commander Scott', as we then knew him, to test the rocket propelled nets, later used to catch and ring Pink-footed Geese.

On leaving the army I joined John Yealland, the Severn Wildfowl Trust's first curator, who had moved to London Zoo. There I specialised in raptors and while in Kenya in 1962, I was able to undertake my first real work on waterfowl. Visiting a colony of 800,000 pairs of Lesser Flamingos nesting on a Rift Valley soda lake, I was shocked on arrival to find more than one dead young flamingo for every foot of shore. Many of the eagles, vultures and Marabou Storks preferred to kill the young flamingos, rather than feed on the fresher corpses lining the shore. Any young that looked slightly unfit were always killed within half an hour. My first impression was

of a wildlife disaster but eventually 400,000 young fledged and left the lake. I realised that this was simply nature in the raw.

With protection for Brent Geese in Holland in 1950 and in the UK in 1954 and later in France and Denmark, numbers steadily increased and they became much tamer. They fed in the estuaries and eventually, after good breeding years, in the surrounding fields on grass and cereals.

Before this, however, a new threat had appeared, with plans to build a new airport on the regenerated *Zostera* beds on the Maplin Sands – a very important feeding ground for the Brent Geese in autumn, after they have lost considerable weight on their long flight from their arctic breeding grounds. Ringed Brent Geese feeding there showed a visible weight gain within four days. *Zostera* may not be the Brent's favourite food. Injured birds I've kept in confinement have invariably ignored it but it sustains their wild cousins very well. They will also eat invertebrates, I watched one catch and eat 47 Crane flies in an hour!

In response to the airport threat - later abandoned as the site was unsuitable - WWT set up The Brent Goose Research Group which I immediately joined. I was soon reading darvic leg rings from birds caught on Foulness and in the following year elsewhere in Essex and then Norfolk and Lincolnshire. Ring reading in Holland and Germany indicated that most Brent Geese staging in Germany, wintered in Britain and most in

The Netherlands wintered on the Biscay coast of France. This was confirmed when ringing commenced in both countries. We found, however, that some Dutch ringed birds did winter here, while others appeared on the Thames *Zostera* beds in autumn or visited the Essex coast on their northward migration.

My prolonged observations of darvic ringed Brent Geese showed that not all birds behaved as expected. Not all juveniles walked with their parents and some became independent more quickly than others. I saw cases of adoption and on one occasion a ringed pair arrived accompanied by 15 young birds. They were not included in my family size counts! Two pairs split up and wintered in different countries, to reunite in the northward staging area. Some birds took winter breaks abroad where they were seen by observers overseas.

Like most wild birds, most Brent Geese live for only a fraction of their potential life span but several of the thousand or so ringed birds I have recorded have lived into old age. Each year I have noted details of their life history, such as breeding success, bereavement, health *etc*; the longest surviving pair were together for thirteen years. Inevitably when birds I had watched perhaps for twenty years failed to reappear, disappointment was tinged with sadness.

On retirement in 1991 I was able to study Brent Geese full time. Many birds recently ringed in the Russian arctic added interest to my work. By then the world population of Dark-bellied Brent Geese was over

300,000 birds and I saw many birds in poor condition; young birds picked up dead were very thin. The 43,000 birds I checked the following winter included just six juveniles. Gradually the population declined and today there is only around 40% of the number present in the early 1990s.

When the Brent Goose Research Group began, we counted over 40% of juveniles amongst birds arriving in good breeding years. Today we have exceeded just half that number only twice this century.

Brent Geese are small geese, with a long flight to their breeding grounds, females need to arrive in good condition to lay and incubate a large clutch of eggs. Climate change, headwinds, precipitation at hatching time, vegetation changes affecting food supply, a new predator, increased parasites, even a virus could be lowering productivity. We need more research.

Many thanks for all your help

The greatest strength of the GSMP lies in the tremendous volunteer input from you, the counters, ring readers and other participants. We hope that you will continue to support the GSMP and, through it, the conservation of swans, geese and wetlands throughout the UK and beyond.

Latest news from GSMP surveys

The table below shows the total counts and the breeding success (percentage young and mean brood size) of goose and swan populations wintering in Britain and Ireland, recorded during various surveys in 2016/17: except the results for Greenland White-fronted Goose which are for 2015/16. Surveys were undertaken at an international or national scale, or at a few key sites; see individual population reports for further details.

More detailed results are available on WWT's monitoring website at <http://monitoring.wwt.org.uk/our-work/uk-waterbirds/goose-swan-monitoring-programme/species-accounts/>



Photo: John Anderson

Population	Total count ¹	Percentage young	Mean brood size
Northwest European Bewick's Swan	-	16.5	2.00
Iceland Whooper Swan	-	16.2	2.10
Taiga Bean Goose	239 ²	3.6	1.25
Greenland/Iceland Pink-footed Goose	481,341 ³	18.8	1.80
European White-fronted Goose	-	19.1	2.50
Greenland White-fronted Goose	18,879 ⁴	15.5 (Britain) 6.0 (Ireland)	2.96 (Britain) 2.61 (Ireland)
Iceland Greylag Goose	90,471 ³	23.5	2.53
British Greylag Goose	-	25.6 (Orkney) 34.8 (Tiree) 28.1 (Uists) 24.5 (Harris/Lewis)	2.89 (Orkney) 2.60 (Tiree) 2.89 (Uists) 3.23 (Harris/Lewis)
Greenland Barnacle Goose	-	17.9 (Islay) 16.2 (Tiree) 15.1 (Durness)	2.12 (Islay) 1.62 (Tiree) 1.77 (Durness)
Svalbard Barnacle Goose	41,700 ⁵	16.0	1.90
Dark-bellied Brent Goose	-	8.6	1.96
Canadian Light-bellied Brent Goose	36,811 ⁶	11.9	2.60
East Atlantic Light-bellied Brent Goose	-	26.7 (Lindisfarne)	-

1 The official UK population estimates (e.g. for. calculation of national 1% thresholds) remain those of the Avian Population Estimates Panel (Musgrove, A.J., N.J. Aebischer, M.A. Eaton, R.D. Hearn, S.E. Newson, D.G. Noble, M. Parsons, K. Risely & D.A. Stroud. 2013. Population estimates of birds in Great Britain and the United Kingdom. *British Birds* 106: 64–100). The official flyway population estimates (e.g. for calculation of international 1% thresholds) are those published by Wetlands International at <http://wpe.wetlands.org>.

2 Combined total from Slamannan Plateau and Yare Valley. From; Maciver, A. & T. Wilson. 2017. *Population and distribution of Bean Geese in the Slamannan area 2016/17*. Report to the Bean Goose Action Group; and Ben Lewis (RSPB) in litt.

3 Flyway total. From; Mitchell, C. & K. Brides 2017. *Status and distribution of Icelandic-breeding geese: results of the 2016 international census*. Wildfowl & Wetlands Trust Report, Slimbridge. 19pp.

4 Flyway total. From; Fox, A.D., I.S. Francis, D. Norriss & A.J. Walsh. 2016. *Report of the 2015/16 international census of Greenland White-fronted Geese*. Greenland White-fronted Goose Study report. 18pp.

5 Flyway total. Griffin, L. 2017. Svalbard Barnacle Goose distribution around the Solway Firth 2016–2017: Flock counts from the Solway Goose Management Scheme area. Final Report to SNH. WWT, Slimbridge. 19pp.

6 Flyway total. All-Ireland Light-bellied Brent Goose Census data provided by the Irish Brent Goose Research Group.

Whooper and Bewick's breeding success in 2016

Julia Newth & Colette Hall

Bewick's Swans started arriving in Britain in mid-October 2016, with the first birds seen at WWT Slimbridge, Gloucestershire (on 3 November) being a pair named 'Tool' (male) and 'Time' (female), who had brought with them their seventh cygnet since they were first recorded at the centre in 2008. Although this particular family had chosen to arrive relatively early to Britain, a high proportion of those birds reaching the country in October and November tend to be non- or failed breeders, with the families usually arriving later. For this reason, a coordinated age assessment is carried out in December or January, which is also coordinated with counts made at wintering sites elsewhere along the flyway when the majority of the population is in west Europe.

