

The newsletter of the Goose & Swan Monitoring Programme

goose news

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36 years of Greenland Barnacle Goose research on Islay

The IGC is 60 years old

Latest results of GSMP surveys



Editorial

Welcome to the 19th edition of *GooseNews*.

As I stepped out of a small plane on to the apron at Liverpool airport late in the evening on 14 March 2020, little did I know that I would not be returning to the office at WWT Slimbridge for quite some time. My colleague Carl Mitchell and I had just returned from counting Barnacle Geese, of the Greenlandic population, off the west coast of Scotland by aerial survey. It was a spectacular, spell-binding flight, in beautiful scenery encompassing remote islands, blue seas, sandy beaches and soaring mountains, as well as the geese themselves. A week or so later finds me under the stairs rearranging furniture and boxes to make way for a desk, whilst trying to work out how to bounce natural light into the windowless area that was to become my new office. Recent months have seen changes for most, if not all, of us in the way that we work and go about our daily routines. I sincerely hope that you, your family and friends are all keeping safe and well, in what has been an extraordinary year.

The 2019/20 GSMP survey season was just coming to an end as Britain and Ireland went into lockdown in late March; however, the majority of surveys had been

completed by that time. Therefore, despite my colleagues and I having a slight break away from our desks in spring/early summer, we are now happy to be able to bring you news of how well (or not) many of the goose and swan populations are faring – from the best ever breeding season for the East Atlantic Light-bellied Brent Goose (see page 26), to the likely continued decrease in Bewick's Swan numbers in Britain (see page 18).

We also present you with tales of one keen researcher's, and his family's, 36 years of studying Greenland Barnacle Geese (see page 6), of a wondrous early morning count of Pink-footed Geese at Montrose Basin (see page 14), and of how the Icelandic-breeding Goose Census has reached its 60th year (see page 10).

And so it just remains for me to say a big thank you to everyone who contributed to the surveys and to this newsletter, and for your continued support of goose and swan monitoring.

With kind regards
Colette Hall

Aerial photograph of 197 Barnacle Geese seen at Eilean Bhrìde, Islay.

Photo: Carl Mitchell

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Survey dates for 2020/21

Icelandic–breeding Goose Census (IGC)

The IGC national organiser is Kane Brides (kane.brides@wwt.org.uk)

The coordinated census dates for autumn 2020 and spring 2021 are as follows:

Pink-footed Goose: 17/18 October, 21/22 November and 13/14 March

Iceland Greylag Goose: 21/22 November and 13/14 March

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.

Ideally, all sites supporting Pink-footed Geese should be covered during the October and November counts, whilst those holding Iceland Greylag Geese should be covered in November.

We would like to encourage all counters at sites within the winter range of Iceland Greylag Geese to also carry out a count during September if the site also supports British Greylag Geese. September counts are not strictly coordinated but ideally should be carried out during the middle of that month, although any counts made during September will be of value.

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

Greenland White-fronted Goose Census

The census is organised by the Greenland White-fronted Goose Study (<https://greenlandwhitefront.org>).

Please contact the organiser Tony Fox (tfo@bios.au.dk) for further details about the census.

Count dates for the 2020/21 census are as follows:

Autumn and spring coordinated censuses:
12–16 December 2020 and 13–17 March 2021

We very much welcome counts from all other dates and times, but for the monthly counts we especially appreciate counts in the following periods:

14–18 November 2020, 09–13 January and 06–10 February 2021

Enter your IGC and age assessment records online

Counters taking part in the Icelandic-breeding Goose Census (IGC) or undertaking age assessments can enter data online using WWT's Waterbird Monitoring Online website.

You will need to register to use the system at <https://monitoring.wwt.org.uk/recording/>, where help pages are available to guide you through the process of registering and entering counts.

If you need any further information on how to use the website, please contact WWT's GSMP team at monitoring@wwt.org.uk.

Call for help!

Help needed with IGC

We are looking for help to cover an Icelandic-breeding Goose Census site in Angus where a counter has recently retired. We are also looking for a new Local Organiser to help coordinate counts in Moray. If you are interested in helping, please contact Kane Brides (kane.brides@wwt.org.uk) for further details.

To take part, counters must be confident in identifying Pink-footed and Greylag Geese, have reasonable experience of counting birds and have confidence in their ability to estimate numbers (potentially large numbers) accurately.

Help with Dark-bellied Brent Goose age assessments

We are looking for additional help to collect age assessment data on Dark-bellied Brent Geese around coastal areas of England. If you know of a local wintering flock and you are keen to help, please get in touch with Kane Brides (kane.brides@wwt.org.uk) to register interest and to check whether this area is already being covered.

To take part, counters must be confident in identifying juvenile (first-winter) Dark-bellied Brent Geese and have some experience of counting birds. A guide to aging the species will be available to new counters. One count is required in both October and November, though counts made during any month between September and March are welcome.

Coordinated Whooper and Bewick's Swan age assessments

Three coordinated census dates are set each winter for age assessments of Whooper and Bewick's Swans.

The coordinated dates for winter 2020/21 are as follows (or the nearest date possible, preferably within three days either side):

17 November 2020

15 December 2020

19 January 2021

Counts of both species can be made during each month; however, for Bewick's, please focus on December (to coordinate with international assessment) and January, and for Whoopers, please focus on January. Assessments made at any other time during the autumn/winter are also welcome.

Find out more

Visit WWT's Waterbird Monitoring website at <https://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 access all editions of *GooseNews*.

Details about all the GSMP surveys, including how to get involved, can be found on the website at <https://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 at www.ring.ac.

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 <https://monitoring.wwt.org.uk/our-work/uk-waterbirds/goose-swan-monitoring-programme/colour-marking>.

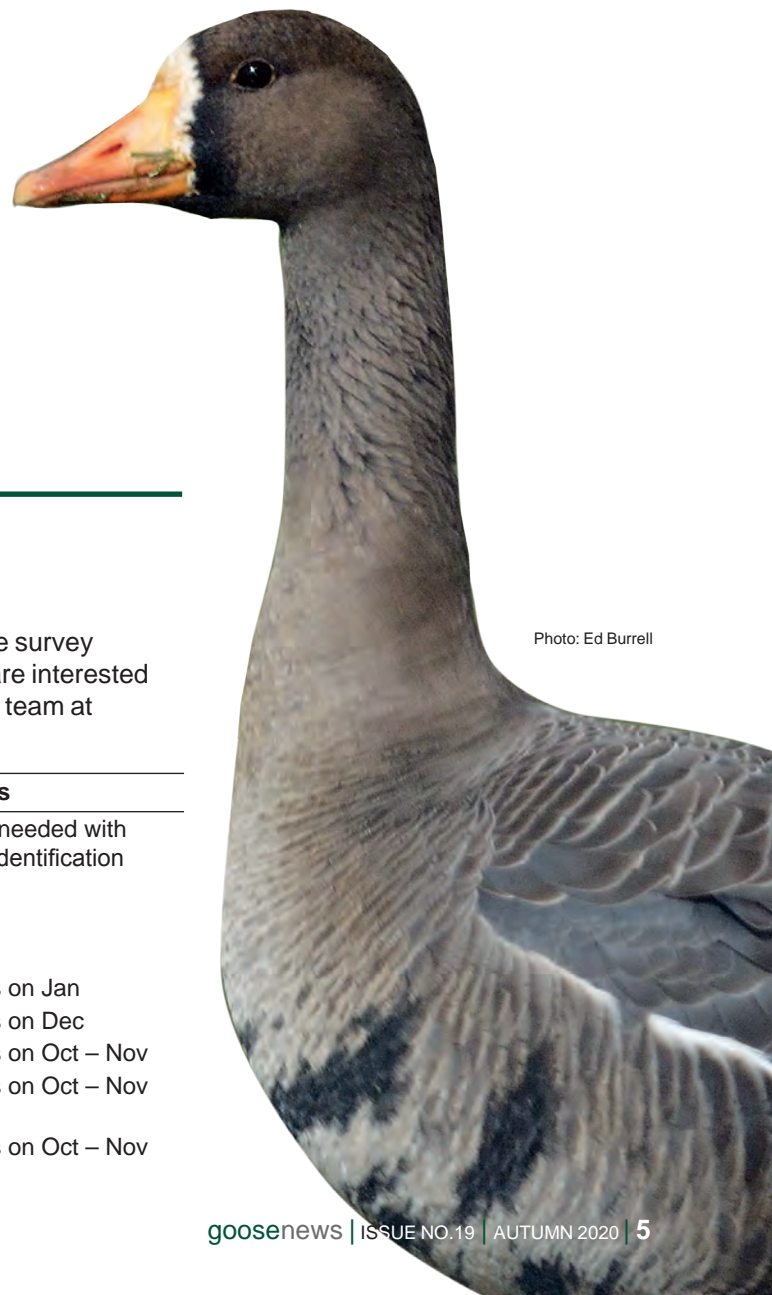


Photo: Ed Burrell

Goose age assessments

Age assessments will continue during 2020/21 as usual. The survey periods vary between species and are shown below. If you are interested in helping with these surveys, please contact WWT's GSMP team at monitoring@wwt.org.uk.

Population	Period	Notes
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	focus on Oct – Nov



Greenland Barnacle Goose research on Islay: 36 years and still going strong

Steve Percival

Ten o'clock in the morning of 24 October 1984 and I'd just read my first Islay Barnacle Goose rings, a pair (ACS and BDT) ringed in the previous summer in northeast Greenland. I'd come to start my PhD with David Houston at Glasgow University. Little did I know then that I would be watching the same bird 11 years later (ACS lived until at least January 1995), nor that I'd still be working on these amazing birds 36 years later.

My PhD was focussed on quantifying the agricultural damage caused by the geese. Islay has always been a hotspot for the geese, though numbers have changed markedly in relation to management on the island. In the late 1970s/early 1980s there was heavy commercial shooting associated with a population decline; I remember seeing Range Rovers with roof racks piled with dead geese. By the time my PhD



Photo: Steve Percival

started, however, numbers had started to increase again, coincident with increased protection under the EU Birds Directive and the establishment of Special Protection Areas (SPAs). By the end of my PhD in 1987, numbers had increased to 22,000 from a low of 13,000 five years previously. Management agreements with farmers were introduced, with payments to reduce the financial impact of the geese. This has been an important conservation success story, with the Islay population now at 35,000, though there continue to be management challenges.

Work by the Scottish Agricultural College (Patton & Frame 1979) prior to my PhD had established that the geese could reduce the grazing available to stock and lower silage yields on Islay, and I looked at this further to investigate the relationship between goose numbers and grass loss. My results confirmed that large losses could occur, but it was not a straightforward link with more geese equating to more damage. In some circumstances grass yields were actually higher under higher levels of goose grazing, and there were strong effects of weather (Percival & Houston 1992). I further investigated ways of reducing losses through the provision of feeding refuges and how those refuges could be managed to be more effective (Percival 1993).

I was also able to look at the behaviour of individual geese, thanks to the ringed birds. I was very fortunate that the start of my work coincided with an expedition to

Ørsted Dal in northeast Greenland, where David Cabot and Steve Newton ringed 647 birds in July 1984, and a further 117 were caught by Steve Newton on Traill Island the following summer. This gave a fantastic sample of individually-marked birds across the winter range.

It was 2 January 1987 before we had a successful catch of Barnacle Geese on Islay. Under the stewardship of Malcom Ogilvie, we caught 302, a total for a single catch that still remains unbeaten! He helped train me, together with the Durham University cannon-netting team headed by Peter Evans, and a few years later I had my own cannon-netting licence. In February 1989 my wife-to-be Tracey joined the team and we've never looked back. Thirty-three years later we've now ringed over 3,500 Barnacle Geese on Islay. We are now also ably assisted by our two girls, Emily and Lucy, who have grown up with October and February half-term goose-catching trips to Islay.

Catching and marking is only the first part of the story, and the project has needed a substantial investment of time to follow the ringed birds' movements and survival. The initial work was funded by the Natural Environmental Research Council, followed up by support from Durham University when I was working as a post-doc there, and Sunderland University when I lectured there. When I left

Sunderland in 2001, I was very fortunate that success with our ecological consultancy work enabled us to continue to largely fund the work ourselves, with a contribution from SNH to fund two winters' catching. The sampling programme was designed for 2–3 visits per year to Islay, and we've amassed a total of 133,000 sightings.

