GOOSE BULLETIN

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Contents:

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GOOSE BULLETIN appears as required, but at least once a year in electronic form. The bulletin aims to improve communication and exchange information amongst goose researchers throughout the world. It publishes contributions covering goose research and monitoring projects, project proposals, status and progress reports, information about new literature concerning geese, as well as regular reports and information from the Goose Database.
Contributions for the **GOOSE BULLETIN** are welcomed from all members of the Goose Specialist Group and should be sent as a Word-file to the Editor-in-chief. Authors of named contributions in the **GOOSE BULLETIN** are personally responsible for the contents of their contribution, which do not necessarily reflect the views of the Editorial Board or the Goose Specialist Group.

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Editorial

Since the latest meeting of the Goose Specialist Group in February in Leeuwarden two founding members and former chairs of the GSG, Jesper Madsen and Bart Ebbinge, left the board. We all have to thank them for their long-year engagement for the group, which shaped the group and had a considerable influence on the way the group is functioning to the present day. Their seats in the board were taken over by two goose researchers of the next generation, Thomas Lameris and Sander Moonen, whom we welcome in the board and wish all the best.

Following Bob Dylan's song "The Times They Are A-Changin" (Dylan 1964), the change of generations means for the GSG that the "old road is rapidly aging" and we have to go out and find a new one! Formely Institutes were proud when their employees undertook voluntary jobs within the scientific community, e.g. as editor of a scientific journal, or member of an international scientific committee or commission. Nowadays most institutes only allow such a commitment in employees' own time or if costs are covered by third parties, which makes the work of the GSG increasingly difficult.

The Goose Specialist Group of Wetlands International and IUCN was founded to strengthen contacts between all researchers and monitoring volonteers working on goose populations in the Northern Hemisphere. The aim of the group is to help to co-ordinate goose research and to encourage studies on population dynamics and goose ecology, to provide reliable estimates of population size and trends, reproduction and survival rates as well as the delineation of breeding and wintering range and migratory routes between them. All this information is crucial for conservation and sustainable management of the goose populations around the world.

Since the mid-1990s, the group has organized 19 Goose Meetings, each visited by between 40 and more than 100 individuals. While some of the participants have taken part in almost all meetings, others only visited some of them and others only participated in meetings organized in their own country. As long as we have an active email address, all these participants are considered to be a member of the group, which means that the Goose Specialist Group is an informal conglomeration of goose interested people and professional goose researchers, but all organized on an entirely voluntary basis.

However, the Goose Specialist Group has increasingly given itself ambitious aims and as a Specialist Group under IUCN, it is expected to regularly report and provide expertise from the membership. Until now, these requests for expertise were answered by the chair, occasionally supported by some board members, but the investment of time and effort is growing. Furthermore, the days when institutes covered all the expenses of such voluntary activities have long since gone.

Within the board, we are discussing how to resolve these problems. One option would be to give the group an official legal structure and to introduce an official membership of the group with an annual membership fee, as is the case with the Wader Study Group. This would require that the GSG be registered in a country as a non-profit international NGO, according to the laws of that country. In return for their financial contribution, group members could enjoy reduced conference fees for the biannual goose conferences. During such conferences, one evening would be reserved for a membership meeting, where at regular intervals, board members would be elected. Working groups can be democratically established to deal with special topics and a part of the membership fees could be used to cover some expenses of group activities, as well as to support colleagues to attend the GSG-meetings who lack resources to do so.

If we wish to follow this new road into the future, there are many consequences we have to consider before we can make an informed decision.
Please let us know, what you think about these ideas. Please send your opinion to the Editorial Board of the Goose Bulletin, to give the Board of the Goose Specialist Group a lead where to go in future, ... in our future.

Thanks in anticipation!

The next issue of the GOOSE BULLETIN is planned to appear in November 2020, which means that material for this issue should have reached the editor-in-chief not later than 30 September 2020.....but earlier submission is, of course, always permitted, if not actively encouraged!

The Editorial Board

Participants of the 19th Meeting of the Goose Specialist Group, Leeuwarden 28-31 January 2020, during the conference excursion (Photo Eckhard Kuijken).

The 19th Meeting of the Goose Specialist Group, Leeuwarden 28-31 January 2020

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The 19th Meeting of the Goose Specialist Group was held in Leeuwarden, in the province of Friesland in The Netherlands, from 28-31 January 2020. The Netherlands is one of the most important countries for migratory geese in Europe, with peak numbers of wintering geese amounting to c. 2 million. Within the country, about 40% of wintering numbers concentrate in the province of Friesland, which is why its capital, the cozy town of Leeuwarden, was chosen as the ideal location for the GSG meeting.
The meeting was jointly hosted by Sovon Dutch Centre for Field Ornithology and Vogeltrekstation Dutch Centre for Avian Migration and Demography NIOO-KNAW at "De Harmonie" in the Centre of Leeuwarden. No fewer than 141 delegates from 20 countries joined the four-day meeting, and that makes the 19th edition of the Goose Specialist Group meeting one of the largest in the history of the group.

Participants of the 19th Meeting of the Goose Specialist Group, Leeuwarden 28-31 January 2020, in the conference hall (Photo Henk van der Jeugd).

There were three conference days, filled with presentations and a one-day excursion on Thursday. Each of the conference days was started by a 45 minute plenary lecture. In order of appearance, these were given by Ingunn Tombre on Tuesday, Jeff Black on Wednesday and Stuart Bearhop on Friday.
Ingunn set off showing that addressing sensitive issues around rising goose numbers takes more than just ecology, and illustrated this with case studies from Norway where problems are solved within an inter- and transdisciplinary framework involving many stakeholders, but without losing the assets, that geese most certainly are, out of sight.

On Wednesday, Jeff Black took this further and put the 'assets' - the geese - in a central position and taught us all some lessons from nature in Northern California.
Finally, on Friday, Stuart Bearhop showed how climate, population density, food availability and other factors during winter and spring can influence demographics of high-arctic breeding geese. This is important, because the notion that what we do in terms of management in the wintering areas can have expected as well as unexpected repercussions during other parts of the annual cycle is ever more important.

Each of these excellent plenary lectures served as introductions to other speakers that treated us on a wide variety of stories, adventures, and important findings. One of the highlights undoubtedly was the talk by Diana Solovyeva, who lifted the 'curtain of secrecy' just enough for a peak into the newly discovered, inaccessible moulting grounds of the lesser white-fronted goose in East Asia, but made us all promise to never go there and leave them in peace.
A highlight of an entirely different nature was the talk by Julia Stahl about the ability of grass swards to rapidly recover from heavy grazing in spring, shedding new light on the way damage is being assessed and compensation paid to farmers in the Netherlands, a story that most certainly will get a sequel. But to be honest, there were many, many talks that were noteworthy in all kinds of respects, and it is fantastic to see how the scientific level of the contributions is steadily growing with every GSG meeting. On Tuesday evening, Herbert Prins evaluated this in his own, special way. He summarized 50 years of goose research in just under two hours, skilfully manoeuvring so that everyone in the audience was at least mentioned, but also painfully exposing that we attempt to address the same questions over and over again, albeit with ever more sophisticated tools and statistics, but never quite getting to the point where we truly understand, let alone can predict, what is going on with populations of wild geese. This, he proclaimed, may be the faith of us ecologists, because nature is too complicated for us to ever really comprehend. Like he started, he therefore ended his lecture with the observation that what really drives us is the ambition to sit around campfires in remote places sipping whisky or vodka, and telling great stories. And a great story it was indeed!

On Wednesday evening, Kees Polderdijk, told us a wonderful and funny inside-story about traditional goose catching in The Netherlands, a craft practised by just a handful of devotees who catch and ring geese for science, and whose work is instrumental in maintaining the ringing effort of wild geese in The Netherlands at an adequate level. The next day, we saw two of these goose catchers in action during the excursion.

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For many of us, this was the first time to witness this traditional and effective way of catching wild geese in The Netherlands. Due to the warm weather, we did not quite see the numbers of geese that we had hoped for, but still enough flocks of mainly barnacle geese and some white-fronted geese could be scanned in search of leg rings and neckbands, that the participants immediately reported through the Birdring-app. The morning shift was just in time to witness thousands of barnacle geese leaving their roost at lake IJsselmeer together at dusk.

The whole Tuesday afternoon was devoted to the AEWA European Goose Management Platform, that addresses the conservation and management of declining, as well as growing, goose populations in Europe by a coordinated flyway approach. Adaptive management plans are currently being formulated for three goose species (barnacle goose, greylag goose and taiga bean goose), while a fourth one, for the pink-footed goose, is already in place. There were presentations on the development of population models, survival analyses, the impact of shooting, and more. It became clear that building these models is not an easy task, but the case of the pink-footed goose, for which an adaptive harvest management plan is in place and functioning, showed that it can be done.

The last talks were on Friday morning, after which a prize was awarded for the best talk. This year that prize went to Romke Kleefstra, for his excellent account of the growing population of resident, breeding white-fronted geese in the province of Fryslân. Then it was time for concluding remarks, during which the meeting was summarised by three words: conflict - the rising goose numbers result in ever more conflicts, and the goose research community is more and more involved in addressing these conflicts and trying to resolve them using a scientific approach, as witnessed by the many talks about this subject. But we must remain critical, and speak out when we see arguments being twisted and truth being bent, and geese lose out in favour of economic gain. Change – we are seeing rapid, and maybe unprecedented changes in goose distribution, migration routes and habits. Discovering these changes is exciting, geese are adapting to a changing world, but for how long will they cope? Tracking – Never before have we have so many talks where new tracking technology proved instrumental in revealing exciting new patterns. Thanks to these technological advances we are now capable of addressing questions in ever greater detail, but do not let the technology get the upper hand: still, a keen eye, a pair of binoculars, pen, paper and a sharp mind may lead to the best ideas!

Records of a 'crested' Lesser Snow Goose and Brent Goose in the wild, and a discussion of previous records in relation to environmental pollution

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In the previous issue of Goose Bulletin, SCHREVEN & LEHIKOINEN (2019) reported sightings of 'crested' Pink-footed Geese (*Anser brachyrhynchus*) in Norway, Denmark and Belgium and stated that this form is exceptionally rare in wild geese, despite the fact that it is commonly known among breeders of captive poultry and wildfowl. In addition to these cases in wild Pink-footed Geese and previously published cases in wild Canada Geese (*Branta canadensis*, PHILLIPS 1913, HANSON 2006, BREDER 2010), here, records from two other species in the wild are reported: the Lesser Snow Goose (*Anser caerulescens caerulescens*) and Brent Goose (*Branta bernicla bernicla*).

Lesser Snow Goose

On 4th August 2016, a crested adult Lesser Snow Goose was caught in a mixed species group of 250 non/failed breeding adult geese during annual banding operations near the Dewey Soper Migratory Bird Sanctuary on western Baffin Island, Nunavut, Canada (66°45' N, 72°22' W). The drive consisted of 14 Ross's geese (*Anser rossii*), 19 Cackling geese (*Branta hutchinsii*) and 217 Lesser Snow Geese (136 blue phase, 81 white phase).

Photos 1-2. The crested Lesser Snow Goose (held by Philip Wilson, Ontario Ministry of Natural Resources and Forestry) which was caught and banded near Dewey Soper Migratory Bird Sanctuary on Baffin Island, Nunavut, Canada, on 4th August 2016. Photo: Joshua Dooley.

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The crest was approximately 2 by 3 cm and consisted of white downy feathers but also protruding white pointy contour feathers, which had the same brownish staining as the normal head feathers (photos 1-2). The aberration was not noted in the banding records, so the sex of the goose remains unknown. This is the only individual with a crest among approximately 17 000 adult and 5 300 juvenile Lesser Snow Geese that have been captured during annual banding operations on western Baffin Island from 2010 through 2019.

Brent Goose

On 5th November 2019, a crested Brent Goose was observed by WT in a flock of approximately 700 Brent Geese, 2 Black Brant (*B. b. nigricans*), 1 Pale-bellied Brent (*B. b. hrota*) and some Egyptian Geese (*Alopochen aegyptiaca*), foraging on grass in polder Wieringermeer, close to the village of De Haukes at the former isle of Wieringen, the Netherlands (52°53'15" N, 04°56'05" E). The crest consisted of white downy contour feathers and was approximately 2 by 2 cm (photos 3-8). This crested individual was a juvenile, and was accompanied by its parents and two siblings, which did not have a crest, although the head of one sibling appeared slightly pointy. The crested goose was presumably a female, judged from its small body size in comparison with its siblings. It was foraging and showed totally normal behaviour. On 8th, 9th and 20th of November 2019, this goose was observed again at the same place. It was always on the outer side of the group, where most families of the group usually graze. It was seen again on 30th of January 2020 by FRED VISSCHER, and filmed and photographed on 8th of February 2020 by WT. It was still together with the family and its abdominal profile showed that the bird was in good condition.

Photos 3-8. The crested Brent Goose, observed in Wieringen, the Netherlands. Photos, top row: 5th and 9th November 2019, Wim Tijsen, bottom: 30 January 2020, Fred Visscher.

This goose is the only crested individual that WT has observed among Brent Geese over 40 years of observations in The Netherlands. Every autumn, winter and spring, between 2 000 and 3 000 Brent Geese stay at Wieringen, but WT had never seen this condition before.
More photos and some videos of this goose are available on Twitter (twitter.com/TijsenW/status/1191745768908087296, twitter.com/TijsenW/status/1191775531383083009, twitter.com/TijsenW/status/1193268807067996160, twitter.com/TijsenW/status/1226526789905854464) and Facebook (facebook.com/wim.tijsen/posts/10217958209684644).

Discussion

These additional records of crested wild geese show that this mutation occurs in various species of the Anserinae subfamily. Currently, some records concern juveniles and (turning into) second calendar year birds (2 Pink-footed Geese, 1 Brent Goose).
Another case was reported by PHIL KAROW: a crested Canada Goose was shot at the Shiawassee River State Game Area, near St. Charles, Michigan, USA, on 6 September 2018 (Photo 9). Judged from the photo, this bird was also presumably a juvenile (pers. comm. BEREND VOSLAMBER).
Other records concern an adult (1 Lesser Snow Goose) and also the Canada Goose observed by Hilke Breder (2010) was probably an adult male, judged from photos (pers. comm. BEREND VOSLAMBER). The three Canada Geese discussed by PHILLIPS (1913) were at least in their second calendar year, in February. HANSON (2006) reports two cases of crested Canada Geese (probably of the race *B. c. belcheri*) that were shot near the Belcher Islands in 1969 and at the Hudson Bay coast southeast of the Belcher Islands, before 1972. Their age was not mentioned. In addition, AIJA LEHIKOINEN and KS again observed a crested Pink-footed Goose, this time a second calendar year or adult, at Storøya, Selbu, Nord-Trøndelag, Norway (63°12' N, 11°01' E), on 2nd October 2019. This probably concerns the same individual as reported from Norway by SCHREVEN & LEHIKOINEN (2019), given the age and similar looks. These records of adult crested geese suggest that, at least in the stage from juvenile to adult, there seems to be no major costs to survival of having a crest.

Photo 9. The crested Canada Goose, harvested in Michigan, 6 September 2018 (Photo: Phil Karow).