In 2016, the assessment was carried out in early December, when a total of 1,816 birds was aged: 1,720 at WWT Welney and the Ouse and Nene Washes (Norfolk/Cambridgeshire) and 96 at WWT Slimbridge. Of these birds, 16.5% were juveniles (with similar proportions recorded in the two areas: 16.5% and 17.7%, respectively) this being higher than recorded in 2015/16 (13.5%) and also above the previous ten-year mean (10.8% for 2006/07–2015/16) suggesting those swans wintering in Britain had seen a good breeding season.

Unfortunately, however, age assessments made elsewhere along the flyway suggest that the Northwest European population as a whole may not have been as successful. Preliminary results from an international age count, coordinated by Dutch ornithologists Jan Beekman and Wim Tijssen, indicated that amongst the 10,065 Bewick's Swans aged across northern Europe (Estonia, Netherlands, Belgium, France, Germany, Poland and Britain) only 8.2% were young birds.

As with the Bewick's, coordinated age assessments

of Whooper Swans are made in mid-winter and in 2016/17 the counts were conducted in mid-January. A total of 13,481 birds were aged (representing c. 40% of the total Icelandic population) of which 16.2% were cygnets, this being slightly higher than in 2015/16 (13.2%) and also the previous ten-year mean (15.4% for 2006/07–2015/16).

The highest breeding success was found amongst those birds wintering in the Republic of Ireland and Northern Ireland (21.8% amongst 3,961 birds aged, and 20.9% amongst 2,154 birds, respectively) and at WWT Caerlaverock, Dumfries and Galloway (21.9% amongst 306 birds). Comparatively, in eastern England at WWT Welney and the Ouse and Nene Washes, of the 5,958 birds aged, only 10.8% were young birds. It is possible that this regional difference in productivity reflects a general preference for Whooper Swan families to select wintering sites closest to their Icelandic breeding grounds or for non-breeders to select sites in eastern England.

Currently, Whooper Swans in Britain are mainly aged at their key wintering sites at or near WWT centres. However, we are keen to obtain age assessments of flocks that regularly occur elsewhere, particularly at sites in Scotland and northeast England. Therefore, if you are aware of any flocks in your local area and you are interested in contributing to the survey it would be great to hear from you. Please get in touch by emailing monitoring@wwt.org.uk.

A big thank you to everyone who helped with the age assessments in 2016/17, particularly to Graham McElwaine and the Irish Whooper Swan Study Group who coordinated the Whooper Swan counts in Ireland, and to Jan Beekman and Wim Tijssen for providing the preliminary results from other European countries supporting wintering Bewick's Swan.



Photo: Brian Burke

Icelandic-breeding Goose Census 2016

Carl Mitchell & Kane Brides

Autumn 2016 saw another year of high Pink-footed Goose numbers but not quite reaching the peak recorded the previous year. A total of 481,341 geese was counted in mid-October through the IGC, the second highest count on record. This represents a 10.3% decrease on the census-based estimate in 2015 (**Figure 3**), a decline of over 55,000 birds. However, bearing in mind the reasonable breeding success (see below), it is possible that the 2016 census underestimated the true population total and some (uncounted) birds remained in Iceland at the time of the census.

Breeding success was about average at 18.8% young (the same figure as in 2015) with a mean brood size of 1.80 goslings per successful pair. As in 2015, some notably large counts were reported, as might be expected with such a large population total. Montrose Basin led the field with a count of 42,840 Pink-footed Geese, followed by Loch of Skene (34,340), Beaully Firth (30,300), WWT Martin Mere (30,050) and the Alt Estuary (23,893), but 16 sites held over 10,000 geese and 29 sites held over 5,000 geese.

The November 2016 count produced an Iceland Greylag Goose population estimate of 90,471, 5.2% lower than the figure for autumn 2015 (**Figure 3**). At the time of the census, an estimated 50,000 Greylag geese remained in Iceland and 46,678 geese were counted in Orkney (although an estimated 21,007 of these were British birds). The population level of Iceland Greylag Geese has decreased by c. 20,000 birds in the last five years to levels of 70–80,000 birds recorded in the late 1990s and early 2000s. The trajectory of the population needs monitoring carefully since c. 40,000 birds are

shot in Iceland every year and as part of SNH's attempts to reduce the number of British Greylag Geese on Orkney, many thousands of both British and Iceland Greylag Geese are shot there each winter.

Estimating the annual breeding success for the Icelandic population is difficult due to the increasing number of British Greylags residing in the wintering areas of the Icelandic geese. However, estimates of 23.5% young and a mean brood size of 2.53 young per successful pair were obtained in Caithness, an area where the Iceland migrants far outnumber British birds.

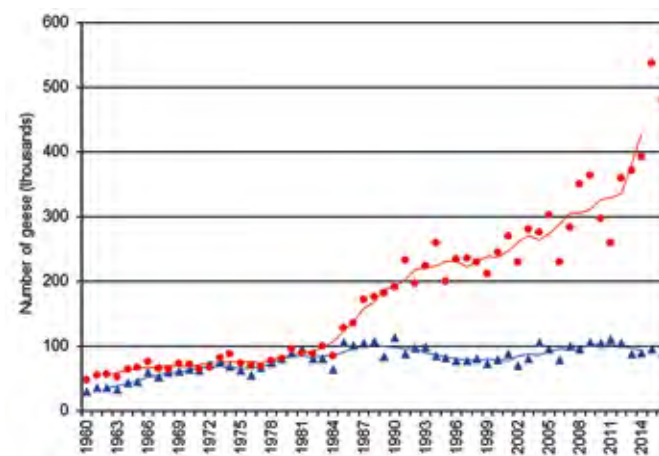


Figure 3. Population estimates for Pink-footed Goose (red circles) and Iceland Greylag Goose (blue triangles), 1960–2016. The five-year running means (e.g. mean for 2014 is from population estimates for 2012–2016) are shown as lines.



Photo: Graham Catley

Taiga Bean Geese wintering in Britain in 2016/17

Carl Mitchell

During winter 2016/17, monitoring of Taiga Bean Goose was undertaken at the Slamannan Plateau, Falkirk, by the Bean Goose Action Group and at the Yare Valley, Norfolk, by RSPB reserve wardens. The total count for the two sites (239 birds) was the lowest since 1982/83.

A peak count of 216 birds was recorded at Slamannan, 47 fewer birds than the previous year. At the Yare Valley, where the number of wintering Bean Geese has been declining since 1993/94, the peak count of 23 geese was just one bird higher than that recorded during the previous winter but was still the second lowest since 1954/55. The Yare flock is demonstrating 'short-stopping', as geese winter further east, probably choosing to over-winter at staging areas in Denmark.

Breeding success was estimated from a sample of 138 birds at Slamannan in late October and only five birds were aged as first winter (3.6% young) with one brood of two young birds and three broods of one, giving a mean brood size of 1.25 young per successful pair. The number of Bean Geese wintering at Slamannan has remained at 200–300 birds since 2002/03 and low annual productivity may help explain why the numbers there are not increasing.

Since 2012, a number of geese from the Slamannan flock have been caught and fitted with GPS tracking devices to help explain their migration routes. An analysis of the location data has documented the movements of the Slamannan flock to their hitherto unknown breeding quarters in south central Sweden and helped to identify key staging areas in Denmark and Norway (Mitchell *et al.* 2016). Further to this, birds fitted with GPS neck collars provided some fascinating information on movements during the spring 2017 migration. Part of the Slamannan flock left Scotland for



Photo: John Anderson

Denmark late in the evening on 5 February 2017, whilst others left the next morning. Some of the migrating birds flew into strong headwinds half way across the North Sea and, rather than push on, either abandoned the crossing and turned back or simply got carried along with the strong easterly winds. GPS data showed that some of the birds landed as far north as Orkney before heading south straight back to Slamannan. They then made a successful crossing a fortnight later (20 February). However, one bird stayed on Orkney and made a direct crossing to Denmark alone. The migration story can be followed at <http://scotlandsbeangeese.wikispaces.com/migration>.

An international action plan for Taiga Bean Geese was adopted by Contracting Parties to AEWA in November 2015 (Marjakangas *et al.* 2015), and the population is currently being managed within the scope of AEWA's European Goose Management International Working Group described by Jesper Madsen *et al.* on page 9. Most recent international status information on Taiga Bean Geese, including those in UK, can be found at <http://www.unep-aewa.org/en/meeting/2nd-meeting-aewa-european-goose-management-international-working-group-egm-iwg2>.