So, what have we learnt from all these marked birds? One of the first things we showed was how site-faithful most of the birds are on Islay, both within and between winters. We have found a clear structure to the population on Islay, with different groups of geese using specific roosts and associated feeding areas. The majority return to those areas year after year (Percival 1991). One of our oldest ringed birds, the 24-year old LBL, has been seen 250 times on Islay since he was ringed on the RSPB Loch Gruinart reserve, all but six of those sightings being on the reserve within 1–2km of his original ringing site. Some birds, though, are more mobile, for example using Islay as an autumn staging area, or moving more around the island. There need to be effective refuges in each part of the island, whilst movements to other wintering sites mean that management on Islay has the potential to affect populations elsewhere (Percival *et al.* in press). Populations on other SPAs could be reduced through the culling on Islay. We have also had a good share of more exceptional movements. We heard about XAL's journey to Ottawa, Canada, through a newspaper cutting (a photo of the bird stuffed, beside its proud hunter) and VUP became a celebrity in the Bronx, New York (as a ring-certified genuine vagrant).

Long-term data have also given us an insight into survival rates. Our oldest bird, CAX, was at least 27 years old, ringed as an adult in Greenland in 1984 and last seen on Islay in February 2011. There has been general long-term stability in survival rate over time, but there is increasing evidence of a recent decrease associated with a new management scheme on Islay (which has the objective of culling the geese to reduce numbers to 25–30,000, McKenzie 2014). This new goose management scheme was introduced in 2015, after a major increase in numbers through to 2005. Numbers since then have been more stable, nonetheless in an austerity-driven move by the Scottish Government to reduce costs, it was decided to carry out culling to drive the population down. We identified major flaws in this scheme, not just in relation to conservation but also in the effectiveness of measures to reduce agricultural damage, and suggested how it might be delivered more effectively (Percival & Bignal 2018). We hear a lot these days about policy supposedly being "led by science", and it would be good to see SNH and the Scottish Government more closely following such an approach, not least by stopping the use of lead shot in its culling, and the use of semi-automatic shotguns that cause high crippling losses.

Our work with the geese has only been possible with the help of many people. David Cabot and Steve Newton were instrumental in establishing a marked

population on Islay in the first place. David has an even longer-term study centred on the Inishkea islands in County Mayo, Ireland that he started in 1961 and is also still going strong. Carl Mitchell has collaborated with our work since our joint ringing trips to Islay back in the late 1980s with the Highland Ringing Group (and Bob Swann), as part of his population monitoring work at WWT; and more recently with Arnor Sigfusson in Iceland, marking large numbers of the newly established breeding population in south-east Iceland. Kendrew Colhoun and Alyn Walsh have also recently caught geese at other wintering sites in Ireland that are helping us to understand their movements better. We are also hugely grateful to the observers at other sites that have contributed many sightings over the years, and particularly John Bowler on Tiree, Martin Enright in County Sligo, and Steve Duffield in the Outer Hebrides.

Many thanks are due to all the folk who have helped with catches over the years (not least my mum and dad who continue to help out 25 years into their retirement), to landowners (RSPB and Islay Estates) for permission to catch, and to the many RSPB staff who have helped hugely over the years, particularly Pete Moore, Andy Knight, Mike Peacock and James How.



Photo: Aimee McIntosh

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Photo: Steve Percival

The Icelandic-breeding Goose Census – 60 years young

Carl Mitchell & Kane Brides

In December 1960, Hugh Boyd published the first report on “*A census of Greylag and Pink-footed Geese in Great Britain, 12th–13th November, 1960*”. In it, he stated that this was the most thorough attempt yet to find out how many Greylag and Pink-footed Geese were in Britain. Pioneering days. The census was carried out by volunteers from the National Wildfowl Counts, wildfowlers, six dedicated mobile observers and two observers in a light aircraft. The totals found were 30,000 Greylag and 48,000 Pink-footed Geese, and productivity that autumn was high with an estimated 45% and 31% young, respectively. Counters included Malcolm Ogilvie and Bobby Smith – both still very much active in ornithology today. The distribution of both species in 1960 makes for an interesting comparison with the situation today with no Pinkfeet recorded in Norfolk and no Iceland Greylag Geese recorded in Orkney or Caithness at that time.

The census had been a success and plans were made to repeat the counts the following autumn. The census continued on an annual basis and, by 1969, sufficient count data had been collected for a review of Pink-footed Goose numbers which was published in *Wildfowl* by Hugh and Malcolm. This was

followed by a similar publication of Greylag Goose numbers in 1972. These reviews were updated in 2004, in the WWT/JNCC Waterbird Review Series which documented changes in the number of birds at most of the roosts in Britain from 1960 onwards. A review of the status of the Greylag Goose population was then published in 2010 in *Wildfowl*. The Icelandic-breeding Goose Census (IGC) continues to this day with the 60th annual counts having been undertaken in autumn 2019. Today, due to changes in the winter distribution of the geese, the census range now covers the whole flyway with colleagues in Iceland, the Faroes, Norway and Ireland contributing to the scheme. A light aircraft is still used – but in Iceland.

Goose counting can often involve arriving at a roost an hour before dawn; no mean feat when this involves traveling along winter roads to a wind-chilled estuary or remote hill loch. Some independent goose groups have become established and their local detailed monitoring is invaluable in assessing counts and movements at a finer scale than the national monitoring can achieve. As nature reserves became established, especially after the designation of Sites of Special Scientific Interest (SSSIs) from the 1980s, so the monitoring of geese



Photo: WWT



using the most important roosts became a requirement of assessing the condition of the designated areas – thus, goose counts became part of the routine for some RSPB and other organisations' staff and volunteers. Several goose monitoring schemes in other parts of Europe have followed the example set by the grey goose scheme.

Our understanding of the status and distribution of both Greylag and Pink-footed Geese is much the better for the efforts of volunteer goose counters. There has been an increase in Pink-footed Goose numbers from just over 30,000 birds in the 1960s to over half a million birds in the late 2010s. There have been changes in the winter distribution too, with Norfolk now supporting a greater proportion in mid-winter than in former years.

The fortunes of Iceland Greylag Geese have followed a different trajectory. Their accessibility to hunting in Iceland has led to over 30,000 being shot annually and, during the 1990s, there were fears that that level of hunting was unsustainable. The grey goose counts indicated that the population was decreasing. However, a shift in winter distribution during the 2000s, which now sees 50–60% of the entire population wintering on Orkney, reduced the number being shot during the winter and the population appeared to stabilise, although there are signs that the population has started to decline again in very recent years (see page 17).

But whither the future? The IGC faces challenges in the coming years. The shift in the majority of Iceland Greylag Geese from wintering in East Central Scotland to North Scotland has shown that the IGC needs to be nimble in order to accommodate winter re-distribution. The winter distribution of migratory Greylag Geese from Iceland now overlaps with the increasing British/Irish population, which brings its own problems, both for adequately determining abundance and annual reproductive success; the latter nigh on impossible when birds from both populations are in the same field.

The recent use of telemetry devices has also shone a light on geese roosting at sites hitherto unknown to the counter network. Pinkfeet are starting to winter in Ireland, where plentiful grass could accommodate far greater numbers in the future. We also need to be aware of the role that climate change plays on the distribution of geese in winter and also the timing of their migratory movements. Several thousand Greylag Geese no longer migrate to Britain each winter. Recent relatively mild winter conditions in Iceland and an increase in the growing of arable crops there (itself made possible through milder conditions) have enabled the geese to abandon migration altogether. How long before wintering Iceland Greylag Geese in Britain becomes a memory?

Above all, the success of the scheme relies on a team of volunteer observers – and we are not getting any younger. We are actively searching for younger goose counters to take up the challenge. The attraction of goose roost counting may not appeal to all, but there are rewards. Witnessing thousands of wild geese take to the air on a crisp, autumn morning is a wildlife spectacle that can be hard to beat. The IGC needs to attract a younger generation of counters to carry on the good work.

Over the years, the census has been organised by several members of WWT staff, both past and present, including (in order of involvement) Hugh Boyd, Malcolm Ogilvie, David Salmon, Jeff Kirby, Richard Hearn and authors Peter Cranswick, Helen Rowell, Jenny Worden and Julia Newth have assisted with the annual report.

The population estimates derived from monitoring over the last 60 years have largely been gathered by volunteer counters and their efforts have been rewarded with a far better understanding of the distribution and abundance of geese in Britain. So, in this, the sixtieth year of the Icelandic-breeding goose counts, a hearty thanks to all volunteer goose counters!

Read more

All IGC reports from 1960 to the most recent and the WWT / JNCC Waterbird Review Series <https://monitoring.wwt.org.uk/our-work/goose-swan-monitoring-programme/reports-newsletter/>

Wildfowl journal online <https://wildfowl.wwt.org.uk/index.php/wildfowl>

GSMP data are already making a difference – can they do more?

Kirsi Peck & Anna Robinson

The Goose & Swan Monitoring Programme (GSMP) is made up of several individual surveys, each concentrating on one or two populations of the migratory geese and swan species that winter in the UK. Over the years, these surveys have produced long and significant datasets. 2019 marked the 60th year of the Icelandic-breeding Goose Census (IGC), one of the oldest of the suite of surveys.

Summaries of data from the majority of these surveys are published in this newsletter you are currently reading, and on the GSMP website¹. The majority of these data summaries are available as ‘open data’ meaning anyone can refer to and use the information. In addition to informing goose enthusiasts and generating data for analysing population trends, they make up a valuable component of the national WeBS (Wetland Bird Survey) reports² in which the waterbird surveillance data are published as Official Statistics³. These statistics feed into the UK Biodiversity Indicators⁴, which are used by government in a variety of policy decisions that impact species and habitat conservation.

Sometimes population totals are not enough and more detailed raw data are needed for a variety of reasons, for instance determining shifts in distribution and trends in numbers at the site level, for planning casework, for site or species management, or for scientific research. GSMP data have been used, alone or in combination with other monitoring programmes, in many scientific publications. These include monitoring of trends in population size (e.g. Frederiksen *et al.* 2004, Hall *et al.* 2016 and the annual IGC reports), parameterising population viability analyses (Trinder *et al.* 2005), informing progress on international species action plans (Beekman *et al.* 2019), and determining the drivers of population change (e.g. Wood *et al.* 2018a,b, 2019, Nuijten *et al.* in review).

To date, researchers or others requiring access to GSMP data have been able to request it from each of the participating groups for use limited to their particular project. However, in recent years the wider scientific world, including biodiversity recording, has been rapidly moving towards what is known as ‘open data’. Open data⁵ are easily accessible data that anyone is free to use, re-use, and share for any

purpose. Usually ‘attribution’ is required to give credit to the original data collectors. In the scientific world, research papers in many journals are standardly accompanied with a downloadable copy of the data used in the analyses presented in the paper. As this enables other scientists to confirm or challenge the analysis, it increases the public scrutiny and, with it, trust in any rigorous research and its findings. The GSMP Partners have recently agreed a new data access policy and are keen to make as much of the data as open as possible to maintain the scheme’s position as a recognised source of rigorous, reliable data.

Having monitoring data openly available also has many conservation advantages. Increased public availability of environmental information promotes transparency in decision-making about the environment. Good policy-making, planning, development and risk management all depend on reliable, up-to-date information about biodiversity status and trends. When data underpinning these are openly available, it increases the trust we have in these policies.

In the planning arena, survey data are often key to objective planning decisions and site conservation. How the environment is taken into consideration in the planning process is variable, and largely depends on the size and location of a proposed development, and whether the site is covered by a conservation designation. If a proposed development is large, or is in a sensitive area such as a national park or Site of



Special Scientific Interest (SSSI), an Environmental Impact Assessment (EIA) is required. These assess the environmental value of the site and evaluate the impact of the development on any significant features therein. EIAs make use of existing environmental data, and where this is not available new studies can be carried out. EIAs are often carried out over a limited time period, and since the planning authority assesses the proposal against the information presented, open access to existing biodiversity data such as bird monitoring records would ensure that these interests are fully represented. A planning authority may require a limited statement on environmental impact even for a small development. In these situations, open access to survey data can be even more important to ensure that what may be a seasonal key site for the birds locally is not overlooked.

Openly available site-based survey data that can be used by all stakeholders helps to make the whole planning process more objective, transparent and robust, and often strengthens the conservation case in the process. It helps the planning authority make better-informed decisions. It also has the benefit that development proposals can be modified or even steered to an alternative site at an early stage based on the survey information, saving everyone involved a lot of time and money. The more extensive the dataset, the more influence it is likely to have. In this way, making survey data such as the goose and swan monitoring data openly available clearly can be a force for good. As well as allowing wider use, being openly available also, importantly, allows scrutiny of how data are used and interpreted so that they remain unbiased.