Although HANSON (2006) suspected that the crests in Canada Geese were caused by a recessive allele that was maintained in the population between 1913 and 1972, crests in captive ducks and chickens are caused by a dominant allele that is lethal in homozygous individuals (REQUATE 1959, see also SCHREVEN & LEHIKOINEN 2019). Therefore, it is more likely that crests in wildfowl all concern spontaneous mutations, except in the case of PHILLIPS (1913) where the three shot crested Canada Geese were probably from one family.

GOOSE BULLETIN is the official bulletin of the Goose Specialist Group of Wetlands International and IUCN

It is striking that 6 out of 11 cases of crested geese compiled here concern Canada Geese. Also, it is striking that 6 out of 11 cases have occurred in the last 10 years. It is unknown to what extent this may have been caused by an increased observer effort in recent years, increased likelihood of reporting a crest, increased goose population sizes and thus a higher chance of a crest to occur, or maybe an increased mutation rate. Mutation rates can increase under the influence of environmental pollutants (SOMERS et al. 2004). Especially, polycyclic aromatic compounds, from steel mills and vehicle exhausts, are thought to induce heritable mutations (SAMET et al. 2004). In the Hamilton Harbour area, Ontario, Canada, these compounds are abundant in the air and soil, and Herring Gulls (*Larus argentatus*) nesting in the harbour were found to exhibit a mutation rate twice as high as conspecifics in rural areas (YAUK & QUINN 1996). It is worth mentioning that all reported cases in North America have occurred either close to, or north or south of this heavily industrialised area, possibly reflecting populations that migrate via this area. Of these cases, 6 out 7 concern Canada Geese, and waterbird counts show that Canada Geese have been a common wildfowl species in the Hamilton Harbour area (GEBAUER et al. 1992). Although information on contaminant loads and year-round habitat use is needed to assess the exposure of geese to pollutants (most interestingly, fathers of crested geese, see SAMET et al. 2004 for hypothesised mechanism), it remains worthwhile to note and report cases of wild crested geese to stay on the alert for a possible association of mutation rates and environmental pollution.

Acknowledgements

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References

BREDER, H. (2010): Canada Goose with head tuft, observed in Turners Fall Canal, Massachusetts on 3rd March 2010. - Online blog: http://onejackdawbirding.blogspot.com/2010/03/canada-goose-with-head-tuft.html.

GEBAUER, M.B., R.Z. DOBOS & D.V. WESELOH (1992): Waterbird surveys at Hamilton Harbour, Lake Ontario, 1985–1988. - Journal of Great Lakes Research 18(3): 420-439.

HANSON, H.C. (2006): The white-cheeked geese: *Branta canadensis, B. maxima, B. 'lawrensis', B. hutchinsii, B. leucopareia,* and *B. minima*: Taxonomy, ecophysiographic relationships, biogeography, and evolutionary considerations. Volume 1. Eastern taxa. - Avvar Books, Blythe, California, US.

PHILLIPS, J.C. (1913): A Crested Canada Goose. - Auk 30 (4): 578-579.

REQUATE, H. (1959): Federhauben bei Vögeln. Eine genetische und entwicklungs-physiologische Studie zum Problem der Parallelbildungen. - Zeitschrift für Wissenschaftliche Zoologie 162(3-4): 191-313.

SAMET, J.M., D.M. DEMARINI & H.V. MALLING (2004): Do airborne particles induce heritable mutations? – Science 304 (5673): 971-972.

SCHREVEN, K.H.T. & A.E. LEHIKOINEN (2019): A 'crested' Pink-footed Goose observed in Norway, and possible explanations why crested waterfowl are rare in the wild. - Goose Bulletin 24: 4-7.

SOMERS, C.M., B.E. MCCARRY, F. MALEK & J.S. QUINN (2004): Reduction of particulate air pollution lowers the risk of heritable mutations in mice. – Science 304 (5673): 1008-1010.

YAUK, C.L. & J.S. QUINN (1996): Multilocus DNA fingerprinting reveals high rate of heritable genetic mutation in herring gulls nesting in an industrialized urban site. - Proceedings of the National Academy of Sciences 93 (22): 12137-12141.

The website geese.org, an interactive database to report marked waterfowl.

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The website www.geese.org was developed in 2005 by ONNO ROOSENSCHOON and YKE VAN RANDEN at the Department of Earth Observation and Environmental Informatics of Wageningen Environmental Research. The primary goal was to stimulate volunteer observers to report sightings of geese marked with individually coded legrings or neckbands. The website and its database are one of the earliest examples of so-called citizen science. Here, we highlight some of its history, including early development, philosophy and data contained in the database to date.

Historical development.

In May 1976, Alterra Wageningen University (then known as Research Institute for Nature Management) joined a project of the Wildfowl & Wetlands Trust and started to catch Dark-bellied Brent Geese *Branta bernicla* and mark these with engraved colour-rings. This project was started in England by ANDREW ST JOSEPH in 1973.

In 1979, Alterra launched a similar project on the Russian population of Barnacle Geese *Branta leucopsis* wintering in The Netherlands and northern Germany, also using two colour-rings (one on each leg) with a letter or digit engraved three times around the ring for easy identification. Each bird thus received a unique code and volunteer observers as well as professionals were encouraged to report the observed geese.

The Dutch Ringing Centre Vogeltrekstation in Arnhem allowed marking of geese as long as standard metal rings were not used, because of fears of coping with the large number of resightings emerging from such a project. Goose ringers at the time were only allowed to either use standard metal rings or colour-rings.

The collected data were stored using the programme Datatrieve, and to stimulate volunteer observers to read rings we provided them with special forms and a computer print-out of all other observations of the birds they had reported at the end of each summer. In addition, a special brochure was produced (GANTER 1997).

This citizen science *avant la lettre* and the use of colour-rings turned out to be extremely effective, especially when compared to when only standard metal rings were used (Table 1). Of the 966 Barnacle Geese ringed with standard metal rings 96 % was never reported over a six-year period, whereas of the 576 Barnacle Geese ringed with engraved colour-rings only five birds (1 %) were never reported. The colour-ringed birds yielded 20.230 resightings (on average 35 per bird) in these six years.

Table 1. Resightings of Russian Barnacle Geese in 1978-1984 (EBBINGE et al. 1991).

Category	Metal rings	Colour-rings
Ringed geese	966	576
Found dead/shot	20	9
Observed/retrapped	25	20.230
Never reported	924 (96 %)	5 (1 %)

Clearly the workload in collecting all sightings and entering these into a database was high. When the Swedish researchers LARS GUSTAFSSON, KJELL LARSSON and PÄR FORSLUND from Uppsala University in 1984 started a large-scale research project using coloured legrings on the newly established breeding population of Barnacle Geese on Gotland and Öland (LARSSON et al. 1988), many were resighted in The Netherlands. In fact, from 5613 sightings from our network of 257 volunteer observers in 1984, the annual number of observations increased to 25.213 in 1988, which forced Alterra to stop ringing more Barnacle Geese in The Netherlands. The Gotland Barnacle Goose study continued to collect sightings, and the information collected was added to the central database. Alterra, continued only with the Brent Goose study yielding a manageable number of sightings.

Other goose marking projects.

In 1990 MAARTEN LOONEN (Groningen University) and BEREND VOSLAMBER (Rijkswaterstaat) started a neck-banding programme in the Netherlands on Greylag Geese *Anser anser*, and in 1998 HELMUT KRUCKENBERG (University of Osnabrück) and GERARD MÜSKENS (Alterra) initiated a neck-banding programme on Greater White-fronted Geese *Anser a. albifrons.* These goose researchers had to promise the Dutch Ringing Centre (Vogeltrekstation) to report all the resightings that they collected, because by now the additional use of standard metal rings was accepted and even obligatory.

They encountered the time-consuming problem of reporting back to the network of volunteer observers, as well as to the official ringing centre.

Similar problems occurred for a much older neck-band project on Bean Geese *Anser fabalis* and Greylag Geese already started by ERICH RUTSCHKE in the former DDR in 1977, and one started in 1984 on Greylag Geese in Sweden and Norway by LEIF NILSSON, ÅKE ANDERSSON and ARNE FOLLESTAD (Nordic Greylag Goose project). In 1990 IGOR KOSTIN and JOHAN MOOIJ started a neck-banding programme on Greater White-fronted Geese *Anser a. albifrons* on the Taimyr Peninsula. Another project on the Svalbard-breeding Pink-footed Geese *Anser brachyrhynchus* wintering in Denmark, the Netherlands and Belgium, was started by JESPER MADSEN (Aarhus) in 1991.

Towards online entry of ring sightings

Given the growing number of resightings, it was a great relief for goose researchers that in 2005 the Dutch Ministry Agriculture, Nature and Food Quality funded the establishment of a special website to report marked geese by the technical staff of Alterra, as part of a larger study on how to accommodate wild geese on farmland. This three-year project was carried out in close cooperation between Alterra, Sovon Vogelonderzoek Nederland and the Dutch Centre for Avian Migration and Demography, Netherlands Institute of Ecology (Vogeltrekstation), and led to the development of the website www.geese.org , using Oracle as a database.

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Because several marked geese are often observed at the same location, the data are stored under a so-called OAS (observer-activity-site) consisting of a unique ID under which latitude, longitude, site-name, observer-code and date are stored. Relationships between marked birds (pairbonds, parent-offspring) can also be stored when observed under the same OAS-ID. When birds are being re-ringed (because of worn or lost rings when retrapped), the birds retain their own (hidden) bird-id. Only their "passport-number", so to speak, will be changed, and observers, when following the track of a single bird they have once seen, see all observations together including the new rings/neckband.

The key philosophy behind this website is that the workload of data entry is carried out by the observers themselves, with species-specific projects managed by project coordinators. The website is available in English, Dutch, German and French, and individual observers can enter their sightings, edit their own sightings, and see (but not edit) all other observations of the individual geese they have observed at least once.
Initially Google-maps was used to enter the location where a marked goose was observed. Later on, when Google decided to charge money for using their map-facility in case of heavy use, OpenStreetMap was used as a map source.

Each single user has to register by choosing an individual code of up to 5 letters, and a password by which he or she can access the website.
Further financial support to run this website was granted by JESPER MADSEN from the Department of Bioscience, Aarhus University, Denmark, the German Ringing Centre Hiddensee, the Schutzstation Wattenmeer, the ONCFS (Office National de la Chasse et de la Faune Sauvage), and BIJ12 (the former Dutch Fauna Fund).

Towards field-based entry of ring sightings
In 2016 MARIO HUIZINGA developed BirdRing, a special bird-ring application for smart-phones (for Android and since 2019 also for iPhones), which allows observers to enter observations of marked birds in the field, and directly upload them to the geese.org database. This has made it even easier to report marked geese and immediately show whereelse these birds have been observed.

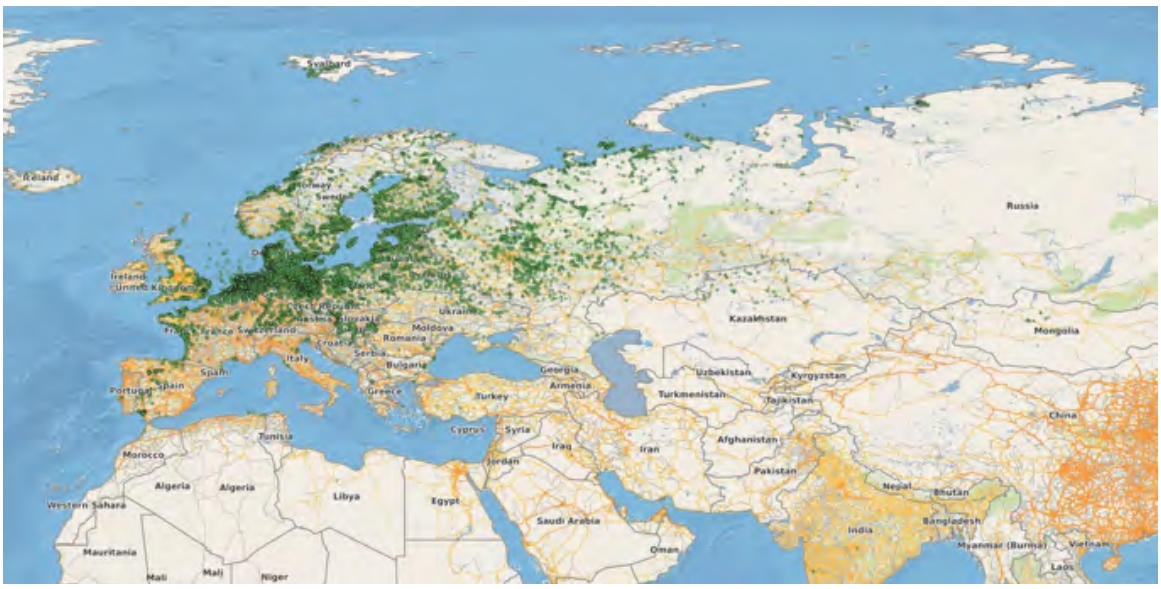

Fig. 1. Sites from where marked geese or swans have been reported, 1973 - 2020.

Reporting probability

In the Barnacle Goose study shown in Table 1 only 1 % of all marked geese were never reported. The Barnacle Goose population wintering in The Netherlands and northern Germany was still quite small then, occurred in a few localities and was relatively easy to observe.

In Table 2, examples are given from the current geese.org database to compare how many birds were never observed/reported after these had been ringed, and how this differed between species and marking device.

The intensively studied and small population of Svalbard Pink-footed Geese shows that almost all birds with blue neck collars and 97 % of those ringed more recently with white neck collars have been reported at least once after ringing. The Dutch breeding populations of Canada Geese and Greylag Geese (all marked with green neck collars) are also observed extremely frequently with 99 % and 98 % respectively being seen.
Scandinavian Greylag Geese (marked with blue neck collars) were observed less frequently with 86 %.

Within the much larger population of White-fronted Geese, birds marked with lime neckbands were more likely to be reported (93 %) than those with black neckbands (91 %). For comparison, White-fronted Geese only marked with standard metal rings have been included and, of those, only 13 % have been reported (mainly shot by hunters). The latter only provide two locations in time; at the point of ringing and recovery.

The legrings used on Brent and Barnacle Geese are more difficult to see and read than neckbands, but still perform quite well with 91 % of all marked Brent Geese being observed at least once, and 90 % of all more recently marked Barnacle Geese. This overview demonstrates clearly the value of the various colour-marking programmes for population studies as facilitated by the website geese.org.

Table 2 Percentage never observed of some species (geese.org database)

Species	Type of marking	Number ringed	Percentage never reported	Where nesting	Remarks
Pink-footed Goose	blue neckband	2 493	0,1%	Svalbard	observed
Canada Goose	green neckband	2 219	1%	NL	observed
Greylag Goose	green neckband	5 055	2%	NL	observed
Pink-footed Goose	white neckband	2 569	3%	Svalbard	observed
Egyptian Goose	coloured legrings	2 897	5%	NL	observed
White-fronted Goose	lime neckband	1 364	7%	Russia	observed
White-fronted Goose	black neckband	15 738	9%	Russia	observed
Brent Goose	coloured legrings	7 905	9%	Russia	observed
Barnacle Goose	coloured legrings	16 210	10%	Russia, Baltic & NL	observed
Greylag Goose	blue neckband	9 037	14%	Scandinavia	observed
White-fronted Goose	only metal rings	47 705	87%	Russia	mainly shot birds

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Other waterbird species
The success of this website also attracted swan researchers, and today also marked Bewick's Swans, Whooper Swans and Mute Swans can be stored in the geese.org database. Moreover, smaller, mainly local Dutch projects focusing on Canada Geese, Bar-headed Geese, Egyptian Geese, Ruddy Shelduck, Wigeon and Black Swan have also been included in the list of waterbirds we deal with.