Thanks to Angus MacIver, Larry Griffin and Ben Lewis for providing data reproduced here.

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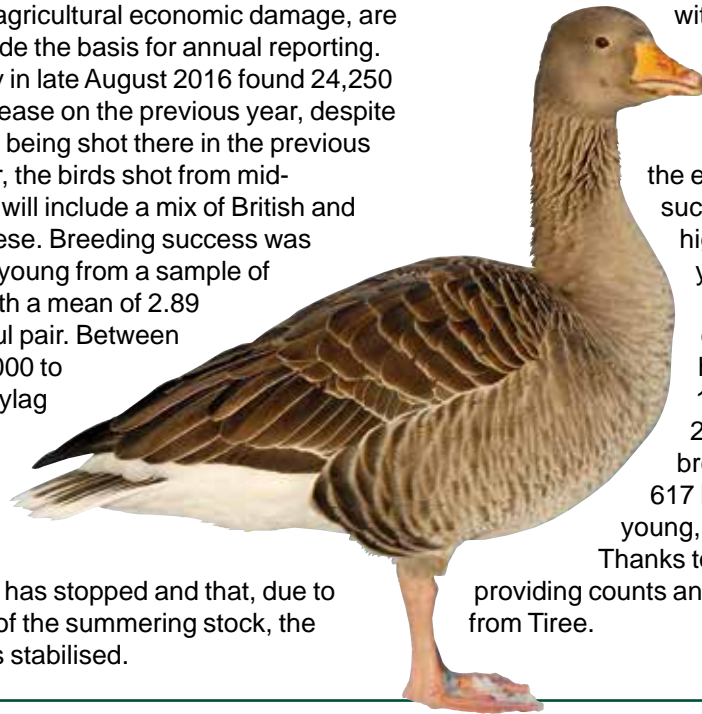


Photo: Dave Appleton

Monitoring of British Greylag Geese in key areas of Scotland in 2016

Carl Mitchell

Areas where Scottish Natural Heritage are now controlling the numbers of British Greylag Geese, in an attempt to alleviate agricultural economic damage, are monitored and provide the basis for annual reporting. On Orkney, a survey in late August 2016 found 24,250 geese, a 13.6% increase on the previous year, despite around 8,500 geese being shot there in the previous 12 months; however, the birds shot from mid-November onwards will include a mix of British and Iceland Greylag Geese. Breeding success was estimated at 25.6% young from a sample of 1,011 birds aged, with a mean of 2.89 young per successful pair. Between 2012 to 2016, c.20,000 to c.24,500 British Greylag Geese have been counted in Orkney suggesting that the rapid increases in numbers up to 2012 has stopped and that, due to increased shooting of the summering stock, the population trend has stabilised.



On Tiree, the late August count was 2,357 geese, a 23.9% increase compared with 2015. Breeding success was once again high with 1,684 birds aged and, of these, 34.8% were young with a mean brood size of 2.60 per successful pair. This was the eleventh year in a row that breeding success was over 25% young, the highest recent value being 40.3% young recorded in 2008. At the time of writing, no count data were available for the Uists; however, in late summer 2016, 1,147 birds were aged there and 28.1% were young, with a mean brood size of 2.89. On Harris/Lewis, 617 birds were aged and 24.5% were young, with a mean brood size of 3.23. Thanks to John Bowler (RSPB Scotland) for providing counts and breeding success data from Tiree.

Photo: James Lees / WWT

Greenland White-fronted Goose population monitoring, 2015/16

Tony Fox, Alyn Walsh, Ian Francis & David Norriss

Coordinated counts from all regular wintering resorts of Greenland White-fronted Geese, supplemented with numbers reported elsewhere, produced a spring global total for 2016 of 18,879, up just 0.13% (25 birds) on the previous world population estimate of 18,854 in spring 2015 (Fox *et al.* 2015). However, there was something of a shift in wintering provenance between the two years, with a 20% increase in British wintering numbers balanced by a 17% decline in Irish numbers compared with the last census.

In Britain, the census total of 10,286 compared with 8,588 counted in the previous season at the same time of year. The increase on Islay of more than 1,000 birds (5,183 *cf* 3,995 in 2015) was especially encouraging, but total numbers elsewhere in Britain increased by almost 650 birds as well.

In Ireland, the spring 2016 count produced a total of 8,593 compared with 10,266 in 2015. Numbers at Wexford were relatively low for much of the winter, the spring count being 20% lower than in 2015, so numbers were a little disappointing there. Missing spring counts needed to be substituted for ten Irish

regular wintering resorts, amounting to 21.0% of the Irish total, including the March count at Loughs Foyle and Swilly which failed to find all the birds at the time of the count which could have potentially added to the Irish total. This could also explain the low Wexford spring count, as reports of collared geese and telemetry have shown that Wexford birds may move to the Foyle/Swilly complex in spring prior to departure for Iceland.

Breeding success amongst geese wintering at British resorts was again reasonable compared to many of the last 15 years, especially on Islay. There were 15.5% first winter birds across all sampled sites after the 2015 breeding season based on 5,556 aged, which compared to 12.9% from 2014. Mean brood size was 2.96 (253 broods) a little improved compared to 2.73 the previous season. On Islay, 16.1% young was recorded which is very cheering and slightly above the average of 14.0% for 1962–2014 inclusive. Indeed, excepting the unusually warm spring of 2010 when the population produced bumper numbers of young, this was the highest proportion of young on Islay since the

summer of 1992. The percentage of first-winter birds exceeded 10% at 20 out of 25 sites in Britain from which age ratio data were received, which was far better than in several recent years. Spring 2015 in west Greenland was mild and snow free (3.8 mm precipitation in April/May prior to the spring arrival of geese compared to the average 26.5 mm for the preceding ten springs), so the better production of young was perhaps not so surprising.

By comparison, the percentage young amongst flocks aged in Ireland during 2015/16 was rather disappointing and considerably lower. From 4,010 aged birds, samples revealed only 6.0% first-winter birds, close to the 6.1% of last season. Mean brood size amongst the Irish flocks was 2.61 (77 broods), almost identical to 2.59 last season.

Why the difference between Britain and Ireland? Well, of course, many Arctic-nesting goose species are constrained to nest in a narrow strip running east-west around the very northern edge of our planet, but the geese that breed in Greenland experience something a little different. The east and west coasts of Greenland run almost north-south, with the result that those geese that breed in the south likely experience very much milder conditions than those in the north. We have known from ringing recoveries over many years and from recent telemetry studies more recently that Greenland White-fronted Geese breeding in central west Greenland tend to winter in Scotland, while those breeding further north from southern Disko Bay northwards tend to winter in Ireland, so these northern

birds likely experience harsher conditions in spring and a shorter breeding season than those nesting further south. Mitch Weegman's PhD study (see also *GooseNews* 11:6 & 12:8) showed that geese wintering at Wexford that experienced a series of poor springs in west Greenland bred significantly later than those that lived through milder springs, suggesting some cumulative effects of sequential poor springs on reproductive success (Weegman *et al.* 2016). This may still be haunting the Wexford birds which suffer harsher conditions in spring, while the Islay geese seem more able to exploit the improved springs of recent years, following a run of seasons with heavy snow fall just prior to their arrival which restricted their ability to reproduce.

We extend a huge thank you to the wonderful selfless network of fanatics that count and age these birds every year and that make such a review possible! As always, the surveys of wintering Greenland White-fronted Geese on the wintering grounds were coordinated by the National Parks and Wildlife Service in Ireland and the Greenland White-fronted Goose Study (GWGS) in Britain.

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Photo: Alyn Walsh

Poor reproductive performance continues in European White-fronted Geese

Kees Koffijberg & Kane Brides

European White-fronted Geese wintering in the North Sea area, including the UK, have shown a considerable decline in their reproductive output since the early 1990s, with 2016 also proving to be another poor breeding season for the population (**Figure 4**). Age assessments of 228,501 geese in The Netherlands, the western part of Germany and in the UK revealed that overall the flocks consisted of 12.4% young birds. This figure sits at the lower end of the range when compared with previous results, with age ratio counts having been carried out since the 1960s (**Figure 4**).

There was little difference in the proportion of young recorded amongst flocks in The Netherlands (12.8 %; 79,583 birds aged) and Germany (12.4 %; 148,442), but it was larger in the small sample from the UK (19.1%; 476). This is a pattern that has been observed in previous years as well.