So how does this relate to the GSMP?

Being a composite of several surveys, including those organised over many years by independent research groups which contribute their data to provide a national perspective, the data reported on by the GSMP are variable in how raw data are collected and stored, how readily the data are available to use, and the conditions attached to access and use of the data. Standardising these so that data from the different surveys are available to access and use, preferably under the same open data license, and with collated metadata (which includes information about the source and the form of data collected) available at a central site, would help to facilitate access to the GSMP data for a range of applications, ultimately benefiting the birds we survey.

Making data openly available, particularly at their finest level, requires permission from the observers who collect them in the field as well as the survey organisers. Such permissions are usually sought when observers register to join a survey or at the point of data entry. If you take part in a GSMP survey coordinated by WWT you will have already seen new wording to sign up to giving this permission, and if you are keen to request detailed data from the scheme, you will see from the website that these data will be available under an 'open government licence'. The

GSMP partnership has carefully considered issues around personal and sensitive data and has made the decision to not release recorder names with datasets, and to withhold publishing of data under an open licence where it is judged that its release would be likely to harm the environment, taking on board advice from the statutory country conservation agencies and the Rare Breeding Birds Panel. However, in practice we expect this to be a very unusual situation and are conscious that, in general, openness allows wildlife to be better considered, as well as increasing trust and transparency in public policy, land management, the planning process, and scientific research.

Footnotes

- 1 The GSMP website can be found at <https://monitoring.wwt.org.uk/our-work/goose-swan-monitoring-programme/>.
- 2 The Wetland Bird Survey (WeBS) is a partnership jointly funded by BTO, RSPB and JNCC in association with WWT with fieldwork conducted by volunteers. The WeBS report online is available at <https://app.bto.org/webs-reporting/>.
- 3 The annual results from many surveillance schemes are published as Official Statistics, a status that gives extra value to the scheme data.
- 4 Biodiversity indicators are a suite of statistics providing evidence of environmental status and change across the UK. They are published annually at <https://jncc.gov.uk/our-work/uk-biodiversity-indicators-2019/>.
- 5 Open data are data made available to use under Open Government Licence <http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>.

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Dawn at the Basin

Anna Cowie



Montrose Basin (Angus) on the northeast coast of Scotland is an enclosed estuary fed by the River South Esk. The estuary supports thousands of migratory birds, including Pink-footed Geese, which are annually monitored by Scottish Wildlife Trust rangers and volunteers. Here, Anna Cowie, a ranger at the site, tells us about a particularly memorable count.

It was October 2016. Pre-dawn in the northeast of Scotland, but neither bleary eye nor stifled yawn could be found among us. This was the Scottish Wildlife Trust Montrose Basin goose counting team and we were ready and raring to go. There was muted excitement between us. Nobody dared jinx it, but we knew there could be an impressive number of Pink-footed Geese on the reserve that morning. Could we break the reserve record? The anticipation was palpable.

As the ranger it was my job, no: privilege, to coordinate the team. We were seasoned goose-counting veterans, so my task was made easy. The tide was falling and the enclosed estuary, all 750 hectares of mudflats, was divided into the regular counting zones covered by our determined team of eight. Teasing open the windows of the Montrose Basin Visitor Centre that look out over the estuary, we could hear through the darkness that unmistakable sound of the Pink-footed Geese waking from their roost across the basin. It was time to get into position. I ventured up the hill to the south and took up my vantage point from where I could observe the entire reserve. We were to record the geese as they left their roost and fly out to feed as dawn broke. At 6:30am, I could make out the lights of all the counters taking up their posts – we were ready.

That morning I was grateful for the calm weather. Many times before and since I have been bowled over by the resilience of my volunteer team in braving the bitterly cold winds that can whip across the basin from the North Sea to the exposed shore. Undeterred they will bear over three hours in harrowing conditions: dedicated to the task in hand.

I employed my trusty scope as the light levels increased, to endeavour to estimate the amount of geese down in the main roost site in the northeast corner in front of the Tayock hide. It was impossible to tell, but for a moment disappointment crept over me as the scale of the roost seemed less than I had thought the previous morning, when I had been out without my faithful team. I consoled myself with the fact that it is very difficult to estimate the size of the roost when the tide is still in as the geese are bunched up more closely together when on water. I double-checked my tide table; it would not be low until just after 10am that morning – I would just have to wait.

The wait seemed a long one before there was any movement and then “ink-ink, ink-ink”; by 7:15am, the first few geese started to head out to feed. Low numbers left at first in small skeins of up to 24. I could clearly make out my ground boundaries and I knew the others

would be able to see theirs too.

These are landmarks that we use to determine our own counting zones

end and the next begin. Everyone had been well briefed and I had confidence in my team. We all used varying methods that suited us for recording the geese as they left: some used tally counters, others a dictaphone whilst some (like myself) preferred only to rely on pen and paper. All was quiet over the southern boundaries once more, but I could make out a few larger skeins of geese heading out over the north and north east that would be covered by members of the team stationed there.

By 7:40am, I was once again occupied in counting over my zone and busily scribbling away in my jotter. The team were all engaged in this way for some time as the geese started to leave in greater numbers: skeins of hundreds and thousands now. When I could find a brief pause in activity over my zone, I would focus my scope back down to the main roost site to roughly determine how many were left. To my astonishment, each time I focused in this way the amount of geese on the roost appeared unaltered.

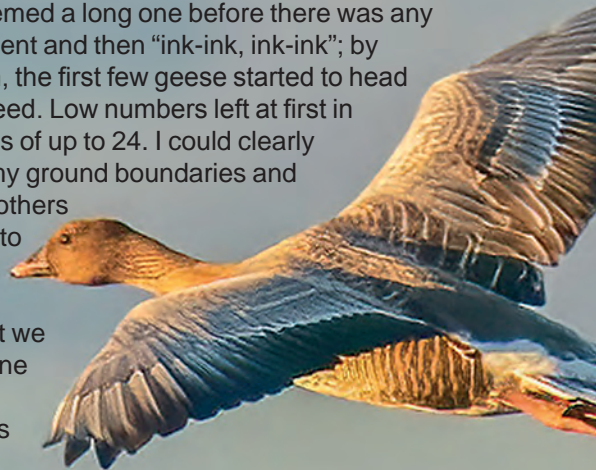
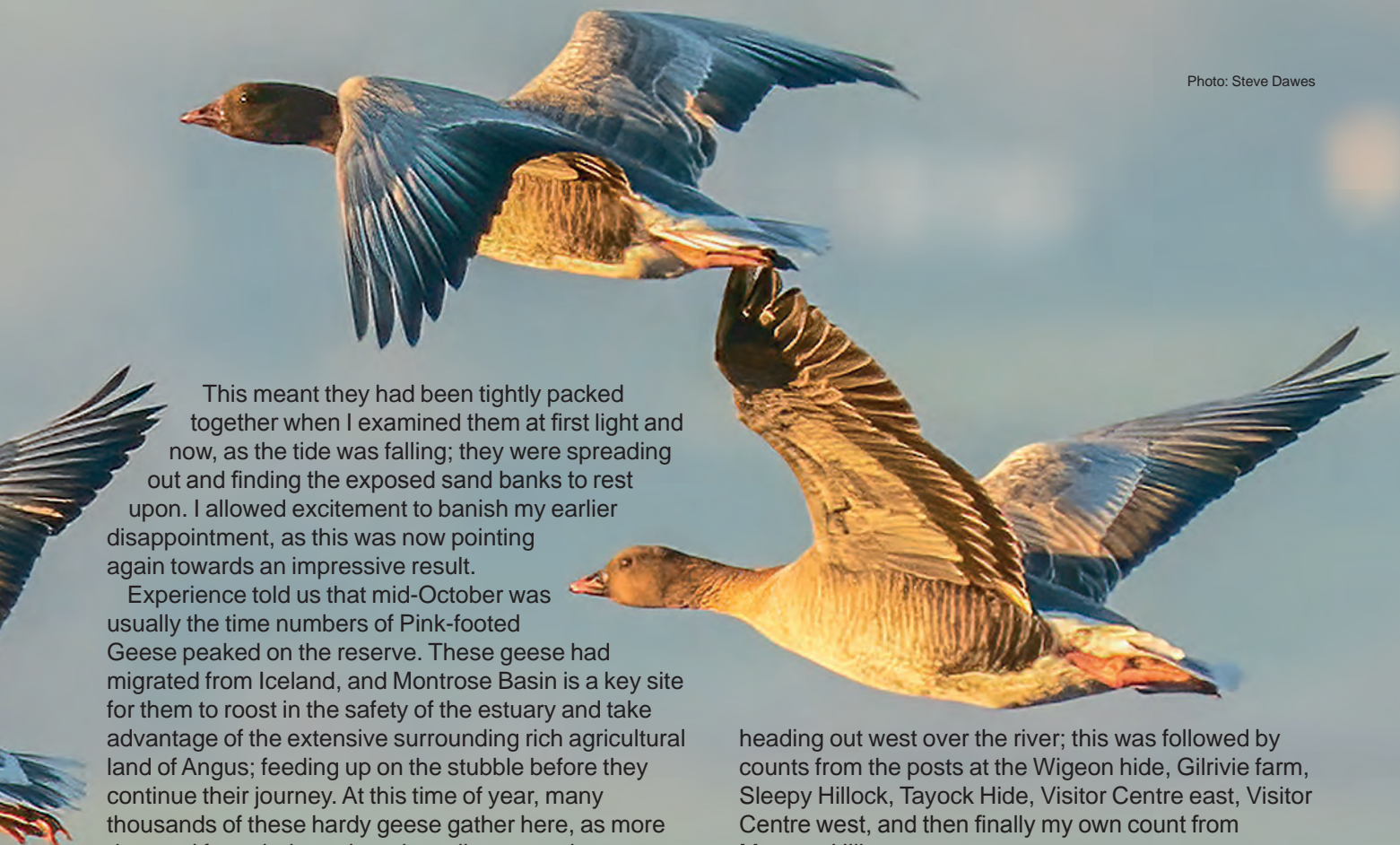


Photo: Scottish Wildlife Trust



This meant they had been tightly packed together when I examined them at first light and now, as the tide was falling; they were spreading out and finding the exposed sand banks to rest upon. I allowed excitement to banish my earlier disappointment, as this was now pointing again towards an impressive result.

Experience told us that mid-October was usually the time numbers of Pink-footed Geese peaked on the reserve. These geese had migrated from Iceland, and Montrose Basin is a key site for them to roost in the safety of the estuary and take advantage of the extensive surrounding rich agricultural land of Angus; feeding up on the stubble before they continue their journey. At this time of year, many thousands of these hardy geese gather here, as more descend from their northern breeding grounds.

We continued our count for some time with a steady stream of geese leaving the estuary. Finally, numbers on the ground appeared to thin out and then: silence. The 'inking' had ceased and that sound reminiscent of a busy school playground fell quiet. All the Pink-footed Geese had left the reserve – every one of them. I contacted the team at all the posts to make sure there were none hidden in dips of the undulating terrain of the estuary that were not visible from my station, but they confirmed what I had observed from my vantage point.

I would not like to fool the reader into believing that all dawn counts operate as smoothly as it did on this occasion. More often than not, a large number of geese do not leave in the first couple of hours, at which point, some geese that have already left and been counted out begin to return. This complicates our data and so this is the point where we concede to a 'ground count'. Often thousands of geese need to be counted in this way. This is arranged in reaction to the position of the geese that are left and volunteer counters are given a new zone to count geese on the estuary depending on their visibility from each location. Where it is possible, ground counts are duplicated by counters from a differing angle to confirm that the number is accurate.

That morning I had the pleasure of calling round the team, not to give directions for a ground count, but to ask all to reconvene at the Visitor Centre where we would tally up our data.

Breakfast was served: crumpets, croissants, tea and coffee. While we enjoyed our well-earned sustenance, the numbers from each zone came in. First the count from 'The Lurgies', not a big number but that was usually the case as this area covered the low geese

heading out west over the river; this was followed by counts from the posts at the Wigeon hide, Gilrivie farm, Sleepy Hillock, Tayock Hide, Visitor Centre east, Visitor Centre west, and then finally my own count from Maryton Hill.

Reading the figure in my hand, I did my best to keep a straight face before the grand reveal.

We had our record: 90,000 pink-footed geese.

I said it twice.