Data ownership
The individual observers remain owner of their own data, but they allow scientists to use the data for scientific analysis. National or regional ringing centres can access data on geese or swans ringed or seen in their country/area, and a special script has been developed to transcribe the data stored to EURING-format, in order to facilitate a smooth exchange between data systems.

Observers
To date, over 9 000 different observers from 34 countries have contributed their sightings: 298 observers have provided more than 1 000 observations each, 868 observers 100 -1 000 sightings each, and 471 observers from 50-100 sightings. Each observer has access to their own data, and can also see other sightings of birds he or she has at least observed once. Species managers can use the website to send mail-messages to observers for further clarification when necessary.
As of 2019, the ringing data of 168 250 individual birds, and almost two and a half million observations have been stored in the oracle-database. The top six species are Greater White-fronted Goose (65 250 individuals), Barnacle Goose (28 326), Tundra and Taiga Bean Goose (22 042), Greylag Goose (19.930), Dark-bellied Brent Geese (14 455), Pink-footed Geese (5 937) and Lesser White-fronted Geese (579).

Table 3. Number of observations of different goose species until the end of 2011 and 2019.

Scientific name	Species	Number of observations until the end of 2011	Number of observations until the end of 2019
Anser anser	Greylag Goose	402 437	585 815
Anser albifrons	Greater White-fronted Goose	225 018	372 417
Anser fabalis/rossicus	Tundra and Taiga Bean Goose	47 335	83 894
Anser brachyrhynchus	Pink-footed Goose	342 335	409 844
Branta leucopsis	Barnacle Goose	381 547	426 427
Branta bernicla	Brent Goose	234 027	278 290

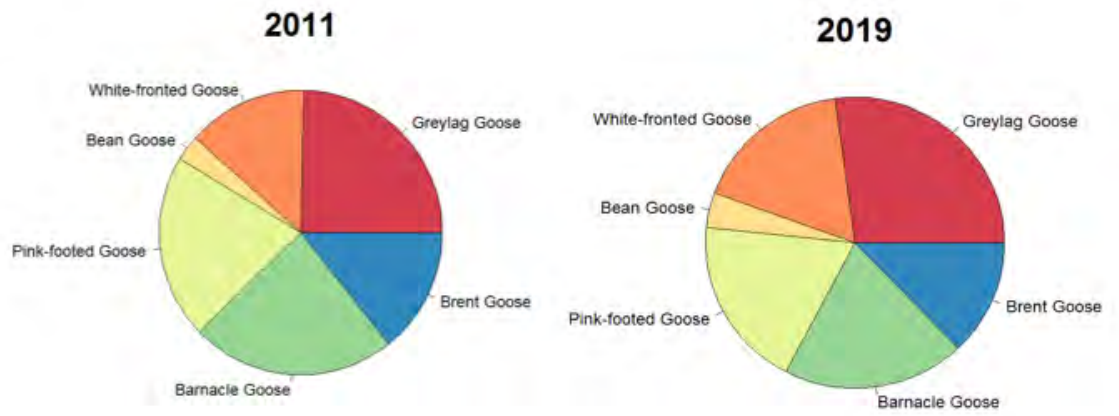

Fig. 2. Proportion of resightings per goose species in 2011 (n = 1 632 699 observations) and 2019 (n = 2 445 545) in the geese.org database.

The data have not only been used to directly inform the individual observer, but also to estimate survival rates, migratory pathways and the importance of staging areas during migration (see Literature).

No data based on satellite tracking or other bird species are included in an effort to keep the website manageable. In this day-and age of sophisticated satellite tracking devices and loggers, we still need extra information to understand the population biology of waterbirds. The main advantages of "old-fashioned" colour-marking and ringing over satellite tracking are that this information enables:

- Larger sample sizes to accurately estimate survival rates
- Studying individual reproductive success
- Longer time span (recording longevity)
- Testing the impact of satellite devices
- Involving amateur bird watchers to improve data quality
- Studying family relationships over many years
- The geese.org database is an interactive one, and the workload is mainly on the shoulders of volunteer observers

Table 3. Current coordinators of the key goose species:

species	Period	coordinator(s)
Dark-bellied Brent Goose	1973 till now	BARWOLT EBBINGE
Barnacle Geese from Russia, the Baltic, and The Netherlands	1979 till now	HENK VAN DER JEUGD
Greater White-fronted Geese (neckbands)	1998 till now	HELMUT KRUCKENBERG, GERARD MÜSKENS, BARWOLT EBBINGE
Tundra and Taiga Bean Geese	1977 till now	THOMAS HEINICKE
Pink-footed Geese from Svalbard	1991 till now	JESPER MADSEN
Greylag Geese from Scandinavia, and Central Europe	1985- till now	LEIF NILSSON, ARNE FOLLESTAD
Greylag Geese from The Netherlands and Central Europe	1990 till now	Berend Voslamber
Lesser White-fronted Geese	2010 till now	Niklas Liljebäck

Further funding.
It is clear that to maintain this very successful goose research tool regular funding is required. Those willing to support the management of the website, financially or otherwise, are invited to contact RALPH BUIJ (). We are open to include sightings for other waterbird population studies, provided a reasonable financial contribution will be made.

Acknowledgements.
This paper is based on a presentation held during the 19th conference of the Goose Specialist Group in Leeuwarden (NL), in January 2020. We would like to thank the input of JESPER MADSEN, THOMAS HEINICKE, LEIF NILSSON, ARNE FOLLESTAD, HELMUT KRUCKENBERG, PETR GLAZOV, MARIO HUIZINGA and the thousands of volunteer observers that contributed to the information collected.

Literature based on individually marked geese, gathered through www.geese.org.

Dispersion, migration

CLAUSEN K.K., J. MADSEN, F. COTTAAR, E. KUIJKEN & C. VERSCHEURE (2018): Highly dynamic wintering strategies in migratory geese: Coping with environmental change. - Glob Change Biol. 2018; 24: 3214–3225.

EBBINGE, B.S. (2009): Tracking marked geese over continental Europe. - Goose News 8: p. 21.

EBBINGE, B.S., H. VAN DER JEUGD, G.J.D.M. MUSKENS & B. VOSLAMBER (2011): Het volgen van individueel gemerkte ganzen. - Vanellus: maandblad voor natuursport, natuurstudie en natuurbescherming 64: 6 - 8. (Tracking individually marked geese, in Dutch)

EBBINGE, B.S. & A.K.M. ST JOSEPH (1992): The Brent Goose colour-ringing scheme: unraveling annual migratory movements from high arctic Siberia to the coasts of western Europe. - In:Ebbinge,B.S. (1992): Population limitation in arctic-breeding geese. - PhD dissertation, Univ. of Groningen, 200p.

GANTER, B. (1997): Observing colour-ringed Brent Geese. Brochure in English, German and Dutch. 24 p. - IBN-DLO, Wageningen, the Netherlands.

LARSSON, K., P. FORSLUND , L. GUSTAFSSON & B.S. EBBINGE (1988): From the high Arctic to the Baltic: the successful establishment of a Barnacle Goose Branta leucopsis population on Gotland, Sweden. - Ornis Scandinavica 19:182-189.

MOOIJ, J.H. (1995): Rückmeldungen und biometrische Daten von auf Taimyr gefangenen Bläßgänsen (*Anser albifrons albifrons*). - in: PROKOSCH, P. & H. HÖTKER (Hrsg.) (1995): Faunistik und Naturschutz auf Taimyr, Expeditionen 1989-1991. Corax 16 (special issue): 160-168.

NILSSON L (2006): Changes in migration patterns and wintering areas of south Swedish Greylag Geese *Anser anser*. - In: BOERE G.C., C.A. GALBRAITH & D.A. STROUD (eds) (2006): Waterbirds around the world. - The Stationery Office, Edinburgh: 514–516

PROKOSCH, P. (1995): Mauser, Gewicht und Ringfunde von Ringelgänsen (Branta bernicla bernicla) auf Taimyr. - in: PROKOSCH, P. & H. HÖTKER (Hrsg.) (1995): Faunistik und Naturschutz auf Taimyr, Expeditionen 1989-1991. Corax 16 (special issue): 108-131.

VOSLAMBER, B., E. KNECHT & D. KLEIJN (2010): Dutch Greylag Geese *Anser anser*: migrants or residents. - Ornis Svecica 20: 207-214.

Habitat use

EBBINGE, B.S. (1992): Regulation of numbers of Dark-bellied Brent Geese *Branta b. bernicla* on spring staging sites. - Ardea 80:203-228.

EBBINGE, B.S. (2009) Evaluatie opvangbeleid 2005-2008 overwinterende ganzen en smienten. - Deelrapport 4. Invloed opvangbeleid op de internationale verspreiding van overwinterende ganzen in NW-Europa. Alterra-rapport 1842, Wageningen (Impact of goose management in 2005-2008 in the Netherlands on the international distribution of wintering geese, in Dutch)

EBBINGE, B.S. & B. SPAANS (1995): The importance of body reserves accumulated in spring staging areas in the temperate zone for breeding in Dark-bellied Brent Geese *Branta b. bernicla* in the high Arctic. - J.Avian Biol. 26: 105-113.

EBBINGE, B.S., P. PROKOSCH, B. SPAANS, G.J.D.M. MÜSKENS, R. BOM, YA.I. KOKOREV & E.E. SYROECHKOVSKIY (2013): Flexibility in faithfulness of Dark-bellied Brent Geese, *Branta b. bernicla* to moulting sites. - Wildfowl (2013) Special Issue 3: 116-134.

GANTER, B., P. PROKOSCH & B.S. EBBINGE (1997): The effect of saltmarsh loss on the dispersal and fitness parameters of dark-bellied brent geese. - Aquat. Conserv.7, 141-151.

KLEIJN D., E. VAN WINDEN, P.W. GOEDHART & W. TEUNISSEN (2009): Evaluatie Opvangbeleid 2005–2008 overwinterende ganzen en smienten. - Deelrapport 10. Hebben overwinterende ganzen invloed op de weidevogelstand? Rapport No. 1771. Wageningen, The Netherlands: Alterra. (Do wintering geese have an impact on nesting waders?, in Dutch)

Survival

BRIX, M. & B.S. EBBINGE (2003): Erkentnisse zum Alter von Ringelgänsen *Branta b. bernicla.* - Seevögel 24 (4): 90. Longevity in Dark-bellied Brent Geese (in German)

CLAUSEN, K.K. & J. MADSEN (2014): Effects of neckbands on body condition of migratory geese. - Journal of Ornithology 155(4): 951-958.

EBBINGE, B.S. & H. VAN DER VOET (1990): Have all barnacle geese *Branta leucopsis* the same probability of being sighted? Implications for estimation of survival rate. - Ring 13: 37-44.

EBBINGE, B.S., J.B. VAN BIEZEN & H. VAN DER VOET (1991): Estimation of annual adult survival rates of Barnacle Geese *Branta leucopsis* using multiple resightings of marked individuals. - Ardea 79: 73-112.

EBBINGE, B. (2014): De rotgans. - Atlas Contact, Amsterdam pp. 363. (The Brent Goose, monograph in Dutch).

EBBINGE, B.S., E. RAKHIMBERDIEV, J. KARAGICHEVA , G.J.D.M. MÜSKENS & B. SPAANS (2020): Annual survival of Dark-bellied Brent Geese (*Branta b. bernicla*) in western Europe in 1970-2016. - Poster 19th International Conference IUCN-SSC Goose Specialist Group

JEUGD, H.P. VAN DER & A. KWAK (2017). Management of a resident barnacle goose *Branta leucopsis* population: how can results from counts, ringing and hunting bag statistics be reconciled. - Ambio 46: 251-261.

JONGEJANS E., B.A. NOLET, H. SCHEKKERMAN, K. KOFFIJBERG & H. DE KROON (2014): Naar een effectief en internationaal verantwoord beheer van de in Nederland overwinterende populatie Kolganzen. - Sovon-rapport 2014/56, CAPS-rapport 2014/02. Sovon Vogelonderzoek Nederland, Nijmegen. (Towards an effective and internationally acceptable management of the population of Greater White-fronted Geese, wintering in the Netherlands (in Dutch))

KÉRY, M., J. MADSEN & J.-D. LEBRETON (2006): Survival of Svalbard pink-footed geese *Anser brachyrhynchus* in relation to winter climate, density and land-use. - Journal of Animal Ecology 75: 1172-1181.

Could changes in feeding behaviour affect longstanding site fidelity of Pink-footed Geese *(Anser brachyrhynchus)* wintering in Flanders (Belgium) ?

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Introduction

The wintering geese of the Oostkustpolders has now been subject to over six decades of intensive monitoring. This coastal area of appr. 300 km² is situated near the North Sea between Bruges, Ostend and Knokke and represent the main wintering area of geese in Flanders (Fig.1.) Most numerous are Pink-footed Geese (*Anser brachyrhynchus*) and White-fronted Geese *(A. albifrons)* reaching in Flanders the southern limits of their respective flyways. Numbers and distribution of Arctic geese in Flanders were recently updated by DEVOS & KUIJKEN (2020).

This paper describes the long-term trends in numbers and land-use of Pinkfeet, characterised by the traditional selection of the Oostkustpolders as their exclusive wintering area in Flanders (and Belgium). The unprecedented pattern in regional distribution of Pinkfeet in 2018-2000 is discussed in relation to the recent changes in food preferences. The question is if this could lead to a change of the traditional winter distribution site-fidelity as frequently described (see e.g. MEIRE et al. 1988, MEIRE & KUIJKEN 1991, KUIJKEN & MEIRE 1996, MADSEN et al. 1999, KUIJKEN et al 2005, 2006, KUIJKEN & VERSCHEURE 2008 & 2016).