Although the UK sample was rather small - age assessments were carried out at North Warren, Suffolk (16.8%; 250), WWT Slimbridge, Gloucestershire (24.4%; 164) and Middle Marsh Farm (9.8%; 41) and Huttoft, Lincolnshire (23.8%; 21) - the larger proportion of first-winter

birds may reflect a tendency for successful pairs to winter towards the western edge of the range. This includes both the UK and Belgium (for which data have not yet been received).

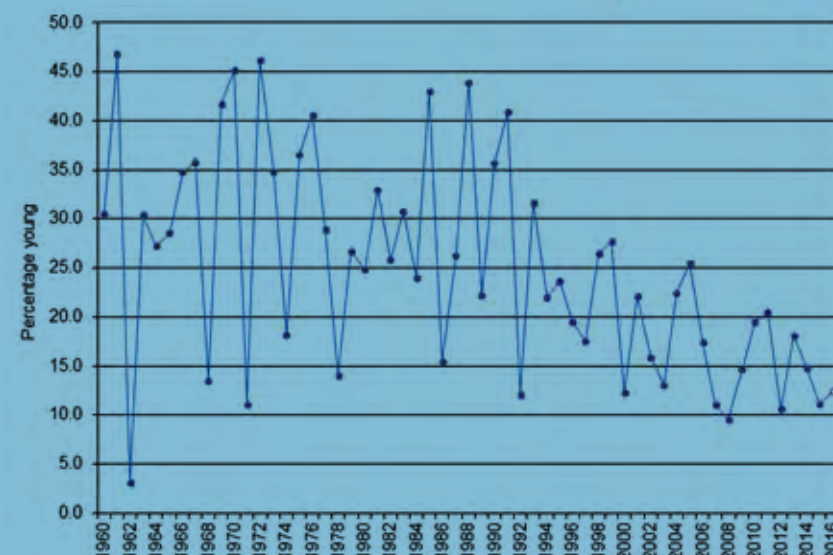
In the UK, brood sizes were only recorded at WWT Slimbridge where the mean was 2.50 goslings per successful pair (16 families). This is much larger than recorded in The Netherlands (1.61; 1,000 families) and Germany (1.64; 3,600). Overall, the mean brood size was 1.65 goslings per successful pair, which is also in the lower part of the range compared with previous results. The majority of successful Whitefront pairs (57%) were accompanied by only one gosling. Brood sizes of more than five goslings were very rare (1.2%), with the one brood of 13 goslings was a major exception.

Given the series of years with low reproduction in the past two decades and an estimated average annual survival rate of 0.82¹, the flyway population is likely to have slightly decreased recently. It may now even be lower than the current population estimate of 1,000,000 individuals², which was estimated for the sixth AEWA Conservation Status Review in 2015.

Many thanks goes to Martin McGill (WWT), David Thurlow (RSPB) and Nigel Lound for recording data in the UK and to all other observers submitting data in The Netherlands, Germany and elsewhere.



Photo: James Lees / WWT



Footnotes

- 1 see www.sovon.nl/sites/default/files/doc/Rap_2014-56_Kolganzen_beheer.pdf
- 2 Wetlands International 2017. *Waterbird population estimates*. Retrieved from <http://wpe.wetlands.org> June 2017.

Figure 4. The percentage young of the Baltic/North Sea European White-fronted Goose population, 1960–2016 (the open circles represent incomplete data). Mainly data from The Netherlands and Germany. Data provided by Sovon Vogelonderzoek Nederland.

Greenland Barnacle Geese wintering in Scotland in 2016/17

Carl Mitchell

Greenland Barnacle Geese are widely dispersed and occur in many areas that are difficult to access or too remote to count from land. Hence, complete coverage of all wintering haunts is only achieved once every five years when a flyway-census involving both ground and aerial surveys is undertaken. The last census took place in March 2013 and resulted in an estimated population size of 80,670, an increase of 43% since the previous census in 2008. The population has been rapidly increasing since the mid-1980s and with the next flyway-census due to take place in spring 2018, it will be interesting to see whether numbers have continued to rise.

Whilst not all sites are covered every winter, annual counts are carried out at number of key sites.

On Islay, the most important wintering site in the UK for Greenland Barnacle Geese, four co-ordinated counts were undertaken during winter 2016/17. These revealed 54,363 birds in November, 45,714 in December, 45,056 in January and 41,721 in March. The mean of these four counts was 46,714 birds which represents a 9% increase compared with winter 2015/16 (42,845 geese); however, the November 2016 count was 8,649 birds higher than the December figure

and the former presumably included transient geese that did not stay to winter on Islay. Breeding success in 2016 in east Greenland was reasonable (see below) and SNH shot just under 2,000 birds there during the winter (see *GooseNews* 14:10–11).

At other sites, winter peak counts of 4,644 on Tiree, 1,062 on Coll, 3,690 on Colonsay/Oronsay and 650 on Danna were recorded. At the time of writing, no data were available for South Walls (Orkney) or the Uists.

Breeding success is measured annually on Islay and counts in autumn 2016 revealed a good breeding season. Just over 12,000 birds were aged and showed that 17.9% were young with a mean brood size of 2.12 young per successful pair. This continues the highest proportion of young recorded there since 1990/91. Age assessments were also carried out on Tiree and at Durness, Sutherland. On Tiree, a sample of 500 birds held 16.2% young with a mean brood size of 1.62 young per successful pair, whilst at Durness, 212 birds were aged and held 15.1% young with a mean brood size of 1.77 young per successful pair.

Thanks go to Malcolm Ogilvie and John Bowler for providing age counts and to SNH for providing goose counts.

Dark-bellied Brent Geese in 2016/17

Kane Brides

The 2016 breeding season proved to be better for Dark-bellied Brent Geese than the previous year, although the overall percentage of young produced remained fairly low. In all, 24,804 geese were aged at 74 locations within ten estuaries or coastal locations in the UK. Overall, wintering flocks held 8.6% young and the mean brood size was 1.96 young per successful pair. However, despite having a better breeding season than the previous year (0.9%) the overall percentage of young was slightly lower than the previous ten-year mean (9.7%).

Reports from monitoring stations in the breeding grounds in Arctic Russia suggest that rodent abundance was relatively low in 2016 and predators such as Arctic Fox were scarce after record high abundance in 2015. As breeding success of Dark-bellied Brent Geese is greatly influenced by interactions between rodent abundance and predator pressure, the low rodent

abundance and low numbers of Arctic Fox may explain why the geese had a slightly better breeding season than the previous year.

The results during 2016 follow a poor breeding performance in 2015 (0.9% young) and a good breeding season in 2014 (23.0% young), and the previous three years (2011/12 to 2013/14) also followed a similar pattern, perhaps suggesting a return to the three-year cycle of lemming and predator abundance which greatly influences Dark-bellied Brent Goose breeding success.

The winter season of 2016/17 marked the 32nd consecutive year in which annual age assessments for Dark-bellied Brent geese have been collected by experienced volunteers in the UK. As always our thanks go to the network of dedicated GSMP volunteers, in particular The Exe Estuary Observers Group, Maureen Gibson, Peter Hughes, Nigel Lound, Rob Lucking, Julian Novorol, Wes Smith, John Walker, David and Pat Wileman and Derek and Glenys Wood for their help with collecting age assessments.

Photo: David Darrell-Lambert



Breeding success for the East Atlantic Light-bellied Brent Goose

Preben Clausen & Kane Brides

Age assessments made at Lindisfarne, Northumberland, in 2015/16 and 2016/17 indicated that geese wintering in Britain saw a marked improvement in their productivity compared with previous years, with 21.4% young and 26.7% young recorded amongst flocks, respectively. These results mirror those from elsewhere along the flyway for the population as whole (**Figure 5**).

During the mid-2000s, the East Atlantic Light-bellied Brent Goose population experienced a series of below average breeding seasons and reduced recruitment leading to a levelling off, if not a slight decline, in the population (see *GooseNews* 15:26). However, the three good breeding seasons in the last three years (16.2%, 17.3% and 17.6% young for 2014/15–2016/17, respectively), in combination with relatively mild winters and consequent high survival have contributed to recent rapid recovery in the population (Clausen & Craggs 2017).