The team fell silent for a moment, astonished. The enormity of the record we had just counted struck us all. We remarked that 15 years earlier we would have felt the same about half the amount of geese such had been the dramatic increase in numbers using the reserve at this time of year, which is a reflection of the growth in population of the Icelandic-breeding Pink-footed Goose.

Three seasons have since passed, and we have yet to observe an increase on that 2016 record, although subsequent years have come close to it.

Monitoring the geese at the Scottish Wildlife Trust Montrose Basin Wildlife Reserve over the past ten years is a role that has been my privilege to undertake. It is certainly true that with each season, I grow more absorbed in observing goose behaviour and I hope to continue to winter with the awe-inspiring Pink-footed Geese at Montrose Basin for many years to come.

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 page for contact details).

Latest news from GSMP surveys

The table below shows the total counts and the breeding success* of goose and swan populations wintering in Britain and Ireland, recorded during various surveys in 2019/20, with the exception of the results for Greenland White-fronted Goose which are for 2018/19. Surveys were undertaken at an international or national scale, or at a few key sites. See the individual population reports that follow for further details.

* Age assessments comprise two measures of annual breeding (reproductive) success (or productivity): the proportion of young (first-winter) birds in non-breeding flocks, and the mean brood size (number of young produced by successful breeding pairs).



Photo: WWT

More detailed results are available on the GSMP web pages at:

<https://monitoring.wwt.org.uk/our-work/goose-swan-monitoring-programme/species-accounts/>

Population	Total count ¹	Percentage young (%)	Mean brood size (young per successful pair)
Northwest European Bewick's Swan	-	17.1	2.03
Iceland Whooper Swan	-	8.5	1.87
Taiga Bean Goose	214 ²	11.3 (Slamannan)	3.0 (Slamannan)
Greenland/Iceland Pink-footed Goose	500,928 ³	15.6	1.98
European White-fronted Goose	-	19.1	2.05
Greenland White-fronted Goose ⁴	21,466 ⁵	12.3 (Islay) 6.9 (Wexford)	2.80 (Islay) 2.92 (Wexford)
Iceland Greylag Goose	73,355 ³	20.1	2.17
British Greylag Goose	-	41.2 (Tiree)	2.47 (Tiree)
Greenland Barnacle Goose	-	10.1 (Islay) 7.2 (Tiree)	2.0 (Islay) 1.4 (Tiree)
Svalbard Barnacle Goose	36,000 ⁶	5.2	1.6
Dark-bellied Brent Goose	-	13.1	2.26
East Atlantic Light-bellied Brent Goose	-	37.5 (Lindisfarne)	3.18 (Lindisfarne)

1 The official UK population estimates (e.g. for calculation of national 1% thresholds) are those published in; Woodward, I., N. Aebischer, D. Burnell, M. Eaton, T. Frost, C. Hall, D. Stroud & D. Noble. 2020. Population estimates of birds in Great Britain and the United Kingdom. 2020. *British Birds* 113: 69–104. 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 for the Slamannan Plateau (data provided by the Bean Goose Action Group) and the Yare Valley (data provided by RSPB).

3 Flyway total. From; Brides, K., C. Mitchell & S.N.V. Auhage. 2020. *Status and distribution of Icelandic-breeding geese: results of the 2019 international census*. Wildfowl & Wetlands Trust Report, Slimbridge. 19pp.

4 Results presented for the Greenland White-fronted Goose are from surveys undertaken in 2018/19.

5 Flyway total. From; Fox, A.D., I.S. Francis, D. Norriss & A.J. Walsh. 2019. *Report of the 2018/19 International Census of Greenland White-fronted Geese*. Greenland White-fronted Goose Study report. 22pp.

6 Adopted Solway total. Griffin, L. 2020. *Svalbard Barnacle Goose distribution around the Solway Firth 2019–2020: Flock counts from the Solway Goose Management Scheme area*. Final report to SNH. WWT, Slimbridge.

Icelandic-breeding Goose Census 2019

Kane Brides

In autumn 2019, the Icelandic-breeding Goose Census (IGC) saw its 60th consecutive year of monitoring the Greenland/Iceland Pink-footed and Iceland Greylag Goose populations. Coverage in Britain was excellent, with counts also received from Ireland, the Faroe Islands, Iceland and Southwest Norway. New population estimates were derived for both populations.

500,928 Pink-footed Geese were counted during the October census, whilst a total of 357,507 was recorded in November. The October count has been selected as the population estimate for 2019 and represents an increase of 13.6% on the previous year (440,891 birds). This takes the population back over the half million mark once again, having previously reached this level in 2015 and 2017.

It is possible that the 2018 estimate suffered from some degree of undercounting: the lack of information regarding how many Pinkfeet were present in Iceland during October 2018, twinned with the potential for birds to have been roosting at locations in the UK not covered for the census, could have contributed to an underestimate of the population size. In October 2019, a concerted effort was made by colleagues in Iceland to count the Pink-footed Geese (previously only ad hoc counts were made), which will hopefully be built upon for future censuses. And in the UK, coverage of several potential new roost sites helped identify where goose flocks may previously have been missed.

During October and November, the breeding success of Pink-footed Geese was sampled at locations in Scotland and England, with 15.6% young found amongst those flocks assessed: this being lower than the previous ten-year mean of 17.6%. The mean brood size of successful pairs was 1.98 goslings.

During the November census, a total of 101,235 Greylag Geese was counted across the flyway. This figure was adjusted to account for the estimated number of British/Irish Greylag Geese likely to have been counted during the census, resulting in an amended population estimate of 73,355 Iceland Greylag Geese. Compared with the previous year, this

represents an increase of 25.6% in the population; however, it is worth noting that the population estimate in 2019 remains below the ten-year average of 92,851 birds (2009–2018). It remains uncertain the degree to which undercounting and under-estimation in Orkney affected the 2018 population estimate.

Orkney continues to hold the largest proportion of the Iceland Greylag Goose population during the winter, where the geese mix with large numbers of birds from the British population. A good understanding of the number of British Greylags present is, therefore, required in order to help determine the number of Icelandic geese. To do this we used the results from the most recent post-breeding census of Greylags in Orkney, which was undertaken in August 2019 (22,956 birds, J. Plowman pers. comm.) and adjusted the total to account for the estimated number of British birds harvested in Orkney between August and November 2019 (c.5,000 birds, J. Plowman pers. comm.). Therefore, 18,000 birds were deducted from the overall Orkney total to give the best possible estimate of the number of Icelandic Greylag present during the census.

The breeding success of Iceland Greylag Geese was sampled in northern Scotland with 20.1% young recorded amongst flocks, which is lower than the previous year and slightly lower than the previous ten-year mean of 21.7%. The mean brood size was 2.17 goslings per successful pair, although both breeding success and brood sizes were based on very small sample sizes. However, as mentioned in previous *GooseNews*, it has become difficult to assess annual breeding success for this population due to the presence of birds from the British Greylag Goose population; the main wintering areas for the Iceland migrants in North Scotland are also home to tens of thousands of British birds.

We are extremely grateful to the many Local Organisers and counters who have been involved in the 60-year existence of the IGC, and without whom, the annual monitoring of the Pink-footed and Iceland Greylag Goose populations would not be possible.

Photo: Jim Porter

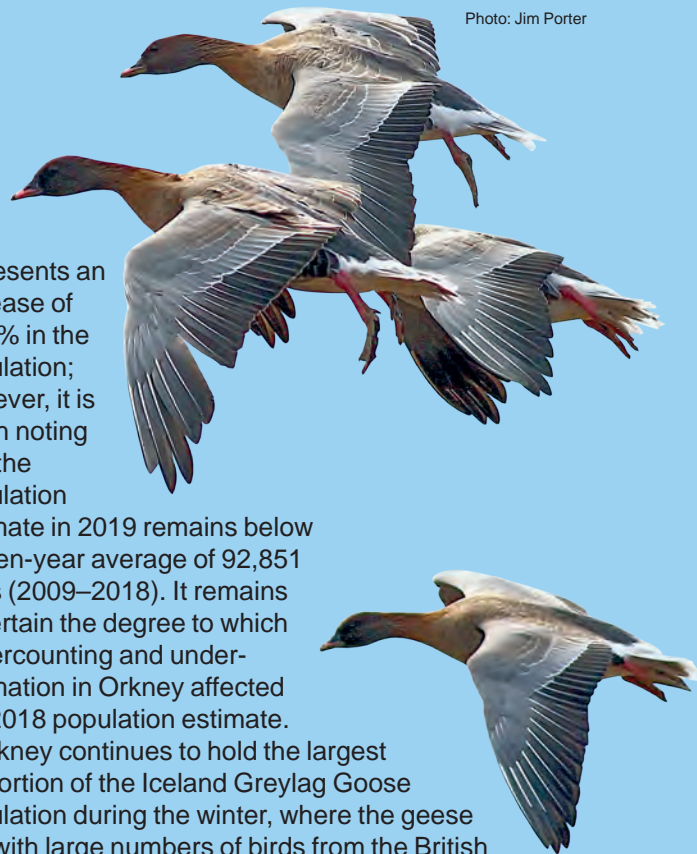
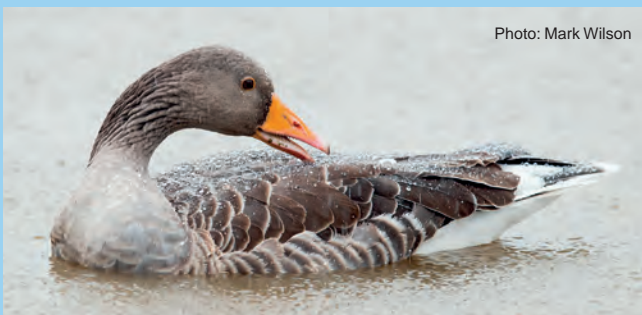


Photo: Mark Wilson



International Swan Census

Kane Brides

January 2020 saw the 8th International Swan Census take place across Europe, with hundreds of counters out in the field looking for yellow-billed swans. The census, organised across the continent by the IUCN SSC Swan Specialist Group¹, covers the two populations of migratory swan that occur in Britain and Ireland: the Icelandic Whooper Swan and the Northwest European Bewick's Swan.

WWT works in partnership with BirdWatch Ireland and the I-WeBS² team, the Irish Whooper Swan Study Group and our colleagues in Iceland to coordinate the census of the Icelandic Whooper population across its flyway, and also counts of Bewick's Swans in Britain and Ireland that will be added to those collected elsewhere in Europe. The census in Britain largely involves the WeBS³ counters and our thanks go to the British Trust for Ornithology (BTO) for all their help in coordinating communications with the network.

We are extremely grateful to all the counters, local organisers and census coordinators in Britain, Ireland and Iceland for all their support.

Coverage was excellent and counts have been rolling in to help produce the new population estimates. To date, counts submitted via WWT's Waterbird Monitoring Online show that over 450 counters took part in the census with over 4,000 individual counts being submitted.

Whilst the census data have yet to be analysed, it is looking likely that the observed decline of Bewick's Swans in Britain has continued: the count at the Ouse and Nene Washes (Cambridgeshire/Norfolk), where the vast majority of Bewick's now winter in the country, was just c.1,000 swans compared with c.3,000 recorded during the previous census in 2015. Conversely, there are early indications of a continued growth in the Whooper Swan population. National organisers in Northern Ireland

and the Republic of Ireland have both commented on a possible increase in Whooper Swan numbers in their regions, and a preliminary glance at counts from England's key area for the species, again this being the Ouse and Nene Washes, suggests the highest census derived total to date was recorded at the site: c.11,500 compared with c.8,300 in 2015.

If you have any counts that still need to be submitted, please do so as soon as possible via WWT Waterbird Monitoring Online at <https://monitoring.wwt.org.uk/recording/>.

Results will be published in the next edition of *GooseNews* and on our website at <http://monitoring.wwt.org.uk/>. Further information about the census can also be found there, including reports from previous surveys.

Footnotes

- 1 International Union for Conservation of Nature Species Survival Commission (IUCN SSC) Swan Specialist Group <http://www.swansg.org/>.
- 2 The Irish Wetland Bird Survey (I-WeBS) is coordinated by BirdWatch Ireland and funded by the National Parks and Wildlife Service.
- 3 The Wetland Bird Survey (WeBS) is a partnership jointly funded by BTO, Royal Society for the Protection of Birds and Joint Nature Conservation Committee in association with WWT with fieldwork conducted by volunteers.