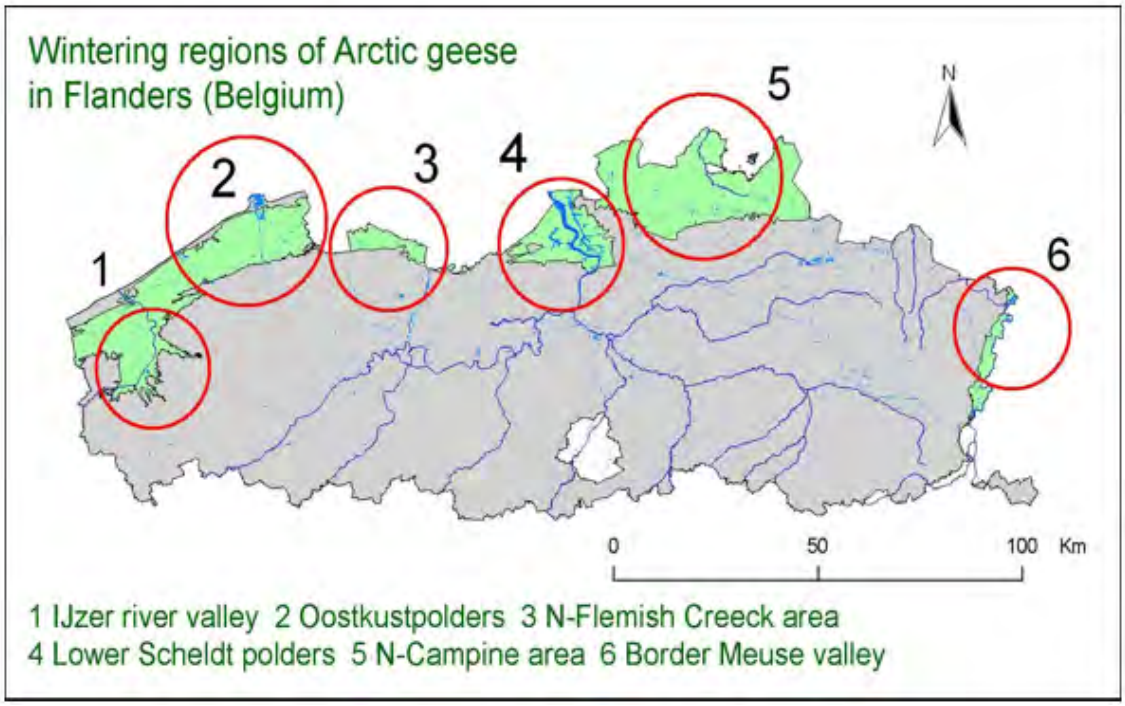

Fig. 1. Wintering regions of Arctic geese in Flanders

1. Fieldwork on wintering geese in the Oostkustpolders 1959/60 – 2019/20

Annually, six simultaneous mid-monthly counts and one extra late-December have tracked trends in numbers, distribution and habitat use for Pinkfeet and Whitefronts, as in most parts along the flyways of these species. Both populations have increased considerably since the 1960s. Nature conservation actions have also influenced the presence of geese in Flanders, notably the national goose shooting ban since 1981/82 and the designation of several Natura 2000 sites (EU Bird and Habitat Directives) that includethe key goose wintering areas in the Oostkustpolders. Special attention was given to conservation and restoration of threatened permanent grasslands of greatest nature value. Lastly the effects of global warming most probably influence the regional attendance of geese, also indirectly as a result of agricultural land-use shifts related to prolonged growth seasons. Some modifications seem to have accelerated during the last decade.

2. Evolution of wintering numbers

The annual peak numbers of Pinkfeet and Whitefronts are represented in Fig. 2. After a build-up period of two decades, the harsh winter conditions of 1978/79 caused a massive retreat of most Arctic geese from more northern areas to Belgium and even France. Many new sites in Flanders were occupied during this influx. In subsequent seasons, increasing numbers returned to this region, more and more exploring the opportunities of using suitable polder grasslands adjacent to the traditional key sites such as Damme. (MEIRE et al. 1988.)

Pinkfeet numbers in the Oostkustpolders started to exceed 20.000 in the mid 1990s, reaching an average winter maximum of 35 000-40 000 during the period 1994 to 2008. This represented almost 75% (up to 90%) of the rapidly increasing Svalbard population. Since 2009, however, maximum numbers have decreased (excepting a short peak of 48 000 in 2010/11) and actually now amount to less than 30% of the Svalbard population, estimated at ca 75.000 (HELDBJERG et al. 2019).

Pinkfeet increasingly stay in Denmark during winter, presumably as a response to milder climate (THERKILDSEN & MADSEN 2000, MADSEN et al. 2018, CLAUSEN et al. 2018a). Numbers wintering in Friesland (the Netherlands) are also still decreasing, at an even faster rate than in Flanders (COTTAAR & KOFFIJBERG 2018).

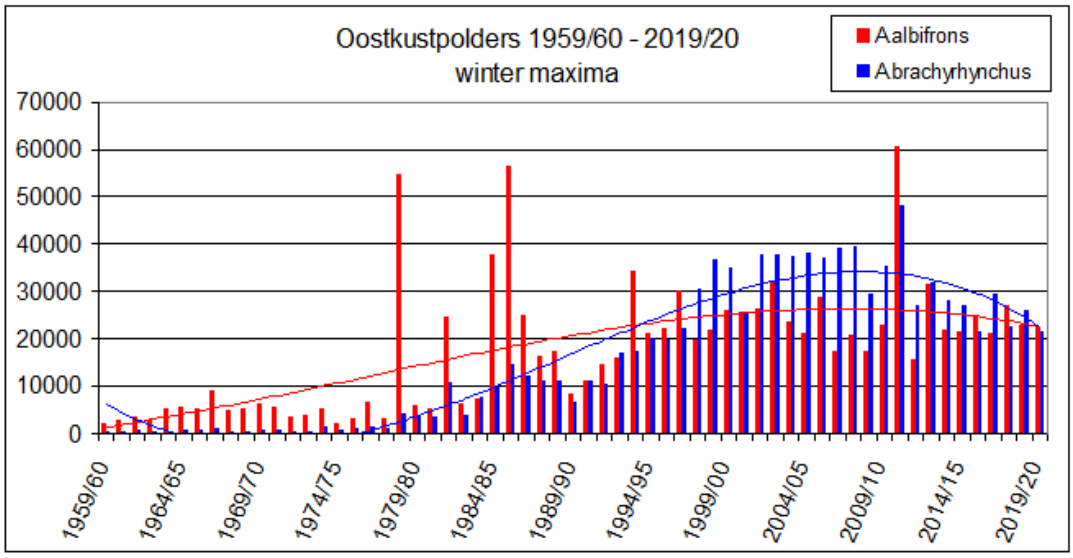

Fig. 2. Annual winter maximum of Whitefronts and Pinkfeet in Oostkustpolders (colums: counts; lines: polynomial regressions)

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In the Oostkustpolders, similar to Pinkfeet, Whitefront numbers also increased from the mid 1990s onwards but have remained quite stable at a level of 25 000 (with also one peak of 60 000 in 2010/11, Fig.2). During the last decade, however, considerable numbers increasingly winter in the IJzer valley (15 000 to over 30 000), but flocks seldom cross the nearby French border. In contrast to Pinkfeet, Whitefronts are more mobile and widely distributed using several staging sites (see Fig. 1). This trend in numbers and distribution is described in detail by DEVOS & KUIJKEN (2012, 2020), also for the other goose species wintering in Flanders.

Pinkfeet arrive in Flanders around mid October. The annual peak numbers are reached in mid or late December, followed by an early departure from before mid January until mid February. Whitefronts arrive in early October, reach a winter maximum between late December to mid January and stay until mid March. In contrast to Pinkfeet, highest Whitefront peaks coincide with hard winters (see Fig. 2).

3. Trends in goose habitat use related to agriculture

Since the earliest observations in the Oostkustpolders, Pinkfeet have preferred permanent grassland as feeding habitat (KUIJKEN 1969).
From the late 1990s onwards, occasional foraging on fields with crop left-overs started: potatoes, sugar beet and in the last decade especially maize (KUIJKEN et al. 2006). A similar increase in maize feeding by Pinkfeet has been reported also in Friesland (The Netherlands) by COTTAAR (2009, 2019) and Denmark (CLAUSEN et al. 2018b). The higher nutritive value of crops compared to grassland is discussed by FOX et al. 2005.

This increasing use of croplands was clearly related to the decrease in the extent of permanent grassland and the increasing areas under potato and especially maize cultivation. This was analysed in detail by KUIJKEN & VERSCHEURE (2016) for the Oostkustpolders. CLAUSEN et al (2018a) compared this behavioural shift in Flanders with the situation in Denmark, where a similar increasing preference for maize followed the increase in the area under this crop, a factor that partly explains the higher numbers of Pinkfeet wintering in Denmark.

Habitat use of Pinkfeet compared to Whitefronts is shown in Table 1. Figures represent the percentage of birds on grasslands in 5-year periods. Pinkfeet in particular started to visit croplands from the late 1990s. The differences between Pinkfeet and Whitefronts in both distribution and habitat use was discussed by KUIJKEN & VERSCHEURE (2008), suggesting a tendency to niche segregation between the species.

Table 1. Grassland use by Pinkfeet and Whitefronts in the Oostkustpolders (5y-periods)

Oostkustpolders: % of geese on permanent grassland		
Period	Whitefront	Pinkfoot
1982 – 1986	97	98
1987 – 1991	90	98
1992 – 1996	91	94
1997 – 2001	95	87
2002 – 2006	91	78
2007 – 2011	93	73
2012 – 2016	90	56
2017 – 2020	93	72

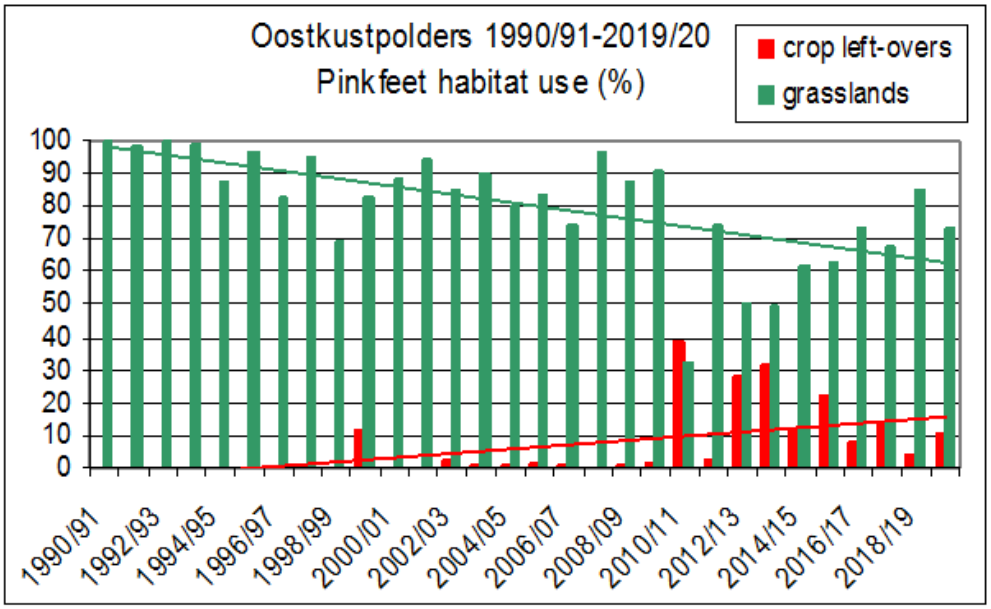

Fig. 3. Long term changes in feeding preferences for grassland and crop leftovers (other habitats used by Pinkfeet are not included, e.g. winter wheat.)

Annual changes in percentage use of crop leftovers and permanent grasslands are compared in Fig. 3 (other habitats such as winter wheat are not represented), showing the slight return to 'normal' use of grassland in the last deacde.

Feeding on arable land remains rather limited to the first half of the winter, until the preferred crop leftovers become depleted. Normally, the supply of spoiled potatoes and sugar beet more or less ends when the fields are ploughed for sowing winter wheat (November-early December), althoughfields sown with this fast germinating crop may contain fragments of potatoes and sugar beet that remain visible and highly attractive to feeding geese, although in lesser numbers.

Pinkfeet exploring the wooded Sand Region landscape in search of maize (photo E. Kuijken)

Many maize stubble fields are undersown with grass to grow following the harvest. Other stubbles grow a spontaneous grassy vegetation cover in mild conditions. Many maize fields with such regrowth are fertilized but not ploughed during winter. These stubble fields continue to function as an attractive resource for Pinkfeet feeding on both the remaining grains and the abundance of fresh grasses (see photos).

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When in late winter and early spring the intensive manuring and fertilising starts, many sites are abandoned by the geese. Only the permanent grasslands on clay soils that are too wet for tractors and other heavy machines escape several weeks from these farming activities and thus attract most foraging geese again in the second half of the winter.

Pinkfeet feeding on maize stubble undersown with grass (*Lolium* sp). in the Sand Region; the food availability of the bare stubble field in the back is almost fully depleted (photo E. Kuijken)

As a consequence of global warming, agricultural land use is changing at a rapid rate. Recent milder winters and earlier spring seasons are extending the period of agricultural productivity. Later autumn harvesting of crops and especially cattle grazing into mid-winter lead to more activities throughout winter. This coincides with a change of goose behavior with increasing preference for foraging on energy-rich crops, harvested croplands or sown nitrogen-rich grasses (e.g. *Lolium sp*.).

Interesting earlier data on feeding habitat shifts are presented by THERKILDSEN & MADSEN (2000) and FOX et al. (2005). WISZ et al. (2008) investigated in which way agricultural land-use could have spatial consequences related to potential wintering grounds for geese. The adaptability of geese and their exploratory behaviour in this regard is discussed by CLAUSEN et al. (2018) and FOX & ABRAHAM (2017).

4. Recent changes of Pinkfoot distribution : (not) the end of site fidelity?

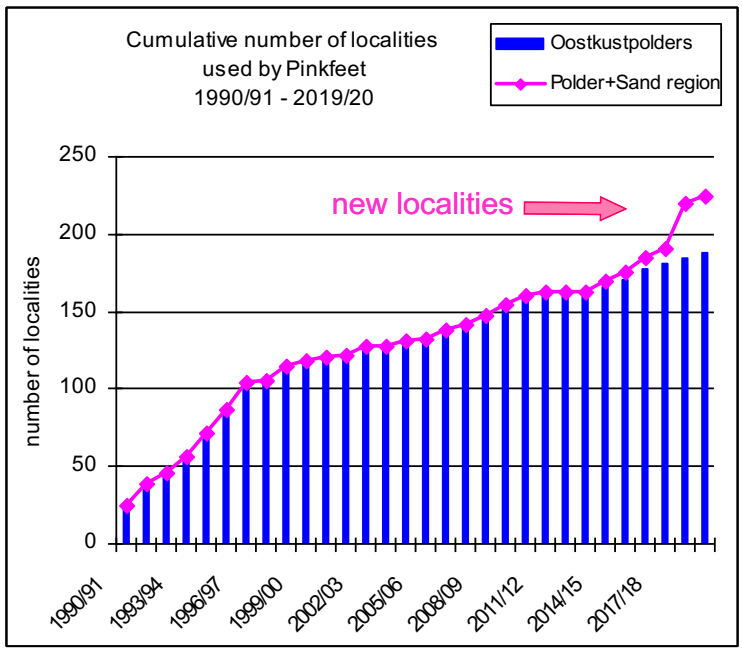

Fig. 4. Cumulative number of locations used by Pinkfeet.

Pinkfeet wintering in Flanders maintained a strict site fidelity for the Oostkustpolders, except where some small flocks were reported outside the traditional area (DEVOS & KUIJKEN 2012, KUIJKEN & VERSCHEURE 2016).

Fig. 4 illustrates the expanding presence of Pinkfeet by plotting the annual number of new sites in a cumulative graph of localities.

The sharp increase in the 1990s runs in parallel with the rapidly increasing goose numbers (see Fig. 1) and levels off in the last decade (blue bars represent polder localities).

The search for croplands by Pinkfeet since the late 1990s (described above, see Tab.1 and Fig. 3) first led to the use of cultivated fields between the traditional grassland complexes *within* the Oostkustpolders. As illustrated in Fig 4 the cumulative number of new polder locations (blue bars) became almost saturated, as most of this traditional region was already being used.