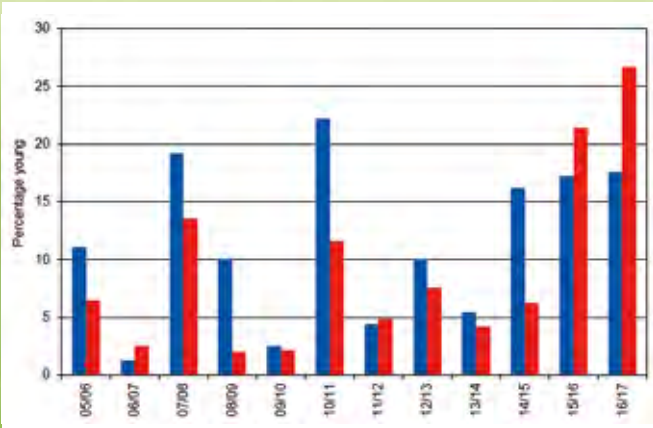


Figure 5. The percentage young of East Atlantic Light-bellied Brent Geese in Britain (red columns) and for the whole population (blue columns), 2005/06–2016/17.

A contributing factor to this recovery is thought to be a major regeneration of *Zostera* at Nibe-Gjøl Bredning, Denmark (Balsby *et al.* 2017), which is the most important wintering and spring-staging site for the geese, holding >60% of the population. *Zostera* is believed to be a better source of food than the alternative resources for ensuring that the geese have sufficient fat reserves (Clausen *et al.* 2012, Inger *et al.* 2008), which potentially improves their chances of survival through the winter as well as successful breeding. *Zostera* has also been increasing at Lindisfarne, increasing the food availability for those geese wintering there (Clausen & Craggs 2017).

Our thanks go to Andrew Craggs for carrying out age assessments at Lindisfarne.

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Results of the Canadian Light-bellied Brent Goose Census

Kendrew Colhoun, Kerry Mackie, Gudmundur A. Gudmundsson & Graham McElwaine

The mid-October 2016 survey was the 20th consecutive census coordinated by the Irish Brent Goose Research Group across the Canadian Light-bellied Brent Goose flyway, with surveys being conducted from Iceland south to northern France. A total of 56 sites were covered, the majority in Ireland and mostly within a few days centring on 15 October.

The census recorded a total of 36,811 geese, just 1% lower than the previous year (**Figure 6**). Aerial surveys conducted in western Iceland, supported by the Icelandic Institute of Natural History, recorded around 7,000 individuals but the largest concentration, as is typical, was of over 22,000 birds at Strangford Lough, Northern Ireland. By mid-month there were also significant flocks at other main haunts in Ireland where inter-tidal *Zostera* beds are present: including Tralee Bay and Castlemaine Harbour in Kerry, and Lough Foyle and Tramore Backstrand in Waterford. The first birds were recorded in northern France in small numbers by the end of October.

The 2016 census total was the second consecutive result of close to 37,000 individuals (with 37,192 recorded in 2015) suggesting numbers may be recovering somewhat from the lows of 2013–2014 (c. 32–34,000) (**Figure 6**). However, the lack of a survey in Iceland in 2014 will inevitably have contributed to the lower count total recorded that autumn, although the census was delayed till early November in an effort to minimise the effect of the reduced coverage.

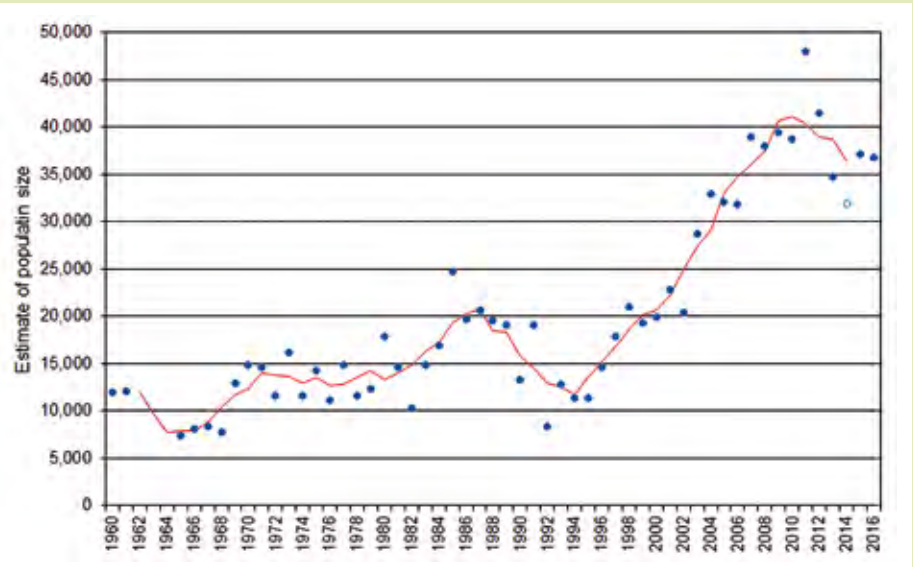


Figure 6. Annual census-derived estimates of Canadian Light-bellied Brent Goose population size, 1961–2016. Five-year running mean shown as red line (e.g. mean for 2011 is from population estimates for 2009–2013). The open circle in 2014 represents the possible undercount.

In 2016/17, our assessment of breeding success was remarkably similar to the previous year at around 12% young, and an intermediate between the long-term maxima of ~25% (2011) and years of almost total breeding failure (such as 2013, 0.04%). Recent work (Clausen *et al.* 2016) has investigated the roles of climate on adult survival and productivity, and their role in regulating the size of the flyway population, utilising count and productivity data in addition to the extensive mark-resightings database collated over recent decades.

Thanks to all our surveyors and ring readers for making our annual assessments and broader analyses possible.

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Photo: Brian Burke

Svalbard Barnacle Geese in 2016/17

Larry Griffin

I'm beginning to feel a bit like a worn out record when I say that this winter was notable because of how mild it was...but it was! When speaking to farmers about the geese it was notable how many commented on how the grass had kept growing even in the mid-winter period. One noted how he felt the geese had not been feeding under the power lines as much this winter with the grass remaining lusher there; an interesting observation and presumably one that could be linked to more grass being available within the rest of the field and so less risks needing to be taken. Not scientific, but a neat observation nonetheless!

That's the great thing about the geese round here on the Solway, you can really get up close to them and watch and listen to what they're up to; you don't really need a scope or even binoculars. They are not scared, and for years no-one shot them, and by and large they feed in peace. You can pull up in your car in most places and get out and photograph them and show them to your kids and they will hardly break step – I'm always minded of those Attenborough films showing those amazing eastern cities or temples where the deer roam the streets and parks freely and live side by side with people as in Nara, Japan. There's not many larger species of wildlife where you can watch them so easily and without the animal taking flight or feeling the need to flee.

This state of play has been made possible by the excellent Goose Management Scheme that has been in place on the north side of the Solway since the mid-1990s. Before that time it was not so peaceful and the geese were regularly pushed off the fields near the reserve and gas guns and bangers were rife throughout the long winter months from September to May and conversations with some farmers were perhaps not so pleasant. The good thing was that the community came together and we got to a workable solution that was hard won. It costs money of course, but I would say it is £250,000 well spent, or rather, invested, as for that money the taxpayer protects not only these amazing geese and the experience of them, but also the myriad of other species beside. At high tide or during periods of wet weather it is not uncommon to find big flocks of Curlew, Lapwing, Oystercatcher, Golden Plover or gulls and wildfowl on the fields and pools the geese use; some of which are species in decline on the SPA as a whole, yet hopefully benefitting from not being disturbed within the Goose Management Scheme. Whilst £250,000 might still sound like a lot of money to some, we should not forget that this investment also generates revenue for the local area from the people that come to watch the geese and the



Photo: Johnny Bakken

investment in the local economy that the management payments represent. Nor should we ignore the willingness of the public to pay for these benefits; the same general public that is happy to spend in excess of 100 times that amount on bird food per year.

Through the great efforts of a loyal and dedicated team of mostly volunteers, the Svalbard Barnacle Goose population was again counted many times during the winter of 2016/17. The counts suggested it had held at or just above the 41,000 recorded last winter, with an adopted total of 41,700. This is perhaps slightly less than expected given the better than average breeding season they had, with 16.0% young in the flocks (the ten-year average being 9.0%). The peak count in late October was 43,425 but due to the very real possibility of double counting some flocks of geese, particularly in the complex counting sector comprising Rockcliffe Marsh, an average population total is always adopted.