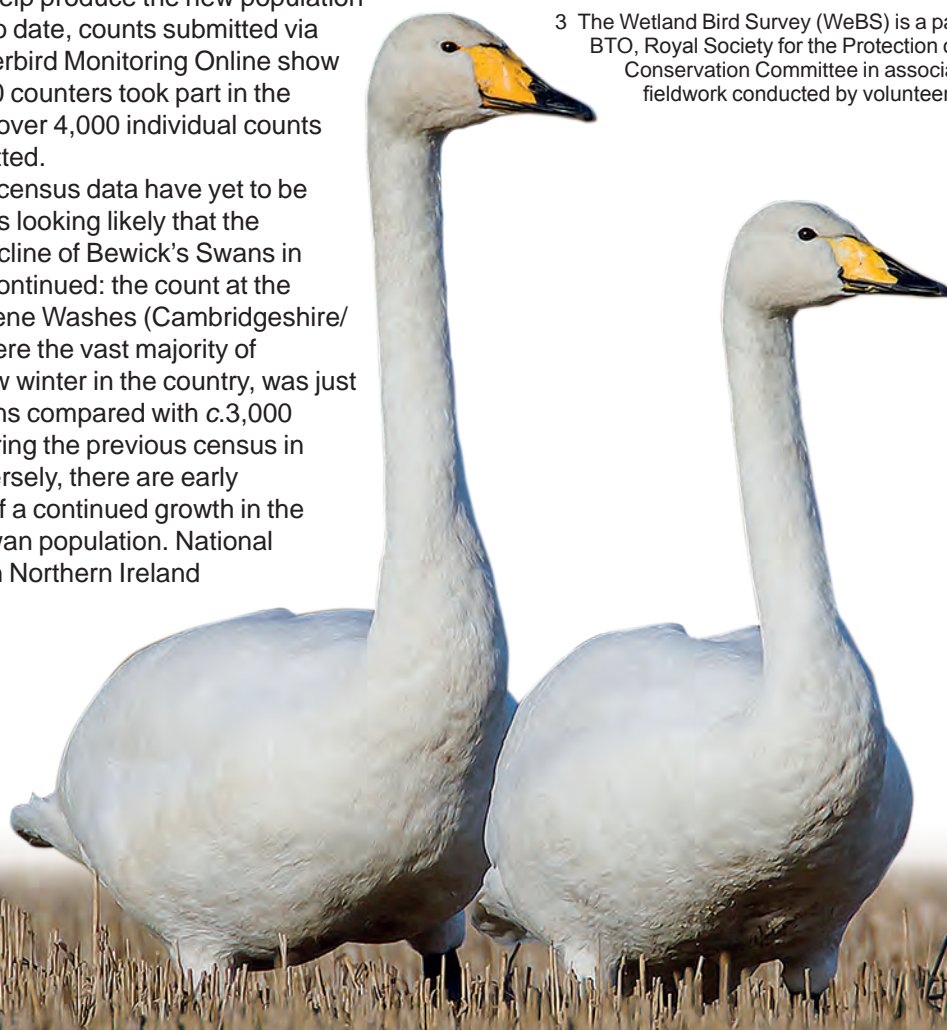



Photo: John Anderson



Whooper & Bewick's Swan breeding success, 2019/20

Kane Brides & Julia Newth

Photo: Sean Gray

The five-yearly International Swan Census carried out in January 2020 allowed a greater sample of Whooper Swans to be age assessed across Britain and Ireland. An impressive 30,185 Whooper Swans, representing 88.8% of the total population recorded at the last international census in 2015 (Hall *et al.* 2016) were aged. Spread across the wintering range, 12,423 birds were aged in England, 3,285 in Scotland, 193 in Wales, 27 in the Isle of Man, 4,125 in Northern Ireland and 10,132 in the Republic of Ireland. Overall, 17.1% of birds were cygnets, this being higher than the previous ten-year mean (15.8%) and the mean brood size for pairs with young was 2.03. No extreme weather events were reported from the breeding grounds in Iceland, perhaps explaining the relatively successful breeding season in 2019.



In contrast, age assessments of Bewick's Swans carried out during the census suggest that flocks wintering in England experienced another relatively poor breeding season in 2019. Across three regions, 1,197 Bewick's Swans were aged: 1,094 in East Central England, 89 in Southwest England and 14 in Northwest England. Overall, these flocks contained 8.5% cygnets, which is below the previous ten-year average (13.9%) for flocks recorded in these areas. The mean brood size was 1.87 per successful pair. The results from England reflected those of the age count held across Europe in December 2019. Of the 9,188 swans aged across ten countries (including England), only 6.6% were young birds, this being lower than the previous ten-year mean of 9.1% (2009–2018) and suggests that 2019 was a poor breeding year for the Northwest European Bewick's Swan population as a whole. Interestingly, with increasing numbers of Bewick's Swans wintering further east, age assessments were received from Estonia for the first time and a record number of swans for the time of year was recorded in Poland.

Our continued thanks goes to all who help with these age assessments, particularly to the Irish Whooper Swan Study Group and BirdWatch Ireland for coordinating Whooper Swan counts in Ireland. Our thanks also to Wim Tijssen and Kees Koffijberg for providing the international data reported on here.

Reference

Hall, C., O. Crowe, G. McElwaine, O. Einarsson, N. Calbrade & E. Rees. 2016. Population size and breeding success of the Icelandic Whooper Swan *Cygnus cygnus*: results of the 2015 international census. *Wildfowl* 66: 75–97.

Taiga Bean Geese wintering in Britain in 2019/20

Carl Mitchell

The two flocks of Taiga Bean Goose wintering in Britain were monitored during winter 2019/20. Counts were undertaken at the Slamannan Plateau, Falkirk by the Bean Goose Action Group and at the Yare Valley, Norfolk, by RSPB reserve wardens. At the Yare Valley, where the number of wintering Bean Geese has been declining for the past 25 years, the peak count was of only seven birds, 14 fewer than the previous winter. The duration the birds spend in Norfolk has also shortened, with birds now only recorded in December and January. The long and slow decline in numbers wintering in England continues and one wonders when the last birds will spend the winter there.

A peak count of 207 birds was recorded at Slamannan on 24 October, 34 fewer birds than the maximum recorded in the previous winter (241). The first 108 Bean Geese were seen on 3 October, although a Bean Goose fitted with a Global Positioning System (GPS) tag had arrived the day earlier (with an unknown number of other birds). The last 22 birds were seen on 3 February. Breeding success was estimated from a sample of 141 birds at Slamannan in late October; 16 birds were aged as first winter (11.3% young) with a mean brood size of 3.0 young per successful pair. The number of Bean Geese wintering at Slamannan has fallen from 300 birds as recently as 2007/08. However, there appears to be a mismatch between annual breeding success and the number of birds overwintering in Scotland. In winter 2018/19, 7.0% young was recorded, and winter numbers increased by 6%, but in winter 2019/20 there was 11.3% young and numbers decreased by 14%; the opposite to what might be expected. Quite what is driving the change in numbers at the site is not clear. The surveillance may suffer from low sample sizes when determining breeding success,

or there may yet be hitherto undetected connections with birds wintering in Denmark one year and in Scotland the next.

Since 2011, a number of Bean Geese from the Slamannan flock have been caught and fitted with GPS tracking devices to help map out their winter quarters and shine a light on their migration routes and the timing of their movements. Five adult Bean Geese were caught at Slamannan in October 2019 and fitted with GPS devices. The geese left Scotland remarkably early in 2020, with the first two GPS-tracked birds crossing the North Sea in the first week of January. Despite all five birds being together when caught, the tagged geese neatly demonstrated the two spring migration routes to the breeding grounds; part of the flock used staging areas in northwest Denmark and to the northeast of Oslo (Norway); and part of the flock staged near Karlstad (southern Sweden, Figure 1). One individual showed a mixed strategy, using both migration stop-over points (orange line in Figure 1). The first tagged geese arrived on the breeding grounds further north in Sweden on 7–8 April 2020.

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

Figure 1. Spring staging areas in February and March 2020 of five Taiga Bean Geese caught at Slamannan, Scotland in October 2019, and one bird caught in 2015. Note that two of the 2019 cohort were a pair, and only one movement line of the pair is shown on the map.

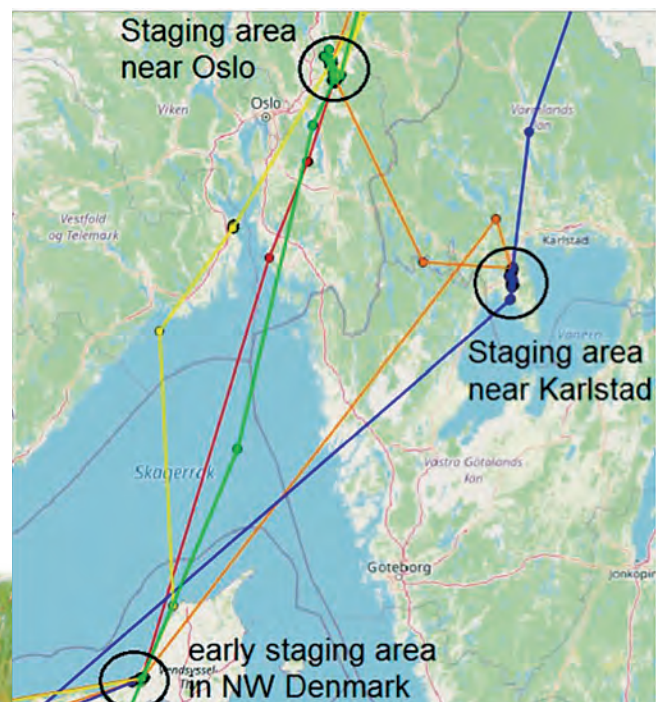


Photo: John Anderson

Monitoring of British Greylag Geese in key areas of Scotland in 2019

Carl Mitchell

The British population of Greylag Geese is now widespread throughout the country, with birds commonly seen in many areas; thus their status is mostly tracked through the Wetland Bird Survey (WeBS). However, key concentrations in north and northwest Scotland are monitored separately, often as part of goose management schemes, and it is data from these areas that are summarised here.

Near annual counts are carried out at four key sites in Scotland by SNH: Orkney, Tiree (Inner Hebrides), the Uists (Outer Hebrides) and Harris/Lewis (Outer Hebrides). A count is usually carried out in late August to assess numbers post-breeding and before the shooting season starts. An assessment of annual breeding success is also conducted at some of these sites.

In Orkney, in late summer 2019, 22,956 Greylag Geese were counted, a 5.3% decrease on the number counted in August 2016, when the last survey was undertaken.

On the Uists, 8,979 Greylag Geese were counted in September 2019, an 80% increase on the count in late summer the previous year. Breeding success was high with 36.6% young recorded in a sample of 1,438 birds in October. On Harris/Lewis, a spring 2020 count of 4,430 Greylag Geese was made, a 3% decline on the previous spring.



Photo: Steve Dawes

Breeding success was high there too with 31.1% young recorded in a sample of 1,278 birds in October.

On Tiree, the late August count was 2,730 birds, an increase of 38.7% compared to 2018. Breeding success was once again high with 1,384 birds aged and, of these, 41.2% were young with a mean brood size of 2.47 per successful pair. This was the fourteenth year in a row that breeding success surveillance recorded over 25% young and the highest value since 2001.

Thanks to John Bowler, Roddy MacMinn and James Plowman for providing counts and breeding success data reproduced here.

Dark-bellied Brent Geese in 2019/20

Kane Brides

The annual monitoring of Dark-bellied Brent Goose breeding success for flocks wintering in the UK continued in 2019/20, the 35th consecutive winter of monitoring. Volunteer counters sampled 18,738 geese at 46 locations within ten estuaries or coastal areas along the south and east coasts of England, from the Exe Estuary in Devon to the Humber Estuary in Yorkshire. Mean brood size data were also collected at four of the estuaries/coastal sites, with a total of 160 broods assessed.

Results suggest that 2019 was generally an average breeding year for the geese. Overall, the flocks sampled contained 13.1% young, which was higher



Photo: Les Bunyan

than the previous ten-year mean (9.4%, 2009/10–2018/19), as was the mean brood size, which was recorded as 2.26 (± 0.10 SE) young per successful pair compared with the previous ten-year mean of 2.10 (± 0.13 SE).

At the time of writing, no data were available from elsewhere along the flyway for comparison. However, reports from monitoring stations in Arctic Russia suggest that the conditions in 2019 were favourable for breeding geese, with the breeding season similarly being noted as generally average.