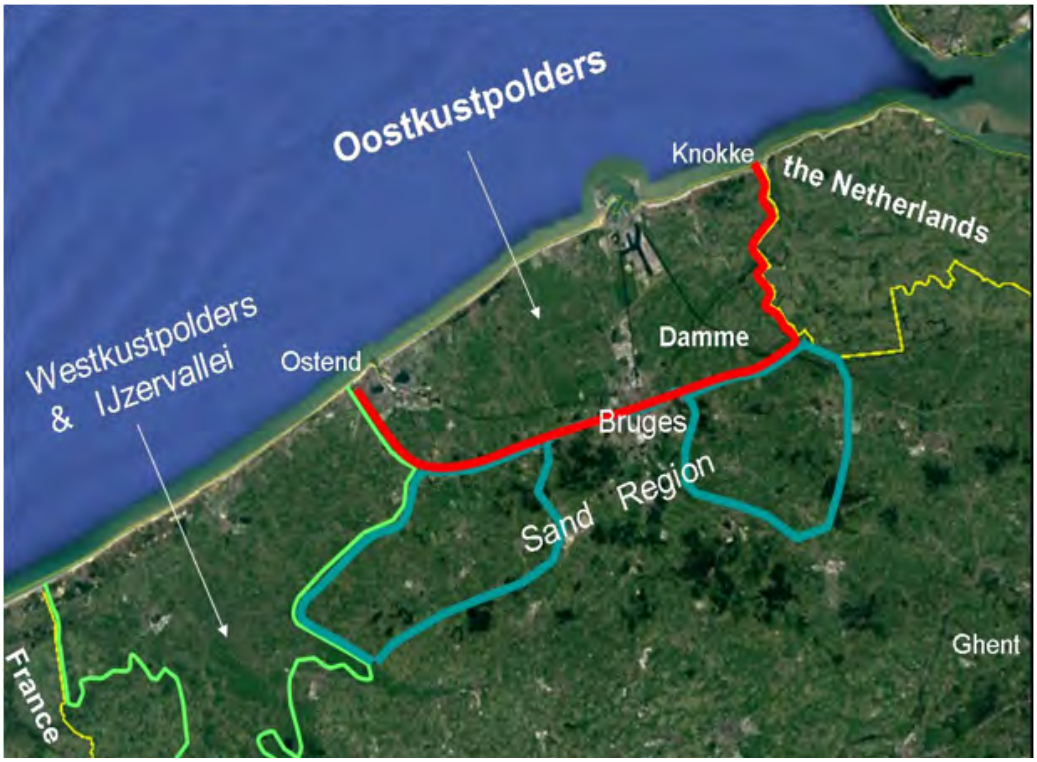

Fig. 5. Wintering areas of Oostkustpolders (red) and adjacent Sand Region in the south (blue); Pinkfeet very rarely visit the Westkustpolders and IJzervallei

From 2012/13, a few small Pinkfeet flocks or single families were observed outside the polders in the adjacent Sand Region, east and west of Bruges (see Fig. 5). A sudden increase of larger Pinkfeet flocks exploring the Sand Region for maize was a most unusual phenomenon during 2018/19 and 2019/20. As a result, the number of new sites increased and was added in the cumulative location curve (Fig. 4). However this red line already seems to flatten which could signify the temporary character and spatial limits of these movements.

This new behaviour was most remarkable in 2018/19, when flocks of sometimes over 3000 birds frequently moved from polder areas to maize fields in the Sand Region at distances up to 15 km. This occurred from early November up to mid-February. These numbers only represented 3,5% of the wintering totals in 2018/19 and 2019/20 (see red bars in Fig. 6).

In most cases, the flocks returned to the traditional key polders sites where they spent the night. Rarely, some single families of Whitefronts accompanied the relocated Pinkfeet. In winter 2019/20, from the very beginning in October until the end of December flocks regularly visited the same (but less) Sand localities of the preceding winter but in lower numbers (max. 1 500). No visible changes in the area (e.g. availability of maize) could explain this reduced exploring behaviour.

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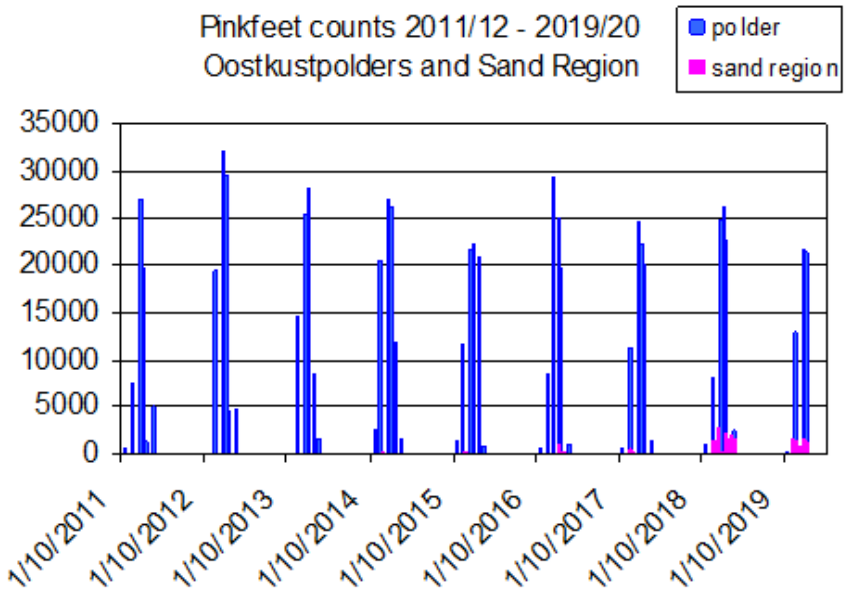

Fig. 6. Numbers of Pinkfeet in Oostkustpolders and exploring adjacent Sand Region.

These extraordinary appearances outside the Oostkustpolders were confirmed by Pinkfeet with GPS-transmitters (project of SCHREVEN, MADSEN & NOLET, 2018-2020). We were allowed to follow the daily locations of 12 geese fitted with transmitters present in Flanders in 2018/19 and 6 tagged birds in 2019/20. This facilitated the ground truth for observing the habitat use of these birds and counts of the flocks of which they were part. Also the field observations of morning and evening flights from and to the polders were confirmed by the GPS positions.

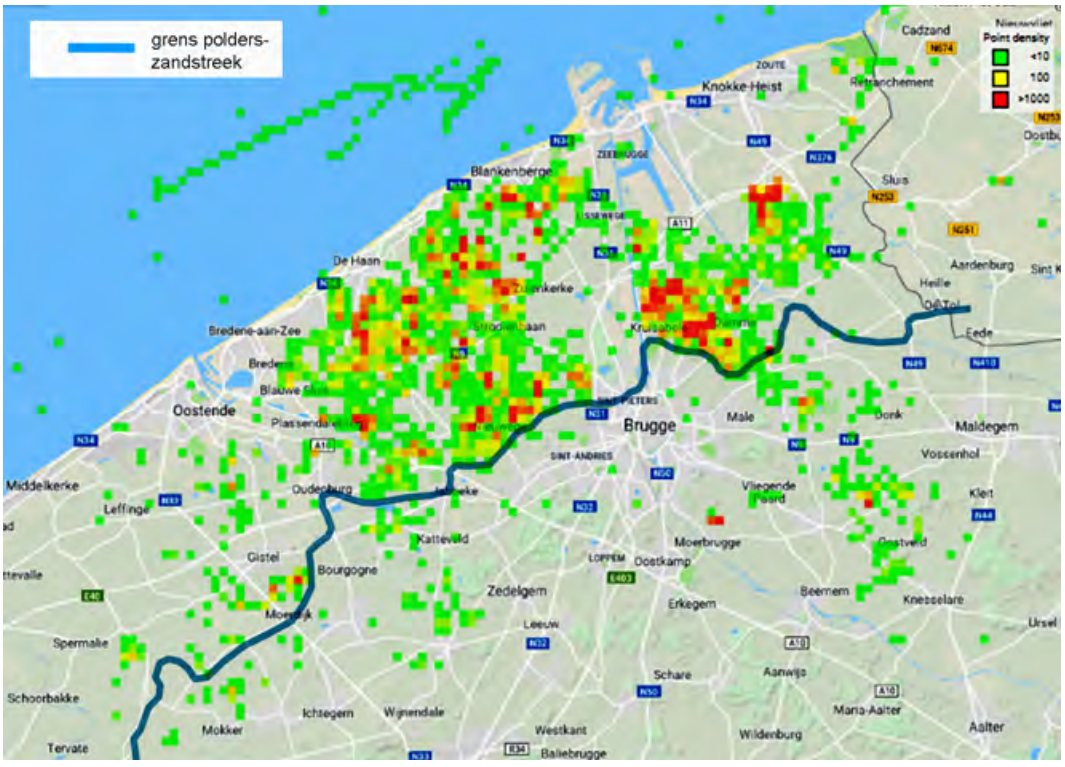

Fig. 7. Density of signals by transmitter-tagged Pinkfeet in 2018/19 and 2019/20: red dots indicate highest densities in key wintering localities (the blue line is the border between the Polders with clay soils and the Sand Region).

The cumulative position of transmitters (density of signals) in Fig. 7 clearly illustrates the location of all key sites (red squares) within the traditional Oostkustpolders. The scattered sites south of the polders (blue line) represent the temporary presence of tagged birds in the Sand Region, where only in a few localities GPS signals were frequently registered (<5 red dots).

A few very isolated feeding parcels were discovered thanks to the presence of tagged birds, although the region was year round visited by a number of skilled field observers that reported the (unusual) presence of geese. Important additional information became available about the daily movements of the tagged birds (and the flocks of which they were part) along some fixed corridors between the Sand Region and the Polders, where nocturnal roosts were frequented as well as feeding grounds.

Finally, these GPS tracks illustrated the importance of the traditional key sites for wintering geese. The restoration of wet grassland habitats has recently been successfully achieved thanks to an important LIFE-project of Natuurpunt. A crucial action was the (re-)creation of shallow ponds and permanent high water levels in four Polder nature reserve areas of this NGO (Uitkerke, Zwaanhoek, Ter Doest and Damme). This was a very successful accomplishment, as in these localities function as safe feeding grounds and nocturnal roosts for wintering geese (and as a habitat for many other waterbirds and breeding meadow birds) and their quality was significantly improved.
This action is a Belgian contribution to the International Species Management Plan for the Pink-footed Goose under AEWA, the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (MADSEN et al. 2017).

Conclusion

The recent phenomenon of Pinkfeet exploring new sites in the Sand Region outside but adjacent to the Oostkustpolders seems to remain a minor change in their overall spatial distribution. Only relatively low numbers wintering in the traditional Polder area also visit the Sand Region (max. 3.5 % of total) but return to spend the night. This new behaviour, caused by an almost obsessional but temporary preference for maize stubble, already reflects the decreasing use of sites in the Sand Region during the last winter. Thanks in part to the use of GPS transmitter data from tagged Pinkfeet, daily movements along fixed corridors have become evident. Moreover, the positive functional response of geese to habitat restoration in core polder reserve areas could be confirmed.
So far we do not need to alter the concept of extreme site fidelity of wintering Pinkfeet for the Oostkustpolders in Flanders, but continued monitoring is essential to reveal future developments.

Acknowledgments

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We are most grateful for the long standing and enthusiastic collaboration of many skilled volunteers participating in the seven simultaneous goose counts annually.

References

CLAUSEN, K., J. MADSEN, F. COTTAER, E. KUIJKEN & C. VERSCHEURE. (2018a): Highly dynamic wintering strategies in migratory geese: Coping with environmental change. - Global Change Biology 2018; 1-11.

CLAUSEN, K., J. MADSEN, B. NOLET & L. HAUGAARD (2018b): Maize stubble as foraging habitat for wintering geese and swans in northern Europe, - Agriculture, Ecosystems & Environment 259: 72-76.

COTTAAR, F. (2009): Pink-footed Geese *Anser brachyrhynchus* exploit maize as a new food source in the Netherlands. Limosa 82 (1): 23-25. (in Ditch with summ.).

COTTAAR, F. (2019) Pink-footed Geese *Anser brachyrhynchus* preferred harvested maize over grass as a food resource in Friesland in autumn 2017. - Limosa 92 (1): 24-27. (in Ditch with summ.).

DEVOS, K. & E. KUIJKEN (2012): Wintering wild geese in Belgium: an update on numbers and trends (1990/91–2011/12). - Goose Bulletin 15: 18-27.

DEVOS, K. & E. KUIJKEN (2020): Trend in the numbers and distribution of wintering geese in Flanders (1990/91–2017/18). - Natuur.Oriolus 86/1: 3-15 (in Dutch with summ.).

FOX, A., J. MADSEN, H. BOYD, E. KUIJKEN, D. NORRISS, I. TOMBRE & D. STROUD (2005): Effects of agricultural change on abundance, fitness components and distribution of two arctic-nesting goose populations. - Global Change Biology (2005) 11, 881–893.

FOX, A.D. & K. F. ABRAHAM (2017): Why geese benefit from the transition from natural vegetation to agriculture. - Ambio, Vol. 46, Supplement 2, pp. 188-197.

HELDBJERG, H., J. MADSEN, O. AMSTRUP, J. BAKKEN, T.T.J. BALSBY, T.K. CHRISTENSEN, K.K. CLAUSEN, F. COTTAAR, J. FRIKKE, O.M. GUNDERSEN, J.P. KJELDSEN, K. KOFFIJBERG, E. KUIJKEN, J. MÅNSSON, P.I. NICOLAISEN, H.H. NIELSEN, L. NILSSON, T. REINSBORG, J. PESSA, P. SHIMMINGS, I. TOMBRE, F. VERHAEGHE, C. VERSCHEURE & M.J. WESTEBRING (2019): Pink-Footed Goose Svalbard Population Status Report 2018/2019. - AEWA EGMP Technical Report No. 11. Bonn, Germany.

KUIJKEN, E. (1969): Grazing of wild geese on grasslands at Damme, Belgium. - Wildfowl 20:47-54.

KUIJKEN, E. & P. MEIRE (1996): Some results from long-term monitoring of wintering geese in Oostkustpolders, Flanders, Belgium. - Wetlands International Goose Specialist Group Bulletin nr 8: 22-25.

KUIJKEN, E., C. VERSCHEURE & P. MEIRE (2005): Geese in the Oostkustpolders: 45 year evolution of numbers and distribution. - Natuur.Oriolus 71: 21-42 (in Dutch with summ.).

KUIJKEN, E., C. VERSCHEURE, W. COURTENS & P. MEIRE (2006): Long term trends in numbers and distribution of wintering geese in the Oostkustpolders, Flanders (Belgium). - In: BOERE, G.C., C.A. GALBRAIGTH & D.A. STROUD (EDS.) (2006): Waterbirds around the World. - The Stationery Office, Edinburgh, UK. pp. 508-511.

KUIJKEN, E. & C. VERSCHEURE (2008): Greater White-fronted Geese *Anser albifrons* and Pink-footed Geese *A. brachyrhynchus* wintering in Belgium: observations on interspecific relations. - Vogelwelt 129: 185 – 190.

KUIJKEN, E. & C. VERSCHEURE (2016): Wintering Pink-footed geese *Anser brachyrhynchus* in the coastal polders of Flanders (Belgium) during 2015/2016: Persistent trends in habitat use. - Goose Bulletin 21: 6–11.