Due to avian influenza restrictions on reserve activities this winter, no catches were attempted. Five Barnacle Geese were, however, caught as by-catch during a Pink-footed Goose catch near Carsethorn and three of the females were marked with small low profile black neck collars. This adds to the five already present in the population. These collars form part of an assessment exercise to see how these smaller *Branta* geese respond to marking with collars – a technique usually reserved for *Anser* geese, though used on *Branta* in America – as if it does not cause problems for the geese, it may provide a more effective way of deploying GPS tags than backpack harnesses. Eight is not a lot of birds in over 40,000 so please do keep a careful eye out for these pioneering geese; it is easy to read the orange leg ring and not even spot the black collar! Even so Dan Gornall, the current placement student at Caerlaverock spotted pair “D” and “I” (marked the previous winter in April 2016) at Caerlaverock on 2 May 2017 and they were then seen again at Vesterålen, Norway, just 18 days later by Johnny Bakken.

Many thanks to the Solway census team including Cara Bell, Dave Blackledge, Lana Blakely, Mike Carrier, David Charnock, Rowena Flavelle, Bob Jones, Sarah Livingstone, Eric Neilson, Mike Peacock, Marian & Dave Rochester and Paul Tarling and to Derek Forshaw for counts from Budle Bay. Thanks also to Dan Gornall, Brian Henderson, Rosie Rutherford and Val & Bob Smith for sterling efforts with the ring reading again this winter.

Ringed birds ‘D’ and ‘I’ seen in Vesterålen, Norway, in May 2017

Capture and marking round-up 2016/17

Kane Brides, Carl Mitchell, Ed Burrell, Graham McElwaine & Lee Barber

Here, we provide a round-up of some of the projects being undertaken by various organisations and individuals involving the capture and marking of the UK's goose and swan populations.

New Greenland Barnacle Goose colour-marking project

Winter 2016/17 saw the start of a new two year initiative, part-funded by Scottish Natural Heritage (SNH), to catch and mark Greenland Barnacle Geese in Scotland. Catches during 2016/17 were made on Islay, Argyll (82 birds), Tiree, Argyll (52), Durness, Sutherland (155) and Hoy, Orkney (four) by WWT, Highland and Orkney Ringing Groups and Steve and Tracey Percival. In total, 293 birds were caught and marked with white plastic leg rings (with three black characters). This initiative will hopefully generate many sightings of these marked birds in future years. One of the aspects of the study is to look at within-winter and between-year movements and site fidelity.

Cannon-netting Greenland White-fronted Geese

It was a productive winter with regard to catching and marking Greenland White-fronted Geese in Britain. In Scotland, the cannon-netting double act of Carl Mitchell and Larry Griffin were responsible for ten catches between November and March; six on Islay (55 birds in total) and two each at Loch Ken (13, including two re-traps) and Tayinloan/Rhunahoarine, Kintyre (17).

Carl also ventured south to the Dyfi Estuary in Wales in December and with Steve Dodd had a successful catch of just about the entire wintering flock, 14 birds being ringed. This gives a UK grand total of 99 birds captured, 97 of which were ringed for the first time; a timely boost to help our understanding of population dynamics of different flocks and linkages within the wintering meta-population.

In addition to the standard fitting of coded neck collars and leg rings, 16 GPS tags were fitted to adult females (ten Islay, two each at Loch Ken, Kintyre and the Dyfi Estuary). These will provide further insights into movements and behaviour throughout their annual cycle.

As ever, we are extremely grateful to landowners/managers for permissions to catch and all who volunteered (or were volunteered!) to help at all stages. Similarly, the value of your observations of marked birds is immeasurable and we'd kindly ask that they continue to be reported to Tony Fox (see back page for contact details).

Tracking Pink-footed Geese for wind farm study

With the support of DONG Energy, WWT has begun a study that will develop further understanding of potential cumulative impacts of wind farms on Pink-footed Geese in Britain and, in particular, understand how these birds navigate through wind farms, such as those in the eastern Irish Sea.

The study uses GPS/GSM tags to study the birds' annual migration routes, their daily movements between roosts and feeding areas, and their seasonal movements within Britain. The project aims to monitor the movements of tagged Pink-footed Geese within their winter quarters in Britain. The first nine Pink-footed Geese were caught at WWT Martin Mere on 1 December and fitted with GPS tags. Subsequent catches were made in Dumfriesshire on 26 January (five birds fitted with GPS tags) and 24 March 2017 (ten birds fitted with GPS tags).

During the Pink-footed Goose catches a number of geese were also marked with the usual grey neck collars; 24 at WWT Martin Mere and 22 in Dumfriesshire. With plans to round-up and colour-mark more Pink-footed Geese in Iceland during summer 2017 these efforts will top up nicely the total of colour-marked birds in this population.

Thanks to dedicated ring readers in Norfolk, Lancashire and some areas of Scotland we are receiving good numbers of sightings; however, we are keen to increase this network of ring readers to other areas of the birds' range and also within Iceland. Observations of leg rings and neck collars are always welcome.

Catching Canadian Light-bellied Brents

Whilst nowhere near record levels, 2016 was again a somewhat better breeding season in Arctic Canada, with many of the previously ringed birds returning with families.

Canon-netting at Strangford Lough was limited to three small mid-November inter-tidal catches, two of which were in quick succession at the same location on the same day. These catches yielded a total of 17 birds. At the end of January 2017, a larger catch of 56 geese was achieved at Dundrum, Co. Down, and this was followed by the only other Irish catch by the Irish Brent Goose Research Group (IBGRG), of 32 birds, at Red Arches, Baldoy, at the start of March.

On to the staging grounds in Iceland in May, where a joint team from the University of Exeter, the IBGRG and Icelandic colleagues caught a further 138 geese



in ten catches. Two of these were located on the Snæfellsnes peninsula, with the one below the magnificent Kirkjufell mountain at Grundarfjörður laying claim to the most westerly European catch to date. The opportunity was also taken by various individuals who had formerly been closely associated to revisit the project there, to lend a hand and renew old friendships.

At the time of writing, with many records yet to be entered, sightings of marked brent geese during the 2016/17 winter/spring period stood at 14,791 records of 1,666 individuals, received from 217 observers along the flyway. Of particular interest was the addition of two new countries, Spain and the Faroe Islands, to the list of locations where ringed birds have been observed. A regular team from IBGRG visited Iceland to augment the annual ring reading effort there during the most recent spring staging period.

Many thanks go to the cannon-netters, Stuart Bearhop and Kerry Mackie, and to all the support teams of volunteer helpers and ring readers in Ireland, Iceland, France, UK and elsewhere.

Rounding-up Greylags at Windermere

The annual round-up of summering geese on Lake Windermere, Cumbria, involving members of the RSPCA ringing group included, 215 Greylag Geese, of which 176 were colour-marked with orange neck collars. From 2013 to 2016, a total of 351 Greylag Geese have been colour-marked at Windermere. Sightings of birds from this study show a regular moult migration from Lancashire and North Yorkshire to moult at Lake Windermere.

Monitoring Greylag and Canada Goose movements in Norfolk

During 2016, two Greylag Geese were neck-collared as part of BTO's study into movements of geese within Norfolk. These birds join the other 172 geese - comprising 98 Canada Geese and 74 Greylag Geese - that have also been marked for this project, which started in 2012. The geese have been ringed at two locations: the BTO Nunnery Reserve and Hickling Broad.

Despite the small sample size of Greylag Geese marked at Hickling Broad (27 birds), 15 sightings were received during the 2016/17 winter. Very few were seen

at the ringing location; however, several birds were seen locally (within 6km) and the rest of the sightings were further down the coast into Suffolk (up to 45km).

Although sightings of birds marked at the BTO Nunnery Reserve were mainly received from BTO staff, some non-BTO staff members did report observations via a shared Google doc. This method of reporting increases efficiency in dealing with the records; however, there can be a delay in loading and reporting, so any sightings that need a quick response are done manually. We received 512 sightings of Canada Geese and 98 Greylag sightings. The vast majority were local, but several Canada Geese roamed over a reasonably large distance (between 5 km and 30 km) with the furthest being 65 km to the north coast of Norfolk.