Svalbard Barnacle Geese in 2019/20

Larry Griffin

Preparation of this account was started earlier than usual due to the abrupt end to the planned counting and catching activities on the Solway from the final week of March 2020 onwards with the travel restrictions put in place by the UK Government as a result of the COVID-19 pandemic. This lockdown prevented the monitoring of the traditional build-up of goose numbers on Rockcliffe Marsh, Cumbria, in late April and subsequent onward migration to Norway in May. However, by having seven GPS tracking devices still functional on the geese it was at least possible to monitor departure patterns to an extent and get an insight into goose movements north along the flyway throughout the spring. Unfortunately, it was not possible under the restrictions to deploy a further 12 tags already purchased as the final part of the Beck Burn wind farm study (see *GooseNews* 17: 23–24) or undertake the usual catching and ringing activities associated with their deployment.

So far this winter the seven GPS tagged birds have provided a wealth of information about the winter use of the Solway Goose Management Scheme area, with some of the tags providing information on field use every 15 minutes. This will allow us to study how the geese forage on the fields and saltmarsh areas available to them during the day but also during the night. The tags have shown that when numbers drop at Caerlaverock, as they typically do in late March when the grass on the fields is at its most depleted, the birds are moving to saltmarsh areas up the River Nith closer to Dumfries, the fields in the Mersehead/Southernness area, Rockcliffe Marsh and the other Cumbrian saltmarshes.

One of the tags (BARN02) highlighted a very odd movement in the last days of January 2020 when it suddenly moved northeast back to Budle Bay, Northumberland, where it had staged briefly in October. Although this winter had been warm up until that point, with very little sign of frosts or snow on the Solway, it

seemed much too early for a bird to be embarking on spring migration, especially when that same bird had previously migrated through that area in early May 2019 when heading north. It is not clear what would have caused this bird to make a two hour journey to Budle Bay, when at the time there was still plenty of food on the relatively warm shores of the Solway. Why fly all that way, especially when it returned to the Solway again just six weeks later in mid-March? Also it seems it was not an individual oddity as the numbers at Budle Bay increased and decreased by about 500 to 1,000 birds, respectively, on or around those dates. Moreover, with increases and decreases in the flock at Budle Bay documented in previous years, out with the main migratory periods, it is possible that such movements are becoming a “strategy” within the wintering Solway flock, although for what purpose is unclear.

Last year in *GooseNews*, it was reported on the difficulty the tagged birds had encountered in migrating northeast from the Solway and again in heading north from the Norwegian staging areas, with the final leg of migration delayed by strong northerly winds and cold conditions on Svalbard; it being suggested that this might affect the 2019 breeding success. When the percentage of young within flocks was assessed in the period from October to November 2019, for over 10,000 birds sampled, there was indeed low numbers of goslings at just 5.2%, the third lowest value in the last ten years and significantly below the average of 8.1% for that period. If the birds cannot get to Svalbard early enough, then with the advancing spring green-up dates due to Arctic amplification of climate change effects as reported by other studies, this might mean the broods of breeding birds cannot make best use of the most nutritious plant growth earlier in the season thus hampering gosling development.

The relatively poor breeding success of this flyway population over the last ten years or more is a cause for concern and might reflect the rapidity of climate, and

Greenland Barnacle Geese wintering in Scotland in 2019/20

Carl Mitchell

On Islay, the most important wintering site in the UK for Greenland Barnacle Geese, four coordinated counts were undertaken during winter 2019/20.

These revealed 32,253 birds in November, 32,017 December, 34,795 in January and 33,202 in March.

The mean of these four counts was 33,067 birds which represents a modest 3% increase compared to the winter 2018/19 mean (32,000 geese).

However, the over-winter population on Islay has now decreased by a third in the last four winters as a result of the management culls that are taking place (see also *GooseNews* 14: 10–11).

Breeding success is measured annually on Islay and counts in winter 2019/20 revealed an average breeding season. Nearly 5,200 birds were aged of which 10.1% were young with a mean brood size of 2.0 young per successful pair. This is only the second year since 2011/12 that the proportion of young has been over 10%. On Tiree, a sample of 600 birds held 43 young (7.2%) with a mean brood size of 1.4 young per successful pair.

The most recent flyway-wide census of Greenland Barnacle Geese took place in March 2020, including those parts of the winter range that need to be checked using a light aircraft. Notable counts during the census included 33,202 birds on Islay, 6,802 on Tiree & Coll, 2,868 on Oronsay/Colonsay, 2,579 on Orkney and 910 on Danna. However, the census occurred just before the COVID-19 lockdown and, at the time of writing, it has not been possible to collate all the results to give a population estimate. An article about the flyway census will appear in next year's edition of *GooseNews*.

The marking of Barnacle Geese in this population continued in 2019/20 with over 200 newly ringed birds in southern Iceland (see also *GooseNews* 18: 20) along with catches on Islay and in Ireland. With so many birds now colour-ringed, it is well worth checking flocks for marked birds.

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

thus environmental, change occurring in the Arctic and the difficulty the geese are having in judging conditions from one migratory leg to another if the habitats in that chain of wintering and staging sites are increasingly out of sync with one another in terms of vegetation development or other signals important to migratory decision-making.

The medium-term trend of poor breeding success will have resulted in a more aged population structure, which in conjunction with the harsh migratory conditions reported last year for the tracked birds, may have resulted in the deeply concerning drop in total population numbers recorded on the Solway in winter 2019/20 and for the flyway as a whole. The adopted population count for 2019 for the Solway was 36,000 birds, a decline of over 4,400 since 2018 and 6,600 since 2017, suggesting a two year decline in total population numbers. The only caveat with regard to the adopted population total this year is that although it is derived in part from a full census count carried out across all count sections under good stable count conditions, there are not as many full census counts to utilise. Normally there are about six to eight full counts available to derive an adopted total from, but this year there were only two because a key bridge was washed away at Brow Well, at the eastern end of the Caerlaverock reserve, preventing access to a count section including Ruthwell, Cummertrees and Gretna until December, and because the March, April and May counts could not be conducted due to the COVID-19 restrictions.

Many thanks to the census team including David Charnock, Rowena Flavelle, Bob Jones, Mhairi Maclaughlan, Marian & Dave Rochester, Paul Tarling and Derek Forshaw. Thanks also to Rosie Rutherford and Val & Bob Smith for their sterling efforts with the ring reading again this winter. Arcus Consultancy Services Ltd, facilitated the tracking work which was appreciated.

Greenland White-fronted Goose population monitoring in 2018/19

**Tony Fox, Alyn Walsh, Ian Francis
and David Norriss**

We live in times where most western European goose populations are doing spectacularly well, given that most have benefitted in the last 75 years from human factors that have allowed their numbers to increase. Following the Second World War, there were considerable efforts to regulate hunting of geese that had always been important quarry for wildfowlers and to protect the roosts the geese used at night. Global warming has likely reduced the severity of the climate where they winter and lengthened the plant growth seasons at all stages of their annual life cycle. However, it now seems likely that it has been the intensification of our agriculture that has provided them with energy and nutritional subsidies, which has most likely fuelled major increases in numbers in recent years.

For some reason, however, some European wintering goose populations have struggled to increase at the same rate as species such as the Greylag and the Pink-footed Geese, the likes of which can be seen as nature conservation success stories, compared to their historical status. The Greenland White-fronted Goose has been a particular example of such an exception to the rule in recent years. One of the last of Britain and Ireland's wintering goose populations to be annually censused, its numbers had apparently declined from the 1950s until the late 1970s, prompting conservation actions to safeguard the population. As a result, their numbers increased spectacularly under protection from hunting on the winter quarters in both Ireland and Britain (effective from winter 1982/83) until 1999, when despite this protection, the population went into just as spectacular a downturn (Figure 1). As we have often discussed in the pages of *GooseNews*, the decline was related to poor reproductive success during the late 1990s through to the present, although an increasing percentage of young among the flocks on Islay has become more conspicuous since 2010 (Figure 2). At the same time, the birds wintering at Wexford (that breed further north in Greenland than Scottish wintering birds) have continued to suffer poor reproductive output because of cold conditions in spring on arrival (see 2017/18 report in *GooseNews* 18).

Encouragingly, with the counts from winter 2018/19, there seems some sign of the population size beginning to not just level out after a prolonged period of decrease, but show very modest signs of increase (Figure 1). There are indications that reproductive success is beginning to increase, even at Wexford where in recent



years the numbers of young have been very low (Figure 2). The global count in spring 2019 comprised 21,466 Greenland White-fronted Geese, a 5.8% increase on the revised total of 20,285 reported in the previous spring. Numbers at Wexford were 201 (2.6%) down on the previous spring count at 7,436, but numbers on Islay increased by a rather spectacular 27.3%, from 5,319 in spring 2018 to 6,771 in 2019. Meanwhile, the cumulative totals for Britain (other than on Islay) stayed pretty much the same from spring 2018 (5,379) to spring 2019 (5,360) as did numbers elsewhere in Ireland away from Wexford, at 1,950 and 1,899, respectively. Of course, some minor count errors affect these numbers, but the major between-year changes at resorts, and especially at Islay and Wexford, underlines the shifts made by geese between winters between these resorts (and potentially others).

Thanks to considerable effort made by WWT in Scotland and the National Parks and Wildlife Service in Ireland, more birds have been caught and fitted with telemetry devices and standard collars at wintering sites away from Wexford and Islay. Data obtained by following these birds will go a long way in the future to help us better understand between wintering movements between sites and how these affect wintering numbers at the different resorts. They will also form the basis for further investigations of Greenland White-fronted Geese currently under way with PhD students at Exeter University in the UK (see Luke Ozsanlav-Harris' article on page 29) and University of Missouri in the USA (see Alexander Schindler's article on page 31).

The modest increase in overall population size fits well with a slightly better than average breeding season in 2018. Although the percentage young among flocks at Wexford was a little higher than in previous years, at 6.9%, it was still very low compared to the regularly reported 10–20% of the 1980s and early 1990s, when the population was very much on the increase. However, on Islay, Dr Malcolm Ogilvie recorded an improved 12.3% young among 3,551 geese sampled for age,

which, while not as good as some recent years, represents an improvement over the years in the doldrums of the 2000s, when the percentage young hovered under 10% annually (Figure 2). Whether this trend continues in the coming years, we cannot predict, but for the meantime, it does seem that the persistent decline in numbers has stopped whilst production of young improves.

As usual, we are incredibly grateful to the counter network who very happily survey the Greenland White-fronted Geese in their respective areas and always report with fascinating anecdotes about their experiences every year! Because Greenland White-fronted Geese are so site loyal, this ought to be a simple task, but the sub-species is devilishly good at secreting itself within the landscape making it hard to find at all, let alone age effectively.

We thank the National Parks and Wildlife Service (throughout Ireland) and the Greenland White-fronted Goose Study (GWGS; in Britain) for coordinating the annual survey of wintering Greenland White-fronted Geese each season since 1982/83. GWGS gratefully acknowledges financial support for this task from WWT under the GSMP, a partnership between WWT, JNCC and SNH. GWGS data from WeBS and BirdTrack were kindly provided by BTO. WeBS data were provided from the partnership jointly funded by the BTO, RSPB and JNCC, in association with WWT, with fieldwork conducted by volunteers. BirdTrack is organised by the BTO in a partnership with the RSPB, Birdwatch Ireland, the Scottish Ornithologists Club, Welsh Ornithological Society and BirdLife International.

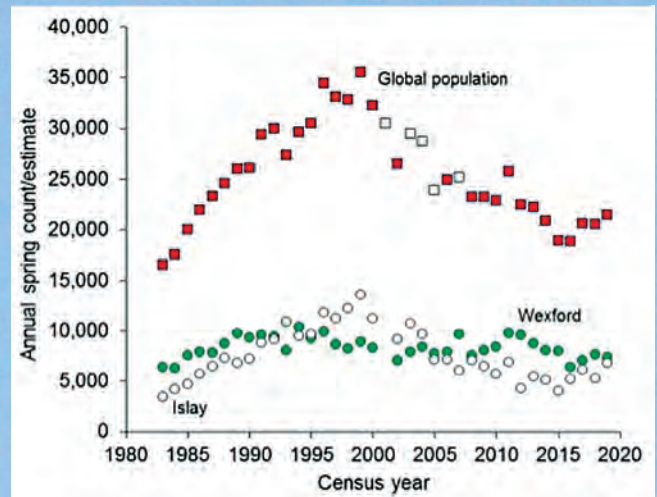


Figure 1. Plot of annual spring estimates of the global population of Greenland White-fronted Geese wintering in Ireland and Britain (red squares, unfilled squares are years with missing counts where total numbers were inferred from counts in previous years). Also shown are the annual spring counts from the two most numerically important winter resorts, Wexford Slobs (SE Ireland, green solid circles) and Islay, Inner Hebrides (SW Scotland, open circles).