MADSEN, J., E. KUIJKEN, P. MEIRE, F. COTTAER, T. HAITJEMA, P.I. NICOLAISEN, T. BONES & F. MEHLUM (1999): Pink-footed Goose *Anser brachyrhynchus*: Svalbard. - In: MADSEN, J., G. CRACKNELL & A.D. FOX (EDS.) (1999): Goose Populations of the Western Palearctic. A review of Status and Distribution. - Wetlands International Publ. No.48, Wetlands International, Wageningen, The Netherlands. National Environmental Research Institute, Rönde, Denmark. pp.82-93.

MADSEN, J., J.H. WILLIAMS, F. A. JOHNSON, I. M. TOMBRE, S. DERELIEV & E. KUIJKEN (2017): Implementation of the first adaptive management plan for a European migratory waterbird population: the case of the Svalbard pink-footed goose *Anser brachyrhynchus*. - Ambio 2017, 46 (Suppl. 2): 275–289.

MEIRE, P., E. KUIJKEN & K. DEVOS (1988): Numbers and distribution of White-fronted and Pink-footed Geese in Flanders (Belgium), 1981-87 in a North West European context. - Wildfowl 39: 71-81.

MEIRE, P. & E. KUIJKEN (1991): Factors affecting the numbers and distribution of wintering geese and some implications for their conservation in Flanders, Belgium. - Ardea 79 (2): 153-157.

THERKILDSEN, O.R. & J. MADSEN (2000): Energetics of feeding on winter wheat versus pasture grasses: a window of opportunity for winter range expansion in the pink-footed goose *Anser brachyrhynchus*. - Wildlife Biology, 6, 65–74.

WISZ, M., N. DENDONCKER, J. MADSEN, M. ROUNSEVELL, M. JESPERSEN, E. KUIJKEN, W. COURTENS, C. VERSCHEURE & F. COTTAAR (2008): Modelling pink-footed goose (*Anser brachyrhynchus*) wintering distributions for the year 2050: potential effects of land-use change in Europe. - Diversity and Distributions, 2008; 11 pp.

Pinkfeet flocks searching for maize fields in the typical Sand Region wooded landscape (Photo: E. Kuijken)

A long-distance shift in nest site of an otherwise site-faithful Barnacle Goose: evidence from GPS-tracking data

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Abstract
Geese are considered to show high nest-site fidelity throughout their lives. While geese can make short-ranged shifts in nest sites, often following reproductive failure, long-distance shifts are rarely reported. Here we use GPS-tracking to show how a female Barnacle Goose made a 100km shift in nest-site to Kolguev Island, Russia after 9 years of high nest-site fidelity in the Tobseda colony on the Russian mainland. Three consecutive years of GPS-tracking show that, despite a change in nest-site, the goose still visited the former nesting site in the Tobseda colony annually before moving on to the new nest site. The shift in nest site is likely caused by disturbance of the nest site in the Tobseda colony by hunting activity.

Introduction

Nest-site fidelity is considered high in waterfowl (OWEN & BLACK 1990), which tend to return to the same colonies, and often to close proximity of the exact same nesting location. For Arctic-nesting species, high site fidelity is especially important as there is little time to search for good nesting sites in the short Arctic breeding season (OWEN & BLACK 1990). While there exists variation in the degree of natal philopatry (LINDBERG et al. 1998), once adult geese are settled in a colony, nest-site fidelity can be as high as 100% in some populations (SEDINGER et al. 2008). Within colonies geese are known to make shifts in nest-site locations, mostly covering short distances (100m to 5km) (LINDBERG & SEDINGER 1997; TOMBRE et al. 1998; KARAGICHEVA et al. 2011), often after nest failure (LINDBERG & SEDINGER 1997; KARAGICHEVA et al. 2011).
Shifts between colonies which are further apart are seldom recorded. The question is whether this is due to the limited number of goose colonies that are intensively monitored, especially in the Arctic region, or whether long-distance shifts in nest-site are rare. Here we used GPS-tracking technology to track movements of geese, thereby recording a nest-site shift of 100km in an Arctic-nesting Barnacle Goose, and discuss the potential reasons for its shift.

Methods

The Barnacle Goose colony at the abandoned village of Tobseda in the Kolokolkova Bay, Russia has been studied since the summer of 2002 in a joint effort by the Russian Ringing Centre, the University of Groningen and the Netherlands Institute of Ecology. During yearly expeditions, nest surveys were conducted and geese were caught and ringed during moult (see VAN DER JEUGD et al. 2003, 2009 for details). Presence and reproductive status (nesting behaviour, number of accompanying chicks) of colour-banded geese was recorded throughout the season. The study site was visited for Barnacle Goose studies between 2002 and 2009, between 2013 and 2015, and in 2018 and 2019.
On 3 August 2003, a female gosling was captured in Tobseda in a moulting flock and marked with leg colour bands Lime "A" (on the left tarsus) and Blue "5" (on the right tarsus), or "LAB5". This allowed the bird to be observed by ring readers in the wintering grounds as well as in the breeding grounds during consecutive expeditions.

On 22 June 2014, LAB5 was captured on the nest in Tobseda (Fig. 1) and equipped with a UvA-BiTS GPS-logger (BOUTEN et al. 2013). The GPS-logger recorded positions every 5 minutes inside the breeding colony, and every 15 – 60 minutes outside the breeding colony, depending on the battery and memory status. GPS-data was downloaded remotely using a Zigbee antenna in the breeding colony in the summer of 2015. In addition, LAB5 showed up in a breeding colony in The Netherlands (Westplaat Buitengronden) during early spring, where we had antennas placed to monitor locally breeding geese. This allowed us also to download data from LAB5 in April and May 2016 and 2017. A part of the data collected by the logger of LAB5 could be downloaded at the Russian breeding colony in 2015, but most of the data was downloaded in April 2017 in the Westplaat Buitengronden.
Details on capturing and tracking methodology is described in LAMERIS et al. (2018).

Fig. 1: Barnacle Goose LAB5 with UvA-BiTS GPS-logger on 22 June 2014.

Results

Colour-band observations
After being captured and marked in 2003, LAB5 was first observed in the breeding colony at Tobseda in June 2005. It is unsure whether it has been breeding during this summer, but it did stay during moult and was recaptured in August 2005. In 2006 it was confirmed as breeding in Tobseda, as it was observed with one accompanying chick in early July 2006. In 2007, it was observed on a nest which successfully hatched on 10 July. It was also observed breeding in 2008 and 2013 (both years on the same location), and in both years its eggs successfully hatched (Tab. 1).

Tracking observations
In 2014, LAB5 initiated a nest on 5 June together with her mate, O=Y5. The nest was located at the exact same location as the 2008 nest. After capture and marking on the 22 June, tracking data showed that the bird remained incubating on the nest until 3 July, and thereafter remained in close surroundings of the nest until 7 July (Fig. 2).
In the field, we observed remains of hatched eggs on 5 July, which suggests that the eggs successfully hatched. However, the bird flew to the Korovaya bay 35km away from the breeding colony on 7 July (Fig. 3), suggesting that the hatched chicks had been depredated. On 11 July, the bird flew to the Peschanka Delta on Kolguev Island where it remained until 22 August, after which it spent the post-breeding period in the Korovaya Bay (Tab. 2).

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Tab. 1: Summering location, age and reproductive status of LAB5 between 2003 and 2016. Age is counted from 0 in the year of birth, reproductive status is presented as non-breeder (no breeding attempt observed), unsuccessful breeder (breeding attempt observed but nest predated or abandoned before hatch) or successful breeder (breeding attempt and signs of hatching observed).

Year	Location during breeding season	Age	Reproductive status
2003	Tobseda	0	-
2004	-	1	-
2005	Tobseda	2	Non-breeder
2006	Tobseda	3	Successful breeder
2007	Tobseda	4	Successful breeder
2008	Tobseda	5	Successful breeder
2009	-	6	-
2013	Tobseda	10	Successful breeder
2014	Tobseda	11	Successful breeder
2015	Peschanka Delta	12	Successful breeder
2016	Peschanka Delta	13	Unsuccessful breeder / non-breeder

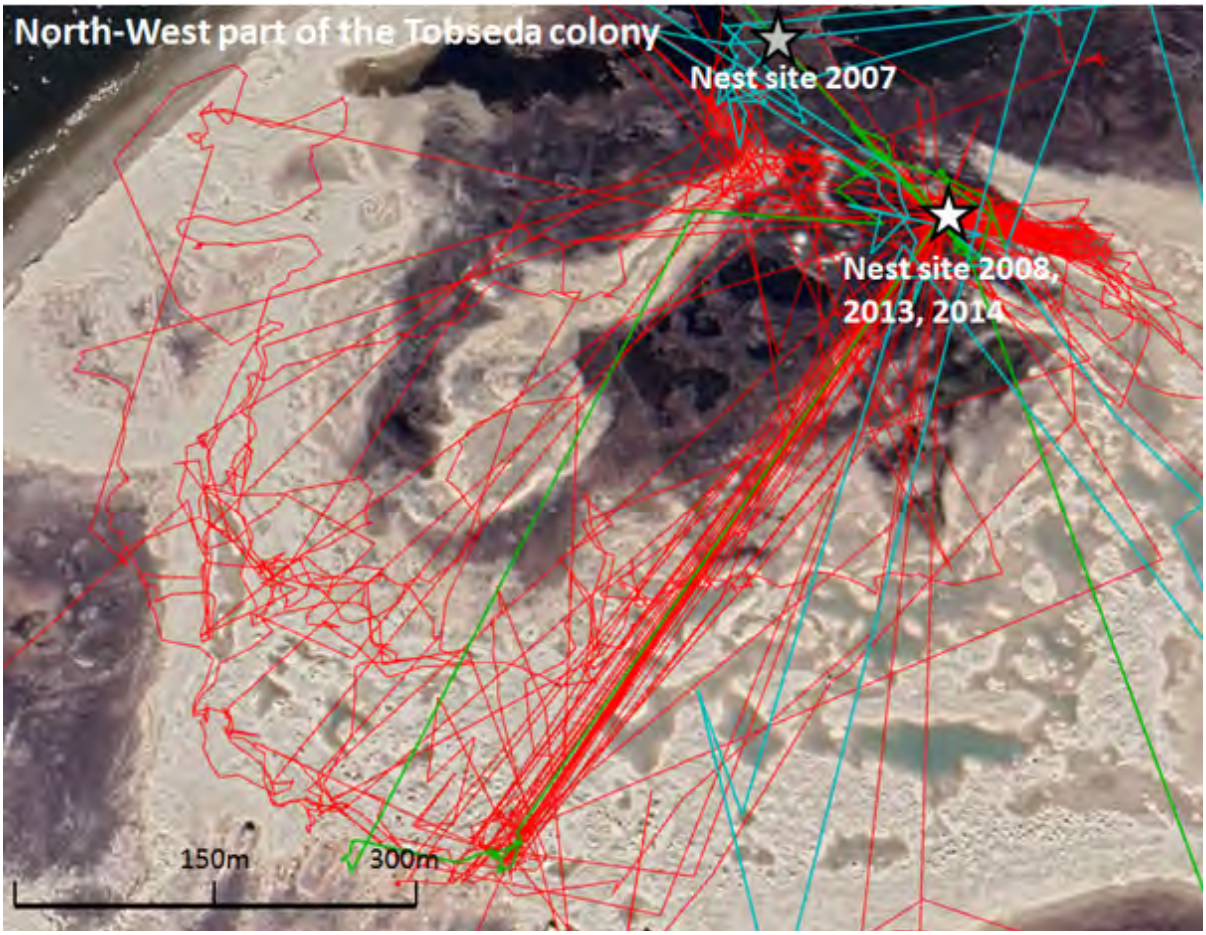

Fig. 2: Nesting locations LAB5 in the North-western part of the Tobseda colony in 2007 (grey star), and 2008, 2013 and 2014 (white star). Lines show the GPS-track of LAB5 in 2014 (red), including nest incubation and foraging trips from the nest, and in 2015 (blue) and 2016 (green), which were short visits to the former nesting site.

In 2015, LAB5 migrated along the Barents Sea coast towards the Kolokolkova Bay (Fig. 3). It arrived in the Tobseda colony on 28 May, where it stayed close to the nest location of 2014 (Fig. 2). On 31 May it departed from the colony in North-Western direction, to fly to the Peschanka Delta on Kolguev island, 106 km from the Tobseda colony. Here it remained for most of the time in a small spot (10x10m, Fig. 4) for over a month, which suggests that it successfully nested here (as total incubation time is around 30 days, LAMERIS et al. 2019). In 2016, LAB5 first visited the Kolokolkova Bay and spent one day at the nest location of 2014 (Fig. 2), after it continued to the Peschanka Delta. Between 1-5 July 2016 it spent most of its time on a similar small spot, 140m from the 2015 (Fig. 4), suggesting an unsuccessful, and late, nesting attempt.

Tab. 2: Location and period of stay of LAB5 as derived from GPS-tracks, during the pre-breeding period, during nest incubation, post-incubation and moulting, and post-breeding (after moulting). Sites are shown in Fig. 3.

Year	Pre-breeding	Nest incubation	Post-incubation & moulting	Post-breeding
2014	Unknown	Tobseda 5 Jun – 3 Jul	Peschanka Delta 11 Jul – 22 Aug	Korovaya Bay 22 Aug – 23 Sep
2015	Kolokolkova Bay 22 May – 31 May	Peschanka Delta 1 Jun – 1 Jul	Peschanka Delta 1 Jul – 24 Aug	Kolokolkova Bay 26 Aug – 22 Sep
2016	Kolokolkova Bay 22 May – 3 Jun	Peschanka Delta 1 Jul – 5 Jul	Peschanka Delta 5 Jul – 13 Aug	Kolokolkova / Korovaya Bay 13 Aug – 27 Sep

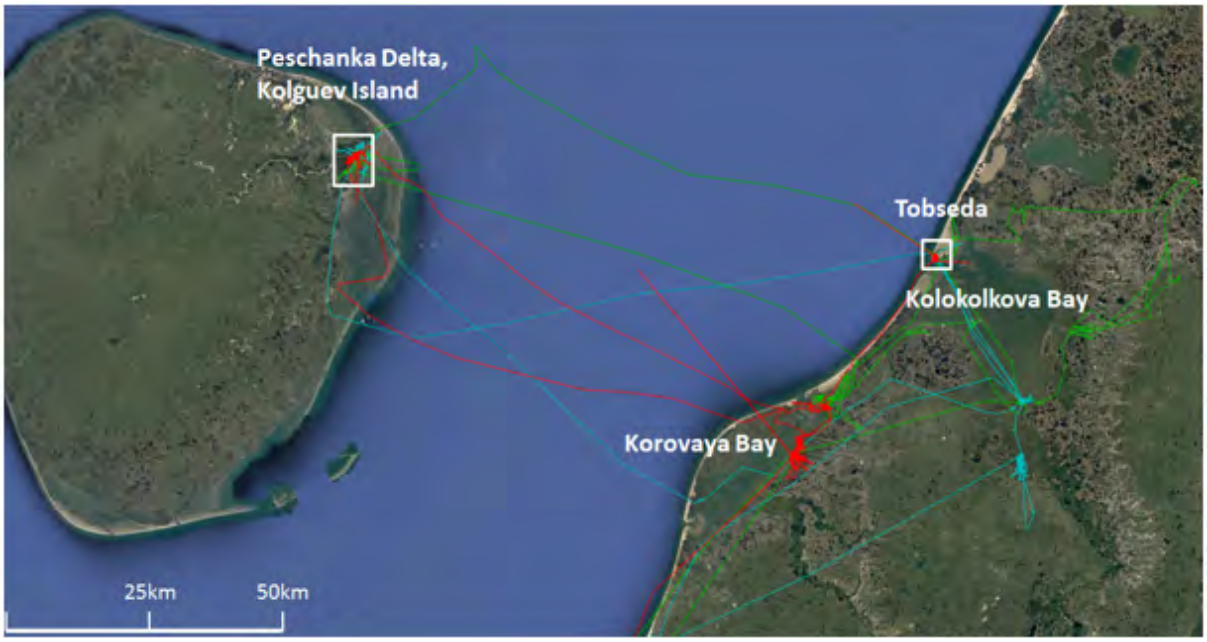

Fig. 3: Overview of the Barents Sea region showing the breeding colonies Peschanka Delta and Tobseda, as well as pre- and post-breeding sites Kolokolkova and Korovaya Bay. GPS-tracks of LAB5 are shown for 2014 (red), 2015 (blue) and 2016 (green).