Whooper and Bewick's Swan ringing and sightings

Whooper and Bewick's Swans are ringed as part of WWT's long-term life history studies, looking into the movements and survival of these species. Although fewer birds are now being ringed, there are still good numbers of previously marked birds within these populations; therefore, it is worth continuing to check flocks for colour-marked birds.

In Iceland, on the summering grounds, Whooper Swans were caught in non-breeding flocks and family parties by Sverrir Thorstensen and Olafur Einarsson. Thirty-seven swans were captured in Skagafjörður, including seven recaptures and 30 new birds, of which 23 were cygnets. In the Bardadalur area, 48 swans were captured which included 17 recaptures and 31 new birds of which 11 were cygnets.

In Russia, Andrey Glotov, Yulia Leonova and the staff of the Nenetskiy State Nature Reserve caught 38 adult Bewick's Swans, and several of these newly ringed birds were seen in Norfolk the following winter.

During the winter of 2016/17, 111 observers reported 7,861 ring sightings of 531 individual Whooper Swans, and 141 individual colour-marked Bewick's Swans were reported by 83 observers across the flyway. At the time of writing the database currently holds 944,664 observations of Whooper Swans and 1,237,416 records of Bewick's Swans.

We are very grateful for the support that we receive from our dedicated team of volunteers who help to ensure WWT's long-term swan studies continue. Many thanks go to all ring readers who submit ring sightings. Special thanks go to Alison Bloor, Steve Heaven and Ailsa Hurst for their help with computerising ring sightings, and to Emma and Irene James, Sheila Stubbs and David and Estelle Walsh for their help in compiling sightings of colour-marked Whooper and Bewick's Swans at WWT's Martin Mere, Caerlaverock and Slimbridge reserves.



Photo: WWT

Conservation and research news

In memorium

Raymond David Murray (IGC counter, Scotland)

Allan W Brown

Ray Murray passed away in September 2016 whilst on a birdwatching holiday in Peru. His contribution to ornithology in Scotland through a life-long association with the Scottish Ornithologists' Club (SOC) and his promotion of bird recording cannot be underestimated. This was especially the case with his involvement in bird atlas work. As one of the leading contributors to the forthcoming Atlas, the Birds of South-east Scotland 2008–13, he was in his element both in undertaking the fieldwork, often in more remote parts of the Borders, and in writing many of the detailed species accounts incorporating many of his own thoughts on current trends in numbers and distribution.

His interest in birds was wide-ranging and particularly within his recording area of the Borders. As producer of the Borders Bird Report since its inception in 1979 he had amassed a huge knowledge of birds and their distribution within this large area. To say that the Borders and Scotland has lost a stalwart would be a great understatement.

I had known Ray for 40 years having first become acquainted with him at the Edinburgh Discussion Group (now the Lothian Discussion Group) of the SOC where local surveys were (and still are) proposed and organised. Goose counts were an important survey for the group at that time under the chairmanship of Willie Brotherston who had instigated the first coordinated goose counts in southeast Scotland from the 1950s. Ray became closely involved with these counts and when I took over as goose count organiser in 1981 he was an ever-present counter who took a keen interest not only in the roost sites but also the location of daytime feeding areas. Additionally, he was of great assistance in encouraging new volunteer counters and he organised the counts in the Borders for several years. More recently he undertook counts at the key Pink-footed Goose roost site of West Water Reservoir thereby ensuring continued recognition of the international importance of the site. His one great regret was that he was on holiday when the highest ever count of over 82,000 birds was recorded there in October 2015. I suspect he thought that I had made it up!

Ray was also of great assistance to my Mute Swan study in the Lothians, being a key figure in the ringing team where his canoeing skills proved invaluable.

He was not one to let any cygnets avoid capture. Of course he then turned his attention to monitoring and ringing the Mute Swan population in the Borders and surveys of waterbirds on inland waterbodies, thus increasing our knowledge of those species throughout the Borders.

We have lost a hugely enthusiastic ornithologist whose commitment and passion encouraged many to take an interest in ornithology and in waterfowl conservation. His immense knowledge of birds in the Borders, Scotland and in the world beyond will be missed and his passing has deprived Scotland of a remarkable champion for ornithology. The forthcoming publication of Birds of South-east Scotland will be a fitting reminder of what he achieved and a legacy for future birdwatchers to build upon.



Photo: Ian Andrews



Photo: Alan Leitch

Eric Meek (former IGC Local Organiser, Orkney) Carl Mitchell

It is with great sadness that we report the loss of Eric Meek who died on 16 February 2017. Eric developed an early interest in natural history in his home county of Northumberland. Originally a school teacher, Eric joined the RSPB in 1981 as the Orkney Officer, working for 31 years before retiring in 2012. He was an outstanding naturalist with diverse interests, notably ornithology and botany. He made a substantial mark on the RSPB's reserve acquisition on Orkney, furthering the society's conservation interests and undertaking pioneering research work on seabirds and raptors.

Eric also established goose monitoring for IGC on Orkney in the 1980s, when there were very few geese in summer or wintering there. His tenure saw a dramatic change in the number of Iceland Greylag Geese wintering on the archipelago, peaking at 80,700 birds in December 2010. The summer breeding birds also increased, from a handful of pairs in the early 1980s to over 24,000 birds in the mid-2010s. His role included organising up to 20 volunteer counters spread over more than a dozen islands and he continued to be involved in goose monitoring after his retirement. We extend our sincere condolences to Eric's widow Aileen and other family members. He will be hugely missed.

Tracking Bewick's Swans in relation to wind farm sites: outcome of the study

Eileen Rees, Larry Griffin & Baz Hughes

Regular readers of *GooseNews* may recall that WWT has tracked the movements of Bewick's Swans caught on the Ouse Washes and at WWT Slimbridge from winters 2013/14 (8 birds) and 2014/15 (14 birds) onwards (see *GooseNews* 13:6 and 14:30). The main aim of the study was to describe the swans' flight-lines in relation to wind farm developments along their migration route, as part of the UK Government's strategic environmental assessment for offshore renewable energy schemes. A main gap in knowledge, which the study aimed to address, was whether the birds follow a relatively narrow path when moving across the North Sea between Britain and continental Europe or if they migrate on a broader front. Onshore sites across Europe were also considered, to illustrate potential cumulative effects of the swans encountering several wind farms along the flyway.

The 22 tagged swans were fitted with solar-powered UHF-GSM-GPS data loggers, programmed to provide GPS (lat/long) fixes at hourly (sometimes 30 minute) intervals, transmitted remotely via the mobile phone network every four hours. One logger fitted in winter

2013/14 and all 14 in 2014/15 provided the frequency of data required for the study, with three more from 2013/14 giving location data up to three times a day.

Swan location data recorded up to March 2016, along with wind farm locations and weather data, were incorporated into a GIS for analysis. Tracks that came within an 80 m radius of a wind turbine were taken as indicative that the turbine was on the bird's flight-line, with 80 m being the current maximum radius of the rotors for wind turbines in Europe.

Results showed that the swans migrated on a broad front between England and continental Europe, and that a total of 52 offshore wind farm footprints (including 11 operational sites) were crossed by the swan tracks. Of these, 33 (63%) were in German waters, 12 (23%) Dutch, four (8%) British, two (4%) Belgian and one (2%) in Sweden, including several wind farms in the area of the North Sea between The Netherlands and Schleswig Holstein (beyond the Heligoland Bight) not previously thought to be a major route for Bewick's Swan migration (**Figure 7**).

In British waters, movement across the East Anglia

ONE windfarm footprint was particularly evident, with all tagged swans and 83% of swan tracks crossing the site between 2014 and 2016 (**Figure 7**). None of the tagged Bewick's Swans were found to cross UK offshore wind farms further north (i.e. none crossed the Hornsea or Dogger Bank sites), but one individual flew across more southerly UK wind farm sites (Greater Gabbard, Galloper B and the London Array) in autumn 2015 on moving to/from the Dungeness-Pett Level SPA in southeast England during autumn 2015 (**Figure 7**).

In addition to the offshore wind farm sites, 15 swans with detailed (c. hourly) location data were found to encounter 322 onshore wind turbines, mainly in Denmark (138; 43%; e.g. **Figure 8**), Germany (113; 35%) and the Netherlands (63; 20%), but also in the UK, Latvia and Estonia.