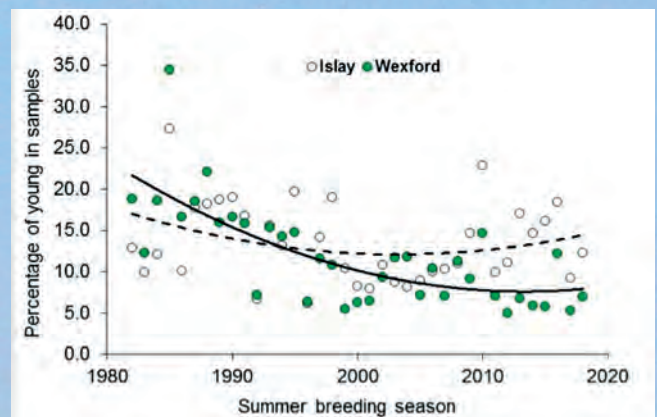
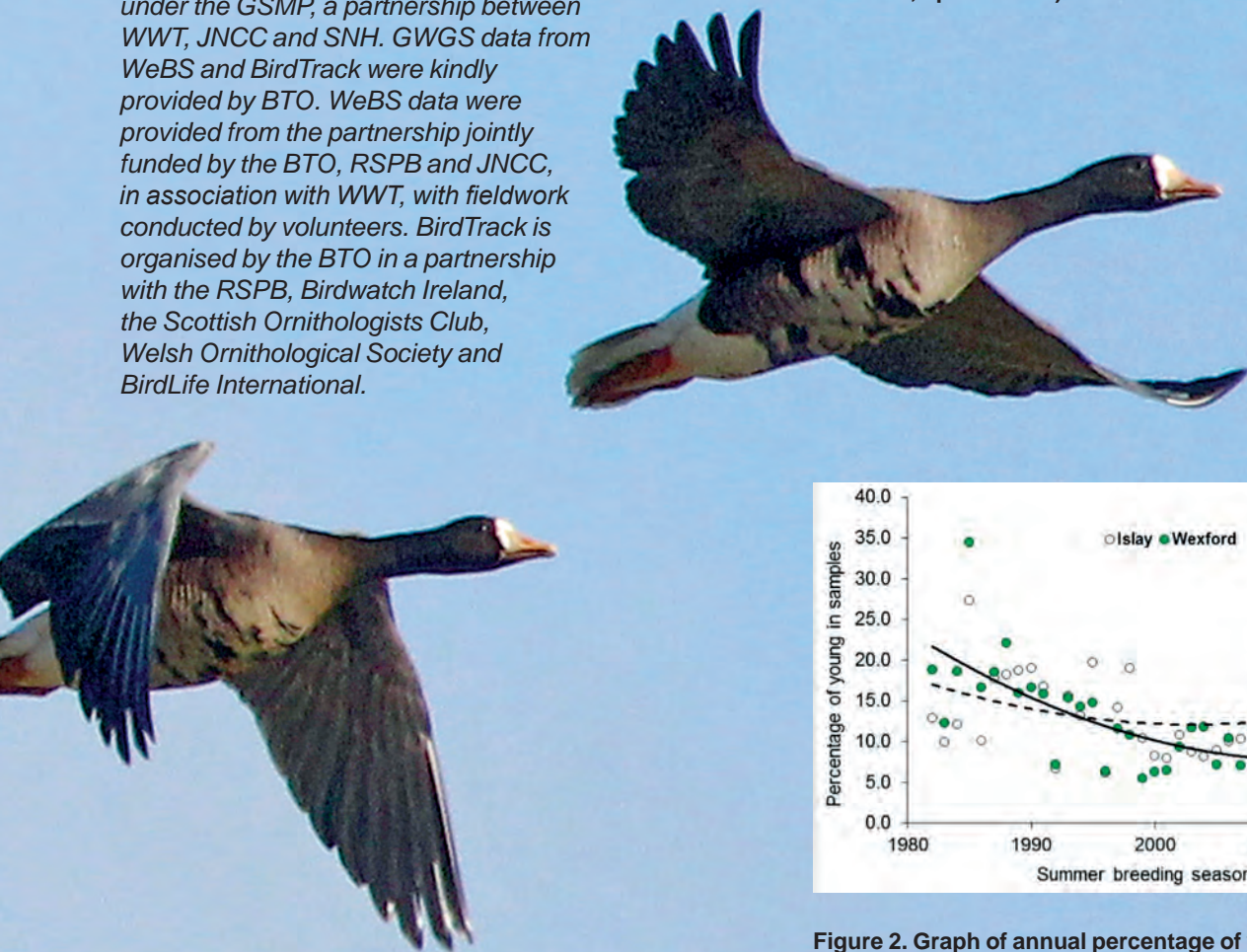


Figure 2. Graph of annual percentage of young for Greenland White-fronted Geese amongst flocks sampled at the two most numerically important winter resorts, Wexford Slobs (SE Ireland, green solid circles, solid line) and Islay, Inner Hebrides (SW Scotland, open circles, dashed line). Least squares quadratic fitted regressions are shown simply to visualize the overall trends, despite large annual variations.

East Atlantic Light-bellied Brent Goose: 2019 best breeding year on record!

Preben Clausen, Steve Percival & Andrew Craggs

Annual assessments of the population size and productivity of the East Atlantic flyway-population of Light-bellied Brent Geese in the wintering season 2019/20 passed the forty year mark, and with a remarkable result.

The population breeds in northern Greenland and on Svalbard and winters in Denmark, in the UK at Lindisfarne National Nature Reserve, Northumberland, and in small numbers at a few other sites in eastern Scotland and England. We estimate the population size annually by combining coordinated autumn counts (September, October or November) and midwinter (January) counts in Lindisfarne and Denmark. Age assessments are done in autumn, from which we pick the largest single sample from as many sites and habitats as possible in a timeframe of less than a month, and usually within just two to three weeks. We do this to avoid resampling of the same birds, and to take into account that we know families tend to cluster in smaller groups, and occasionally use different habitats than unsuccessful breeders do. Hence the more flocks, sites and habitats we sample, the better an estimate we get.

In early autumn 2019 we managed to get a large sample of productivity. At Lindisfarne, two large flocks were aged by Steve on 5 October at Holy Islands Sands and Fenham-le-moor: a total of 2,040 birds were aged, resulting in a juvenile percentage of 37.5 and an average brood-size of 3.18 young for the 239 broods assessed. In Denmark, Preben and a group of volunteers aged 1,025 birds at ten different sites. This

sample yielded a result of 46.2% goslings and an average of 2.7 goslings per brood (37 broods assessed). Together, these data suggest an overall breeding success of 40.4% goslings and an average brood size of 3.12 goslings for this population. Later in the season, from January to March 2020, flocks with more than 60% goslings were seen occasionally at Lindisfarne and Budle Bay (Northumberland).

The breeding result for 2019 is hitherto the best breeding year on record. The recorded juvenile percentage is more than three times as high as the average for 1980/81–2018/19 (12% goslings), the first to be above 40% goslings and only the third from 40 sample years to be at or above 30%, with the 33.9% in 1993 previously the best year. Likewise, there have only been two other breeding years on record with an average brood size above 3.0: in 1996 with 3.3 goslings and 2010 with 3.6; and as both years had around 22% goslings in the flocks, this suggests that more pairs bred successfully in 2019, but with slightly fewer goslings surviving per pair than in the other two years.

The good breeding success of course means that we also expected a higher population estimate – and indeed, that's what we found. A coordinated count in Denmark in late September 2019 gave just below 10,400 Light-bellied Brent Geese, to which we added 3,400 birds counted in Lindisfarne on 5 October resulting in an estimated population size of 13,800 birds. This preliminary result is over 40% higher than the 2018 estimate (9,700) and the highest recorded to date (P. Clausen & A. Craggs unpublished data).



Flock of Light-bellied Brent geese on pasture at Chesterhill, Budle Bay, Lindisfarne NNR, Northumberland, January 2020. Note the remarkable numbers of goslings from summer 2019, identifiable by the three to four whitish bars on the wings (pale edges on the wing-coverts). They also tend to be more darkish on the bellies than the adults.

Photo: Derek Forshaw

Preliminary results from the 2020 midwinter-census in Denmark gave 8,650 birds in mid-January from land-based counts, but some additional flocks recorded from aerial surveys will have to be added to this. From numbers reported to us in January at least 1,000 birds were still in Lindisfarne including Budle Bay and a small flock of 100 birds were found in the outer Moray Firth at Nairn. Some hundreds also went to The Netherlands and Belgium to winter. The numbers recorded in winter are usually lower than in autumn, because the geese tend to spread out in smaller flocks at many more sites, and many birds move inland to feed on pastures or cereal where they are easily over-looked. This is in contrast to autumn when most birds cluster in bigger flocks on the large eelgrass (*Zostera*) beds found in Lindisfarne as well as the primary staging sites in Denmark. The increased population size was again confirmed in spring 2020, when 13,100 birds were counted in Denmark in late April.

Thanks to Derek Forshaw, Ole Amstrup, Henrik Haaning Nielsen, Thorkil Brandt, Bjarke Laubek and Tony Fox for providing age assessments of Brent Geese on either side of the North Sea, and to all the volunteer counters contributing to WeBS in UK and the NOVANA waterbird monitoring programme in Denmark.

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.

Average breeding success for European White-fronted Geese in 2019

Kees Koffijberg & Kane Brides

As in previous years, age ratio counts were carried out in the main wintering range of European White-fronted Geese in Germany, The Netherlands, Belgium and the UK. Collating all data collected from October through to February revealed an overall juvenile percentage of 12.4% (Table 1).

There was little variation during the season, with the first arrivals in September involving slightly more successful families than those arriving later. The overall juvenile percentage was very close to the average recorded in the previous five years (11.7%); however, when viewed over a longer-term it was still rather low. Years with more than 20% juveniles have become extremely scarce; the last year when this happened was in 2005. However, the current level of productivity is likely to keep the Baltic-North Sea flyway population at a stable level or may even exceed annual mortality.

Age ratios were similar for the large winter flocks in Germany and The Netherlands (juvenile percentages 12.2% and 12.5%, respectively, see Table 1). Both in Belgium (Flanders) and in the UK they were clearly higher with 19.1% young. This is a well-known phenomenon and has been observed in previous years too. Flocks in the far southwestern edge of the wintering range consist of more successful families (albeit total numbers are much smaller compared to those at the core wintering sites in Germany and The Netherlands).

Data in the UK were collected at the RSPB reserve North Warren, Suffolk, Holkham Fresh Marsh, Norfolk and at WWT Slimbridge, Gloucestershire, in January.

Juvenile percentages were similar for the sites in Suffolk and Norfolk (21.1% and 20.0%, respectively), whilst a single flock scan at WWT Slimbridge recorded 20 juveniles out of 141 birds checked (14.2%). The figures collected in the UK were slightly lower than those recorded in winter 2018/19 (23.1%), but as the sample size was small, annual variation is expected to be high.

The mean brood size in UK flocks was 2.05 per successful family (21 broods). This is much higher than the mean brood size of 1.51 young per successful family in a sample of 3,684 broods recorded at the Lower Rhine area in Germany, situated in the core wintering range, suggesting, larger broods are somewhat overrepresented in the (small) UK sample.

Table 1. Age ratio counts in European White-fronted Geese in Northwest Europe, 2019/20. Data are preliminary as not all records have been received.

Country	No. aged	No. adults	No. juveniles	% juveniles
Germany	136,423	119,762	16,661	12.2
The Netherlands	71,186	62,312	8,874	12.5
Belgium	3,411	2,761	650	19.1
UK	551	446	105	19.1
Total	211,571	185,281	26,290	12.4

Conservation and research news

Photo: Aimee McIntosh



Researching goose-agricultural conflict in the Greenland Barnacle Goose

Aimee McIntosh

In recent decades, many goose populations in the northern hemisphere have seen an increase in abundance generally associated with conservation efforts, agricultural intensification and hunting moratoria. While this may be viewed as a conservation success, population increases alongside shifts towards their use of agricultural pasture have caused conflict amongst stakeholders due to perceived damage. Management approaches and conservation initiatives emphasise the need for effective mitigation strategies. An example of this is the Greenland Barnacle Goose population that spends the winter on Islay in the Inner Hebrides. Where the Barnacle Geese traditionally fed on salt marsh and coastal grassland they have now transitioned onto agricultural pasture. Increasing population size since the 1950s (Mitchell & Hall, 2020) combined with a preference for reseeded and fertilised pastures has caused growing tension with local farmers. Islay's goose-agriculture conflict has led to a long history of goose management including the current 'Islay Sustainable Goose Management Strategy' which includes population reduction (and subsequent disturbance) as a means of reducing goose grazing pressure (see *GooseNews* 14: 10–11).