Discussion

The regular observations in the Tobseda colony between 2006 and 2014 suggests that LAB5 has been breeding in this colony for 9 years, from 3 until 11 years of age. The locations of the nests of LAB5 which have been found in 2007, 2008, 2013 and 2014 are very close together, showing high nest site fidelity. In 2015, after a stay of only 4 days in the Tobseda colony, LAB5 shifted to the Peschanka Delta colony on Kolguev Island.

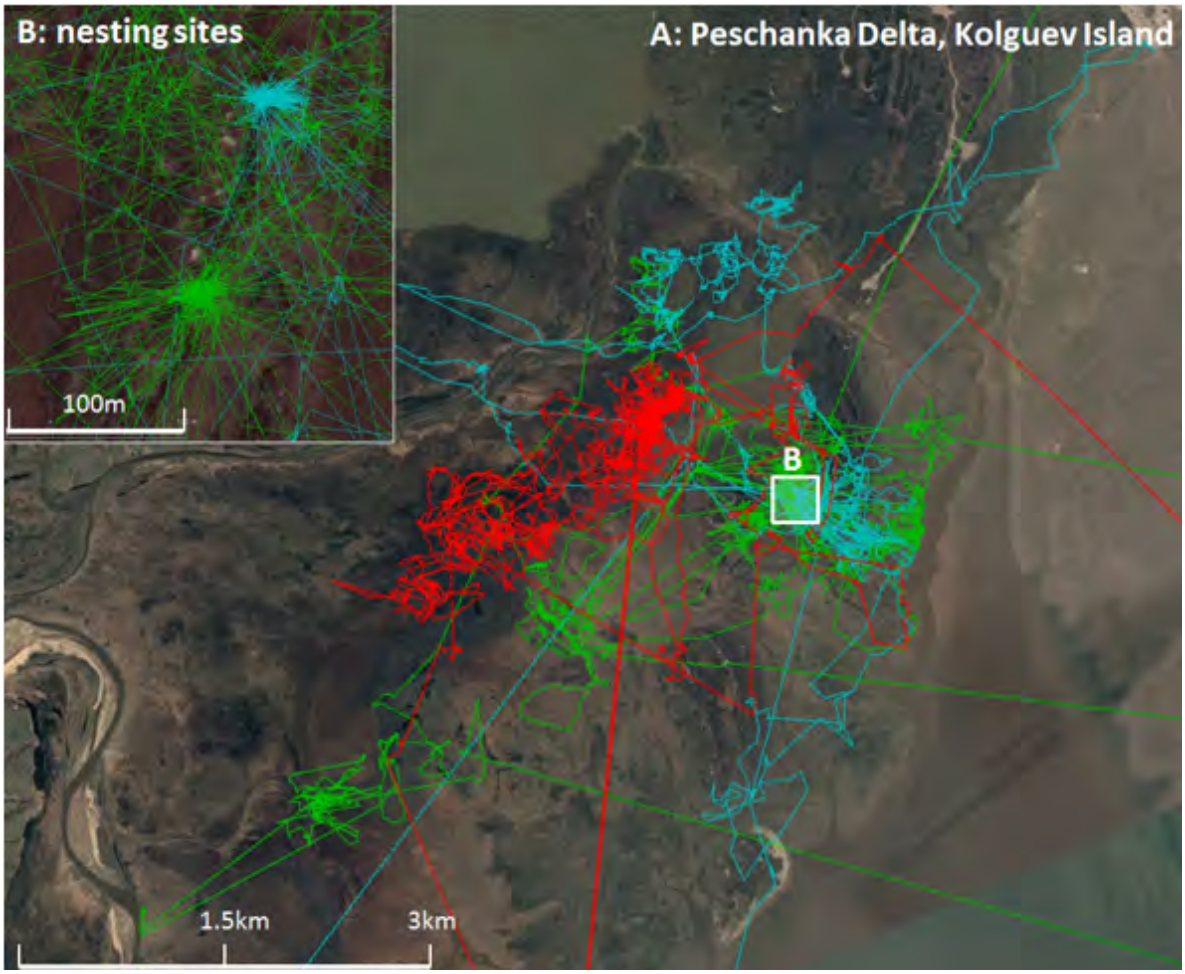

Fig. 4:(A) A close-up view of the Peschanka Delta colony, showing GPS-tracks during the moulting period in 2014 (red), and the breeding attempts and moulting / brood-rearing period in 2015 (blue) and 2016 (green). (B) a close-up of the area where two nesting attempts by LAB5, one successful in 2015 (blue) and one failed in 2016 (green).

During 2015, a group of goose hunters was present in the western part of the colony. While small hunting groups have probably been present almost every year in Tobseda village during the spring hunt in late May, they mostly remain close to the village to shoot at migrating flocks of geese. Spring in the Arctic started very early in 2015, and as a result spring migration of geese was significantly advanced in this year (LAMERIS et al. 2018). Between the arrival of our research team in Tobseda on 28 May and the departure of the hunting team on 2 June, there were very few migrating flocks of geese. In this period, hunters were often observed walking through the western part of the colony, thereby chasing geese until they flew off, after which the hunter would take a shot on these geese. These geese were probably often pairs that were preparing for nesting in the area. Moreover, a hunting hide was erected at approximately 400m from the nesting location of LAB5 in 2014, and goose decoys were placed in the lake 150m south-west of the nesting location. These adverse conditions for nesting could have caused LAB5 to decide to find a better place to initiate a nest. Nevertheless, other geese did nest in this area after LAB5 had left, and one pair nested on the same nest location. However, there were slightly fewer nests in the 150m around the former nest of LAB5 (8 in 2015 vs 13 in 2014). Another possible reason for leaving would have been a case where the partner of LAB5 was shot by hunters. However, LAB5 was observed together with her partner O=Y5 in The Netherlands during the winters of 2015-2018.

LAB5 decided to leave the Tobseda colony and fly to the Peschanka Delta colony on Kolguev Island. This is the largest known colony of Barnacle Geese (90.000 nesting individuals in 2007) and is still rapidly growing (KONDRATYEV et al. 2013). In addition, the Peschanka river and delta are important moulting sites for Barnacle Geese (KONDRATYEV et al. 2013). In 2014, after probable predation of her chicks in the Tobseda colony, LAB5 moved to the Peschanka Delta to moult. This means that after leaving the Tobseda colony in 2015, LAB5 moved to a site which she knew from previous experience in 2014. In fact, the nest location of 2015 was only 1km away from the main moulting site in 2014 (Fig. 4).
After nesting in the Peschanka Delta, LAB5 kept showing fidelity to the Kolokolkova Bay region. After moulting on Kolguev Island, it spent the post-breeding period in the Kolokolkova Bay in 2015, and did the same in 2016. During the last spring migration stretch in 2016, LAB5 first moved to the Kolokolkova Bay, where it also inspected the former nesting site in the Tobseda colony for one day before moving on to Kolguev Island. Possibly it assessed the potential for nesting also in 2016. As there was no research expedition to the Tobseda colony in 2016, we do not know whether conditions for nesting were good in 2016, or similar to 2015, which could have been a reason for LAB5 to again depart from the Tobseda colony in 2016.

To conclude, we report on a long-distance shift in nest-site of an individual goose which otherwise showed high nest site fidelity. The fact that the decision to make this shift was taken only after 4 days of stay in the colony, stresses the vulnerability of geese to disturbance during the nest initiation phase. At the same time, the fact that LAB5 could breed successfully in the same year of the shift in nest site, shows the high flexibility of geese to cope with changing conditions.

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References

BOUTEN, W., E.W. BAAIJ, J. SHAMOUN-BARANES & K.C.J. CAMPHUYSEN (2013): A flexible GPS tracking system for studying bird behaviour at multiple scales. - J Ornithol 154:571–580. doi: 10.1007/s10336-012-0908-1

KARAGICHEVA, J., E. RAKHIMBERDIEV, D. DOBRYNIN, A. SAVELIEV, S. ROZENFELD, O. POKROVSKAYA, J. STAHL, J. PROP & K. LITVIN (2011): Individual inter-annual nest-site relocation behaviour drives dynamics of a recently established Barnacle Goose *Branta leucopsis* colony in sub-arctic Russia. - Ibis (Lond 1859) 153:622–626. https://doi.org/10.1111/j.1474-919X.2011.01123.x.

KONDRATYEV, A., E. ZAYNAGUTDINOVA & H. KRUCKENBERG (2013): Barnacle Goose *Branta leucopsis* abundance on Kolguev Island - Current status and history of population growth. - Wildfowl 63:56–71.

LAMERIS, T.K., M.E. DE JONG, M.P. BOOM, H.P. VAN DER JEUGD, K.E. LITVIN, M.J.J.E. LOONEN, B.A. NOLET & J. PROP (2019): Climate warming may affect the optimal timing of reproduction for migratory geese differently in the low and high Arctic. - Oecologia 191:1003–1014. doi: 10.1007/s00442-019-04533-7.

LAMERIS, T.K., H.P. VAN DER JEUGD, G. EICHHORN, A.M. DOKTER, W. BOUTEN, M.P. BOOM, K.E. LITVIN, B.J. ENS & B.A. NOLET (2018): Arctic Geese Tune Migration to a Warming Climate but Still Suffer from a Phenological Mismatch. – Curr.Biol. 28: 2467–2473. doi: 10.1016/j.cub.2018.05.077.

LINDBERG, M.S. & J.S. SEDINGER (1997): Ecological consequences of nest site fidelity in black brant. - Condor 99:25–38.

LINDBERG, M.S., J.S. SEDINGER, D.V. DERKSEN & R.F. ROCKWELL (1998): Natal and Breeding Philopatry in a Black Brant, *Branta bernicla nigricans*, Metapopulation. - Ecology 79:1893–1904.

OWEN, M. & J.M. BLACK (1990): Waterfowl Ecology. - Chapman & Hall, New York.

SEDINGER, J.S., N.D. CHELGREN, D.H. WARD & M.S. LINDBERG (2008): Fidelity and breeding probability related to population density and individual quality in black brent geese *Branta bernicla nigricans*. - J Anim Ecol 77:702–712. doi: 10.1111/j.1365-2656.2008.01403.x

TOMBRE, M., F. MEHLUM & M.J.J.E. LOONEN (1998): The Kongsfjorden colony of barnacle geese: Nest distribution and the use of breeding islands 1980-1997. – Nor. Polarinstitutt Skr. 200: 57–65.

VAN DER JEUGD, H.P., G. EICHHORN, K.E. LITVIN, J. STAHL, K. LARSSON, A.J. VAN DER GRAAF & R.H. DRENT (2009): Keeping up with early springs: rapid range expansion in an avian herbivore incurs a mismatch between reproductive timing and food supply. - Glob Chang Biol 15:1057–1071. doi: 10.1111/j.1365-2486.2008.01804.x.

VAN DER JEUGD H.P., E. GURTOVAYA, G. EICHHORN, K.YE. LITVIN, O.Y. MINEEV & M. VAN EERDEN (2003): Breeding barnacle geese in Kolokolkova Bay, Russia: Number of breeding pairs, reproductive success and morphology. - Polar Biol 26: 700–706. doi: 10.1007/s00300-003-0535-7.

Outstanding Ornithologist of the past: Thomas (Tom) Lebret (1918-1982)

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Tom Lebret (born 10 September 1918 in Teteringen, Noord-Brabant, and died 19 June 1982 in Rotterdam, Zuid-Holland) was a Dutch ornithologist, an internationally well-known expert on waterbirds and hunting, an engaged nature conservationist from the bottom of his heart and state attorney for the Dutch province of Zealand as his profession.
After his school education in Teteringen and Dordrecht, he studied law at Leiden University, the oldest university in The Netherlands.

Tom Lebret (left) with his old friend Sir Peter Scott (right).

Even as a boy, he spent a lot of his time in nature, especially in the Biesbosch - one of the last extensive freshwater tidal wetlands in Northwestern Europe and based on his expertise now a National Park – and started to document his adventures and observations in text and drawings in field diaries. He wrote about the species he saw during his field-trips, about their behaviour, about his meetings with fishermen, waterbird hunters and catchers, willow and reed cutters as well as poachers and collected a treasure of historic information about a now lost world. In this period he developed his life-long interest and enthousiasm for waterbirds.

During the Second World War, as he was hiding in the province of Friesland from the German occupiers, where he partly lived in duck decoys (facilities to catch ducks), he deepened his knowledge of waterbirds and waterbird ecology. Shortly after the war he met Sir Peter Scott, when he was studying the Dutch duck decoy scene. Their first meeting was the beginning of a life-long friendship between two men with a common passion for waterbirds (especially the Red-breasted Goose), waterbird ecology and nature conservation. About one of their common excursions Sir Peter Scott wrote: ”This wonderful interlude owed much to the pleasant and undemanding companionship of Tom Lebret whose enthusiasm for *Branta ruficollis* matched my own.”.

In 1947 Tom Lebret not only started to work as an attorney at the provicial court in Middelburg, but he also entered the board of the “Nederlandse Vereniging tot Bescherming van Vogels” (now Birdlife-Netherlands) and became national Dutch delegate in the “International Waterfowl Research Bureau” (IWRB, now Wetlands International). Besides he was involved in number of further national nature conservation

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organisations. In all these functions he was a restless advocate for waterbird, wetland and nature protection and used all his juristic skills to conserve the threasures of nature for future generations.

Besides his work as an attorney he travelled regularly in core waterbird areas (especially in the Balkans), continued his studies, coached young ornithologist and ecologists, wrote books and scientific publications about his observations and the ecology of ducks, geese, swans and wetlands (partly illustrated by Peter Scott), published articles about nature protection problems and gave his expertise on hunting items as well as in a number of nature-endangering landscape development projects in The Netherlands (e.g. the Dutch Delta Works to protect the southwestern Netherlands against the North Sea).

In the period after the Second World War, Tom Lebret was one of the leading ornithologists and waterbird ecologists of The Netherlands. Besides his national activities he also influenced the international waterbird and wetland protection scene.
In April 1982, his active life was ended by a stroke, from which he never recovered, until his death in June 1982.