Further assessment of hourly track segments where flight height, speed or distance data indicated that the swans were flying ("flight segments"), gave an overall encounter rate of 0.066 turbines per flight segment – i.e. one turbine encountered for every ~15 flights made by the swans. Encounter rates varied considerably between countries, from <0.001 (i.e. less than 1 in 1,000) encounters per flight segment for birds in the UK, compared with 0.14 in Denmark, 0.17 in the Netherlands and 0.23 in Germany, indicative of variation between these countries in onshore wind farm density. Encounter rates also varied across years for particular individuals, depending on their choice of staging or wintering site.

Flight height data were recorded for five Bewick's Swans; only a sample of the tags were programmed to give altitude data because it drains battery power and the main priority was to ensure that we had the high frequency GPS data required for the study. Nevertheless, 89.2% of 323 flight height records over land and 93% of 201 records over water were at <150 m, suggesting that the swans mostly fly at or below



Figure 7. Overview of the main wind farm sites crossed by the tracks (white lines) of 18 GPS-tagged Bewick's Swans. Yellow = wind farm at the application stage in March 2016, orange = consented, red = operational (from Griffin *et al.* 2016).

the height of the turbine rotors. These findings are similar to those reported for Whooper Swans and for Svalbard Barnacle Geese, which also migrated at low altitudes (modal flight heights = 10 m and 20 m, respectively, with altitude data accurate to ± 22 m of true height), with Whoopers Swans generally flying at about half the Barnacle Goose migration flight height (Griffin *et al.* 2011).

A full report on the Bewick's Swan tracking study (Griffin *et al.* 2016) was finalised for the Department of Energy and Climate Change (now the Department for Business, Energy and Industrial Strategy) in April 2016. The study demonstrates that the cumulative effect of the substantial number of wind farms (both offshore and onshore) encountered during the annual cycle



Photo: Alec Taylor / WWT

should be included in collision risk models developed for Bewick's Swans, that Environmental Impact Assessments for offshore wind farms should assess the effects of the developments on inland as well as on coastal Special Protection Areas, and that international communication and sound data on wind farm installation across all range states are crucial for determining cumulative effects more precisely. Further modelling of the Bewick's Swan tracking data is



required to determine the collision risk, and thus potential mortality rates, for the swans encountering a series of both offshore and onshore windfarms during their movements through Europe each year.

We are grateful to John Hartley of Hartley Anderson Ltd. for facilitating the study, to Ib Petersen, Leho Luigujõe, Steven Velthuijsen, Abel Gyimesi, Roland Lebus, Michaël Pierrot, Hans-Joachim Augst, Seb Rae and RenewableUK for provision of wind farm data and to the many people who kindly helped in catching and resighting the swans.

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Figure 8. Wind farms encountered by one Bewick's Swan in part of western Denmark during the study (red dashed line). The arrow illustrates a one hour period during which the swan potentially crossed four wind farm sites (black squares) on migrating north through Denmark (from Griffin *et al.* 2014).

Moulting Greylag Geese in southeast Greenland

David Boertmann

Until recently, Greylag Geese were considered accidental visitors to east Greenland, either in spring (one record) or during the summer (at least six records) (Boertmann 1994, unpublished information). However, during surveys for breeding seabirds in 2014 and 2016, moulting Greylag Geese were found at three sites along the southeast Greenland coast. In 2014, a single bird was found in a small archipelago at Qeertaartivit (64° 18' N, 40° 31' W), and in 2016 two small flocks (comprising 2 and 3 birds) were found just south of the mouth of the Scoresby Sound (69° 45' N, 23° 56' W). All the geese observed were flightless with growing primaries and all the birds stayed in coastal habitats.

The bird in 2014 was considered an accidental vagrant, but if considered together with the two flocks

in 2016, a pattern may emerge. Do Greylag Geese regularly perform moult migration to Greenland? If so, it is currently most likely on a small scale. The breeding population in Iceland seems to be increasing in some areas (Thorstensen *et al.* 2011, Stefánsson 2016), although the overall population is thought to be stable (Mitchell 2016) and there may be pressure on some Icelandic moulting sites which may mean more Greylag Geese move to Greenland to moult in the future. Since the surveys in 2014 and 2016 only covered marine habitats, more Greylag Geese may moult at lakes and freshwater wetlands in southeast Greenland.

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Contributions welcome!

We're always looking for new stories to tell, as well as photographs and relevant news items to fill future editions of *GooseNews*. Therefore, if you have any ideas or if you would like to contribute to the newsletter, please contact Colette Hall (see back cover for contact details).

The history of Barnacle Geese in the Faroe Islands

A recent paper by Hammer *et al.* (2017) provides a fascinating insight in to the increasing population of Barnacle Geese in the Faroe Islands.

Historically, the Barnacle Goose was a scare visitor in the Faroe Islands, although geese have been kept in captivity there since 1960. The first breeding observation was in 1989 when a bird was seen incubating five eggs; however, there was no further evidence to suggest that any of the chicks fledged. Five birds were recorded in the Islands in 1990, one of which was a colour-ringed escapee, but it is uncertain whether any of these birds bred. The first successful breeding attempt was reported in 1991 when a pair reared one gosling.

Since 2005, annual counts of breeding pairs and goslings have been undertaken with the results indicating a high reproductive rate and a marked growth in the total population, which has increased from five individuals in 1990 to 356 in 2016. There has also been a notable change in the population's migratory behaviour. Between 1990 and 2007, the majority of geese overwintered in the Faroes; however, since 2008 they have all migrated during the autumn, although their destination is unknown.

The Faroese breeding population may, in part, stem from the captive birds, and observations suggest that at

least one escaped bird constituted part of the early breeding stock. However, similar increases have also been observed in Iceland and Svalbard, and it is possible that the growth of the Faroese population is a reflection of a wider regional population growth. The authors suggest further study into the migration and connectivity of the Faroese Barnacle Goose population is thus warranted.

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The 3rd review of the UK's network of Special Protection Areas

Richard Hearn

In October 2016, the UK's Joint Nature Conservation Committee (JNCC) published the third major review of the UK network of Special Protection Areas (SPAs) – special sites which are designated and protected under the EU Birds Directive. The UK network of SPAs includes 270 sites of international importance that are central to the conservation of birds in the UK.

The review brought together extensive datasets compiled during the 2000s, including counts from volunteer schemes such as the Goose & Swan Monitoring Programme (GSMP). It also, for the first time, assessed the completeness of the network against verifiable criteria so that gaps in the network could be consistently identified, and the change since the second network review (published in 2001). This will allow future assessments to track progress with the designation and management of sites that are required to ensure that SPA suites for all species are complete (*i.e.* they protect an appropriate proportion of the total population).

The UK SPA network is used in winter by almost 2.5 million ducks, geese, swans and waders – nearly 40% of all the UK's non-breeding waterbirds (and two thirds of all geese and swans). It thus provides extensive protection for these internationally important wintering

populations. However, some gaps in the network were identified for waterbirds, for example Iceland Greylag Geese have undergone a substantial change in their distribution, leading to a large decrease in the number of birds using the existing SPA network. Gaps can also relate to ecological completeness, *e.g.* most SPAs for geese are roost sites because that is where they are counted, but these sites do not provide the geese with all of their ecological needs, *i.e.* feeding areas. The review recommends that more needs to be done to protect and manage feeding areas around SPAs for most goose and swan populations, which in turn requires the collection of data that allow feeding hotspots to be identified.

The review also acknowledges the massive efforts of many tens of thousands of volunteers who gave and continue to give their time to participate in systematic surveys and monitoring of UK birds – critical information which helps conserve and manage these important sites. The GSMP network is one of the key contributors to this and every counter can be rightly proud of the contribution they make to the protection of our best sites for migratory geese and swans.

The full report can be downloaded from the JNCC website at <http://jncc.defra.gov.uk/page-7309>

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The Goose & Swan Monitoring Programme (GSMP) monitors numbers and breeding success of geese and swans in the UK during the non-breeding season. GSMP is organised by WWT in partnership with JNCC (on behalf of NE, NRW and DAERA Northern Ireland) and SNH.

The Joint Nature Conservation Committee (JNCC) is the statutory adviser to Government on UK and international nature conservation, on behalf of Natural England, National Resources Wales, Scottish Natural Heritage and the Department of Agriculture, Environment and Rural Affairs, Northern Ireland. Its work contributes to maintaining and enriching biological diversity, conserving geological features and sustaining natural systems.

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