Management approaches such as this can impact foraging behaviour, movement and individual fitness of the geese. Understanding how geese respond to these strategies and what impact they have is vital to inform management schemes to ensure their efficacy in reducing grazing pressure and maintaining viable populations. I am a NERC (Natural Environment Research Council) CASE PhD student based at the University of Exeter's Cornwall campus working with WWT and SNH. The aim of my PhD is to provide a greater understanding of how Greenland Barnacle Geese are responding to current management

strategies with a view to informing future approaches and assist in the mitigation of this conflict. My research has three main areas of focus: the behaviour and movements of the geese and the unobserved consequences of shooting management.

Repeated exposure to shooting disturbance can cause changes in behaviour (such as increased vigilance and reduced foraging time). While this may reduce grazing pressure on pastures, these responses can also affect individual fitness and breeding success. A key part of my fieldwork includes behavioural observations of Greenland Barnacle Geese across sites on Islay in order to assess how the behaviour of the geese such as vigilance and foraging intake rates may vary in response to differences in disturbance pressure.

Shooting disturbance often causes changes in the duration of site use due to increased disturbance flights. On Islay, very little is known regarding how Greenland Barnacle Geese respond to a shooting event. Advances in tracking technology are helping to provide the answers. We have deployed Global Positioning System (GPS) tags on Greenland Barnacle Geese utilising sites across Islay. We will be able to use the GPS and acceleration data to determine how the geese use specific sites throughout the winter. I plan to answer questions such as how far do geese travel after disturbance? Where do they fly to and how long do individuals avoid a site following a shooting event?

Finally, as with many species in the UK, shooting can have unobserved consequences on the fitness and survival of individuals through non-lethal wounding and lead poisoning. By using x-rays of live birds, I will be assessing the extent to which the population wintering in Islay carry embedded shot. The use of lead shot can also result in lead poisoning when it is ingested and

broken down in the gizzard. By collecting faecal samples from Greenland Barnacle Geese across sites on Islay, as well as analysing tissue and blood samples from dead birds my research aims to assess the extent to which the geese wintering on Islay may be exposed to lead poisoning.

My research uses multiple approaches to assess how Greenland Barnacle Geese wintering on Islay are responding to current management approaches and aims to improve our understanding of the efficacy of

existing strategies. Consequently, this will enable the adaptation of schemes implemented to mitigate this conflict in the future.

My thanks to Geoff Hilton, Jess Shaw and Stuart Bearhop for their help and support.

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Understanding population regulation in Greenland White-fronted Geese

Luke Ozsanlav-Harris

Greenland White-fronted Geese undertake four North Atlantic sea crossings and two passages over the Greenland Ice sheet annually to travel between their breeding grounds in the temperate western fringes of Greenland and their wintering grounds in the UK and Ireland. Since a peak of 35,570 birds in 1999, the population fell to 18,850 in 2015 but has seen a small upturn to 21,466 in 2019 (Fox *et al.* 2019). There are multiple stages of the annual cycle where population regulation could be acting. However, studying migratory populations throughout their whole annual cycles has its inherent geographical challenges. Recent advancement in micro-electronic biologging tags allow us to determine individual locations and behaviours throughout the year using Global Positioning System (GPS) and accelerometer data. Coupling these data with fieldwork in the UK and Ireland and global remote sensing datasets we can start to pinpoint which environmental and

anthropogenic factors are leading to the population decline and at which stages in the annual cycle these effects are most pervasive.

As part of my PhD, there are four main stages of the annual cycle where I intend to quantify the contribution of these factors to overall population regulation, these include: breeding in west Greenland, staging in Iceland, wintering in the UK and Ireland and the migration that links these stationary phases.

Breeding Grounds: long running juvenile counts collated by the Greenland White-fronted Goose Study suggest that annual productivity has been poor over the last two decades and at a level unlikely to replace annual adult mortality (Weegman *et al.* 2017). At the population level, spring periods with high precipitation levels lead to lower overall productivity (Boyd & Fox 2008). Using data from biologging tags we can directly infer breeding outcomes of female geese and then relate this to remotely sensed environmental data to

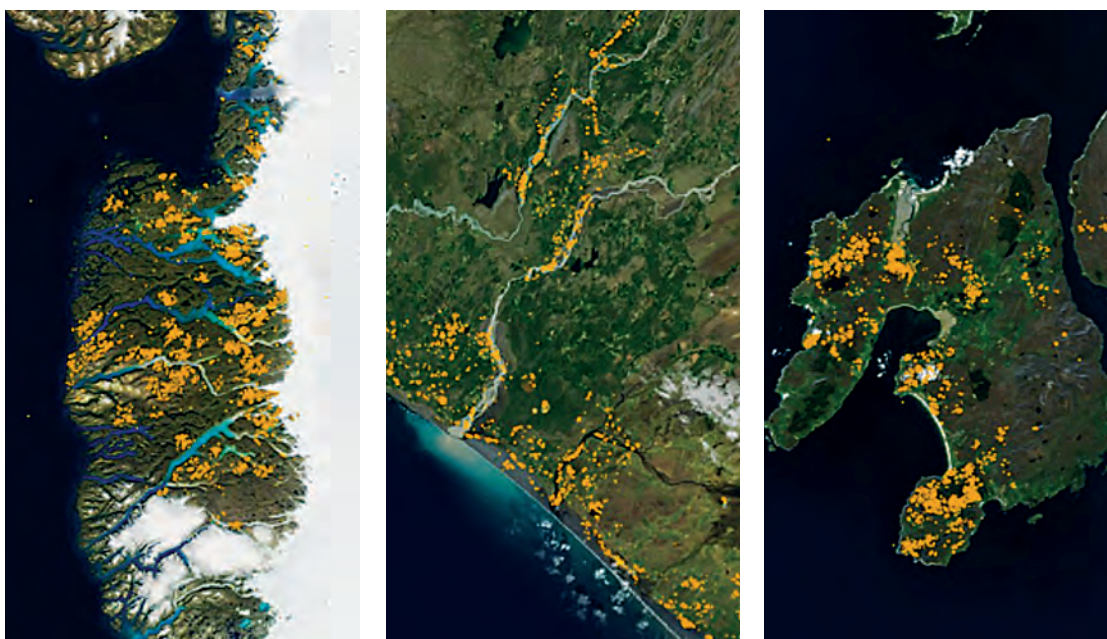


Figure 1. Satellite images showing GPS data collected from Greenland White-fronted Geese tagged in the UK and Ireland. From left to right; southern end of the Western Greenland breeding range, Icelandic southern lowlands and Islay, Scotland.



determine the set of climatic factors that most likely lead to breeding failure.

Migratory episodes: migrations have high energetic costs and mortality risks. Changes in the frequency of storms, or even in the prevailing winds, have the potential to lower adult survival and have carry over effects on breeding success (Newton 2006). A proxy for energy expenditure can be calculated from the accelerometer data (Qasem *et al.* 2012) to determine how different environmental conditions affect the energetic costs of their migrations. Using historic climate data we will be able to determine if the climatic conditions on migration have worsened over the past decades and whether this has entailed increased energetic costs of migration.

Wintering Grounds: my work focusses on the Islay wintering population in west Scotland that comprises around one third of the global population. Here the Greenland Whitefronts inhabit the island alongside large numbers of Barnacle Geese. The latter are managed with lethal scaring to reduce damage to agricultural pastures (see *GooseNews* 14: 10–11). Due to a large overlap in feeding habitat, Greenland Whitefronts have the potential to be affected by imposed management techniques, either through the direct disturbance of shooting activities or ingestion of toxic spent lead shot. The biologging tags will allow us to examine if shooting activity alters the movement patterns and behaviours of individuals. Collaboration with Dr Mark Taggart will enable detection of elevated lead levels in faeces through laboratory analysis, which is often an indicator of lead poisoning.

Staging Grounds: despite a shooting ban in Iceland since 2006, there is still evidence that illegal shooting occurs. Of all the GPS-tagged birds staging in Iceland in the last four years, 4% (n= 149 staging periods) have ceased to function while flying to coastal roost sites. Half the tags ceasing in this manner have in fact been returned directly by hunters (n = 3). Using X-ray images

of captured birds, we can calculate the percentage of birds with metal shot embedded in their tissues. These data, along with those from similar studies on other *Anser* and *Branta* geese (Holm & Madsen 2013) can be used to reverse calculate the annual hunting mortality in Iceland for our population.

WWT and the National Parks and Wildlife Service have already deployed a large number of biologging tags that we are currently seeing the dividends of, with large amounts of biologging data streaming in remotely (Figure 1). In spring 2020, 47 GPS-tagged birds set off from Iceland for the breeding season in Western Greenland, hopefully to reveal even more about their migration and breeding outcomes.

My thanks to Dr Larry Griffin, Alyn Walsh, Dr Mark Taggart, Dr Geoff Hilton and Prof Stuart Bearhop for their help and support.

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Population and movement ecology of Greenland White-fronted Geese

Alexander Schindler

While populations of many Arctic-nesting goose species have remained stable or have increased in recent years (Fox & Madsen 2017), the global Greenland White-fronted Goose population has declined by 33% in the past 20 years, to 21,466 individuals in 2019, despite closure of hunting in Iceland in 2006 and Greenland in 2009 (Fox *et al.* 2019). Recent research has suggested that low reproductive success has contributed more to population change than survival and is therefore the likely mechanism of decline in this subspecies (Weegman *et al.* 2016). However, we still do not fully understand the drivers of poor production (Weegman *et al.* 2017). Furthermore, recent studies have confirmed that wintering numbers at Wexford, the largest aggregation of wintering Greenland White-fronted Geese, have only been maintained by high rates of immigration, potentially leading to declines in number and quality of individuals at other wintering locations (Weegman *et al.* 2016). We also do not fully understand the structure of other wintering flocks, range-wide population dynamics, and movement between wintering sites (Weegman *et al.* 2017).

Thanks to an international partnership between Aarhus University, Texas A&M University-Kingsville, Chinese Academy of Sciences, University of Missouri, National Parks and Wildlife Service and WWF, we now have an opportunity to learn about populations outside of Wexford and address these knowledge gaps at a range-wide scale. By combining historical population-level data (e.g. resightings of collared geese, annual wintering flock counts, age ratios) and recently collected data from devices that collect Global Positioning System (GPS) locational and behavioural data at frequent intervals from tagged birds, we will examine both individual decision-making and population-level processes of Greenland

White-fronted Geese. Our research goals include 1) estimating movement rates of Greenland White-fronted Goose individuals between wintering flocks in Britain and Ireland, as well as the individual and habitat characteristics that influence these movement rates, 2) quantifying patterns in demographic rates (e.g. differences in survival, reproduction, immigration, and emigration) of geese at different wintering flocks, 3) examining the decision-making process regarding an individual's choice to attempt or defer breeding in a given year, and 4) assessing patterns in annual goose abundance among wintering flocks and quantifying the effects of changes in wintering habitat and management strategy on variation in abundance. In combination, these individual and population analyses will inform conservation planning for Greenland White-fronted Geese across their entire range.

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The GSMP partnership

The Goose & Swan Monitoring Programme (GSMP) monitors the abundance and breeding success of the UK's native geese and migratory swans during the non-breeding season. GSMP is organised by the Wildfowl & Wetlands Trust (WWT) in partnership with the Joint Nature Conservation Committee (JNCC) and NatureScot*.

The members of the GSMP Steering Group in 2019/20 were Colette Hall (WWT), Eileen Rees (WWT), Richard Hearn (WWT), Kirsi Peck (JNCC), Anna Robinson (JNCC) and Simon Cohen (NatureScot).

* Scottish Natural Heritage (SNH) has changed its operating name to NatureScot as of 24 August 2020. This newsletter still refers to SNH within the text, which was written prior to the change.

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Information in *GooseNews* is compiled from a variety of sources and does not necessarily reflect the views of WWT, JNCC or NatureScot.

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, NatureScot 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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