New Publications 2018 – 2020

CALVERT, A.M., R.T. ALISAUSKAS, D.K. KELLETT (2019): Fitness heterogeneity in adult Snow and Ross's geese: Survival is higher in females with brood patches. - Auk 136(4), ukz027, https://doi.org/10.1093/auk/ukz027.

COTTAAR, F. (2019) Pink-footed Geese *Anser brachyrhynchus* preferred harvested maize over grass as a food resource in Friesland in autumn 2017. - Limosa 92: 24-27.

CUTHBERT, R.J., T. AARVAK, E. BOROS, T. ESKELIN, V. FEDERENKO, R. KARVONEN, A. KOVALENKO, S. LEHIKOINEN, N. PETKOV, A. SZILAGYI, J. TAR, S. TIMONEN, A. TIMOSHENKO, K. ZHADAN & I. ZUBAN (2018): Estimating the autumn staging abundance of migratory goose species in northern Kazakhstan. - Wildfowl 68: 44–69.

DANIELS, B.L., D.H. WARD & J.M. BLACK (2019): Activity budgets, daily energy expenditure and energetic model of black brant *Branta bernicla nigricans* during winter and spring along the Lower Alaska Peninsula. - Wildfowl 69:134-159.

DOKTER, A.M., W. FOKKEMA, B.S, EBBINGE, H. OLF, H.P. VAN DER JEUGD & B.A. NOLEt (2018): Agricultural pastures challenge the attractiveness of natural saltmarsh for a migratory goose. - J.Appl.Ecol. 55: 2707-2718. DOI: 10.1111/1365-2664.13168.

FOWLER, D.N. E.B. WEBB & M.P. VRTISKA (2020): Condition bias of decoy harvested geese during the conservation order. – Journal of Wildlife Management 84: 33-44. FOX, A.D. (2019): Urban Geese – looking to North America for experiences to guide management in Europe? - Wildfowl 69: 3–27

GAN, S.K, K.F. ABRAHAM, R.W. BROOK & D.L. MURRAY (2019): The influence of habitat selection on Canada goose *Branta canadensis* nest success on Akimiski Island, Nunavut, Canada. - Wildfowl 69:118-133.

GRISHCHENKO, M., H.H.T. PRINS, R.C. YDENBERG, M.E. SCHAEPMAN, W.F. DE BOER & H.J. DE KNEGT (2019): Land use change and the migration geography of Greater White-fronted geese in European Russia. - Ecosphere 10(8), p.e02754.

KLEEFSTRA, R. (2020): Going out on a moonlit night: nocturnal foraging by White-fronted Geese *Anser albifrons* and Barnacle Geese *Branta leucopsis* in relation to new and full moon. – Limosa 93: 23-27.

KÖLSCH, A., A. FLACK, G.J.D.M. MÜSKENS, H. KRUCKENBERG, P. GLAZOV & M. WIKELSKI (2020): Goose parents lead migration V. – Journal of Avian Biology 2020: e02392. DOI: 10.1111/jav.02392.

KOUZOV, S.A., E.M. ZAYNAGUTDINOVA & A,V. KRAVCHUK (2019): Late nesting makes Barnacle Geese *Branta leucopsis* sensitive to anthropogenic disturbance in the Russian part of the Baltic Sea. - Wildfowl 69: 160–175.

KRUCKENBERG, H. (2019): Large-scale egg-dumping by island nesting Greylag Geese *Anser anser*: an indication of density-dependent regulation in a breeding population in northwest Lower Saxony, Germany? - Wildfowl 69: 221–229.

LAMERIS, T.K., M.E. DE JONG, M.P. BLOOM, H.P. VAN DER JEUGD, K.E. LITVIN, M.J.J.E. LOONEN, B.A. NOLET & J. PROP (2019): Climate warming may affect the optimal timing of reproduction for migratory geese differently in the low and high Arctic. - Oecologia 191:1003-1014. https://doi.org/10.1007/s00442-019-04533-7.

LI, H., L. FANG, X. WANG, K. YI, L. CAO & A.D. FOX (2020): Does snowmelt constrain spring migration progression in sympatric wintering Arctic-nesting geese? Results from a Far East Asia telemetry study. - Ibis 162: 548-555.

LI, X., X. WANG, L. FANG, N. BATBAYAR, T. NATSAGDORJ, B. DAVAASUREN, I. DAMBA, Z. XU, L. CAO & A.D. FOX (2020): Annual migratory patterns of Mongolian-Manchurian Eastern Greylag Geese (*Anser anser rubrirostris*) revealed by GPS/GSM loggers. - Integrative Zoology 15: 213-223

MOLVÆRSMYR, S. & A.D. FOX (2020): Using δ^2H stable isotope analysis to identify the origin of a first winter Red-breasted Goose *Branta ruficollis* caught in Norway. - Ornis Norvegica 43: 1-3.

MASSEY, E.R., L.G. CARLSON & D.C. OSBORNE (2020): Temporal trends in body condition of arctic geese wintering in the Mississippi Alluvial Valley. - Journal of Fish and Wildlife Management 11(1):xx–xx; e1944-687X. https://doi.org/10.3996/062018-JFWM-047.

MENG, F., X. WANG, N. BATBAYAR, T. NATSAGDORJ, B. DAVAASURENC, I. DAMBA, L. CAO & A.D. FOX (2020): Consistent habitat preference underpins the geographically divergent autumn migration of individual Mongolian common shelducks *Tadorna tadorna*. - *Current Zoology* 000: 000-000. doi:10.1093/cz/zoz056.

MONTRÀS-JANER, T, J. KNAPE, L. NILSSON, I. TOMBRE, T. PÄRT & J. MÅNSSON (2019): Relating national levels of crop damage to the abundance of large grazing birds: Implications for management. – J.Appl.Ecol. 56: 2286-2297.

NIENHUIS, J. (2018): Numbers and distribution of domestic geese *Anser anser* forma *domesticus* in the province of Groningen, 1999-2005. - Limosa 91: 79-87.

NILSSON, L. (2018): Changes in abundance and breeding output of Greylag Geese *Anser anser* breeding in southern Sweden. - Wildfowl 68: 30–43.

NILSSON, L. & C. HERMANSSON (2019): The establishment of a new major moulting site for Greylag Geese *Anser anser* at Lake Hornborgasjön, southern Sweden. - Wildfowl 69: 93–104.

NOLET, B.A., K.H.T. SCHREVEN, M.P. BOOM, T.K. LAMERIS (2020): Contrasting effects of the onset of spring on reproductive success of Arctic-nesting geese. - Auk 137(1), ukz063, https://doi.org/10.1093/auk/ukz063.

OTTENBURGHS, J., J. HONKA, G.J.D.M. MÜSKENS & H. ELLEGREN (2020): Recent introgression between Taiga Bean Goose and Tundra Bean Goose results in a largely homogeneous landscape of genetic differentiation. – Heredity, Journal of the geneticssociety, https://doi.org/10.1038/s41437-020-0322-z.

SHIMADA, T., Y. YAMADA, N. HIJIKATA, K. TOKITA, K. UCHIDA, M. KURECHI, H. SUGINOME, Y. SUZUKI & H. HIGUCHI (2018): Utilisation of terrestrial habitat by Black Brant *Branta bernicla nigricans* after the Great 172 East Japan Earthquake of 2011. - Wildfowl 68: 172–182.

SHIMADA, T., A. MORI & H. TAJIRI (2019): Regional variation in long-term population trends for the Greater White-fronted Goose *Anser albifrons* in Japan. - Wildfowl 69: 105–117.

SMITH, P.A., L. MCKINNON, H. MELTOFTE, R.B. LANCTOT, A.D. FOX, J.O. LEAFLOOR, M. SOLOVIEV, A. FRANKE, K. FALK, M. GOLOVATIN, V. SOKOLOV, A. SOKOLOV & A.C. SMITH (2020): Status and trends of tundra birds across the circumpolar Arctic. - Ambio 49:732–748. https://doi.org/10.1007/s13280-019-01308-5

STROUD, D.A., R. CROMIE, O. CROWE, B. DENNY, R.A. STROUS, H. THOMAS, N. TIERNEY, A. WALSH & A.D. FOX (2018): Annual movements of Interior Canada Geese Branta canadensis interior marked in Greenland, revealed by recoveries and re-sightings during 1992–2018. - Wildfowl 68: 70–83.

TADEO, M.P. & M. GAMELL (2018): Activity budgets in different habitats of a species of conservation concern in Ireland, the Light-bellied Brent Goose *Branta bernicla hrota*. - Wildfowl 68: 84–103.

VAN IMPE, J. (2019): The mystery of *Anser neglectus* Sushkin, 1897 – a victim of the Tunguska catastrophe? - The Russian Journal of Ornithology 28: 81-125.

VAN IMPE, J. (2019): The mystery of *Anser neglectus* Sushkin, 1897. Victim of the Tunguska disaster? A Hungarian story. Ornis Hungarica 2019 27: 20-58. DOI: 10.2478/orhu-2019-0014.

WILLIAMS, J.H., T.J.S. BALSBY, H.Ø. NIELSEN, T. ASFERG & J. MADSEN (2019): Managing geese with recreational hunters? - Ambio 48: 217–229 https://doi.org/10.1007/s13280-018-1070-7.

XU, Y., Y. SI, J. TAKEKAWA, Q. LIU, H.H.T.. PRINS, , S. YIN, D.J. PROSSER, P. GONG & W.F. DE BOER (2019): A network approach to prioritize conservation efforts for migratory birds. - Conservation Biology DOI: 10.1111/cobi.13383.

XU, Y., Y. SI, , S. YIN, , W. ZHANG, , M. GRISHCHENKO, H.H.T. PRINS, P. GONG & W.F. DE BOER (2019): Species-dependent effects of habitat degradation in relation to seasonal distribution of migratory waterfowl in the East Asian–Australasian Flyway. - Landscape Ecology 34: 243-257.

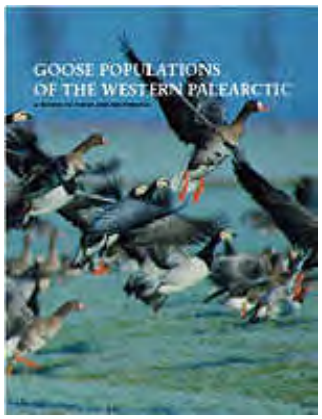
YIN, S., D. KLEIJN, G.J.D.M. MUSKENS, R.A.M. FOUCHIER, J.H. VERHAGEN, P.M. GLAZOV, Y. SI, H.H.T. PRINS & W.F. DE BOER (2017): No evidence that migratory geese disperse avian influenza viruses from breeding to wintering ground. - PLoS ONE 12(5): e0177790.

ZHANG, Y., A.D. FOX, L. CAO, Q. JIA, C. LU, H.H.T. PRINS & W.F. DE BOER (2019): Effects of ecological and anthropogenic factors on waterbird abundance at a Ramsar Site in the Yangtze River Floodplain. - Ambio 48: 293-303.

ZHU, Q., K.A. HOBSON, Q. ZHAO, Y. ZHOU, I. DAMBA, N. BATBAYAR, T. NATSAGDORJ, D. BATMUNKH, A. ANTONOV, J. GUAN, X. WANG, L. FANG, L. CAO & A.D. FOX (2020): Migratory connectivity of Swan Geese based on species' distribution models, feather stable isotope assignment and satellite tracking. - Diversity and Distributions 00:000-000. doi:10.1111/ddi.13077.

Literature

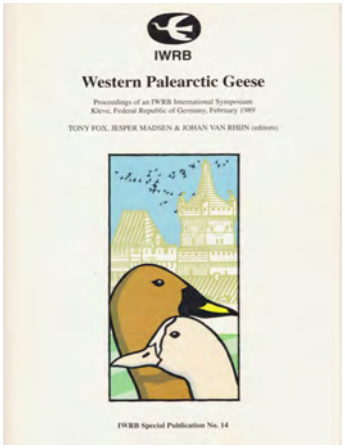
Goose populations of the Western Palearctic



The Goose Specialist Group made an impressive compilation (edited by Jesper Madsen, Tony Fox & Gill Cracknell) of our knowledge on the status and distribution of the goose populations of the Western Palearctic. This book is not for sale anymore, but a digital copy can be downloaded for free from:
http://issuu.com/jesper_madsen/docs/goosepopulationswestpalearctic
or from
http://bios.au.dk/en/knowledge-exchange/about-our-research-topics/animals-and-plants/mammals-and-birds/goose-populations-of-the-western-palearctic/

Proceedings of the Klever, the 10th and the 12th meeting of the GSG

Furthermore it is still possible to receive a printed copy of the official proceedings of earlier meetings of the Goose Specialist group, as there are:



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Proceedings Goose 2007
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Proceedings of the 14th meeting of the Goose Specialist Group

The proceedings of the 14th meeting of the Goose Specialist Group held in Steinkjer, Norway in April 2012 have been published in the online journal Ornis Norvegica, which is the scientific journal of the Norwegian Ornithological Society (Norsk Ornitologisk Forening – NOF). You can find articles from the 2012 meeting, as well as a number of other ornithological papers which are surely of interest on the journal website:
https://boap.uib.no/index.php/ornis/issue/view/62

Proceedings of the 15th meeting of the Goose Specialist Group

The proceedings of the 15th meeting of the Goose Specialist Group held in Arcachon, France in January 2013 have appeared as a special edition of the journal **Wildfowl.**

By sending an email to wildfowl@wwt.org.uk a printed copy of this Special Issue (nr.3) can be ordered at the cost of £17 plus an additional £3.50 for credit card transactions.

It also can be downloaded for free at:
http://wildfowl.wwt.org.uk/index.php/wildfowl/issue/view/285

The WWT journal Wildfowl

Wildfowl is an international scientific journal, recognised by the Web of Science and published annually by the Wildfowl & Wetlands Trust (WWT).
The journal appeared originally as the Annual Report of The Severn Wildfowl Trust at the end of the Trust's first working year in 1947. From the outset it presented the results of scientific research in order to improve knowledge and understanding of wildfowl populations. It now disseminates original material on the ecology, biology and conservation of wildfowl (Anseriformes) and ecologically-associated birds (such as waders, rails and flamingos), and on their wetland habitats.
The journal is completely free to contribute to as an author (there are no page or article changes at all) snd is open access, freely available to anyone who may wish to read the contents.
The complete back catalogue of Wildfowl is available via the Open Journal System at http://wildfowl.wwt.org.uk.

Instructions to authors

The **GOOSE BULLETIN** accepts all manuscripts dealing with goose ecology, goose research and goose protection in the broadest sense as well as Goose Specialist Group items.
All manuscripts should be submitted in English language and in electronic form. Text files should be submitted in ".doc"-format, Font "Times New Roman 12 point", tables and graphs in ".xls"-format and pictures in good quality and ".jpg"-format.
Species names should be written with capitals as follows: Greylag Goose, Greenland White-fronted Goose etc. Follow an appropriate authority for common names (e.g. Checklist of Birds of the Western Palearctic). Give the (scientific) Latin name in full, in *italics*, at first mention in the main text, not separated by brackets.
Numbers - less than ten use words e.g. (one, two three etc) greater than 10, use numbers with blank for numbers over 1 000.
In case of doubt please look at the last issue of the **GOOSE BULLETIN**.

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