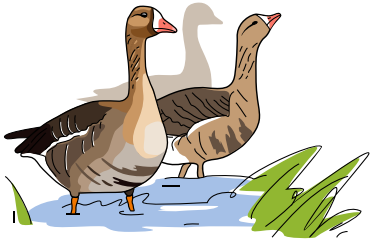
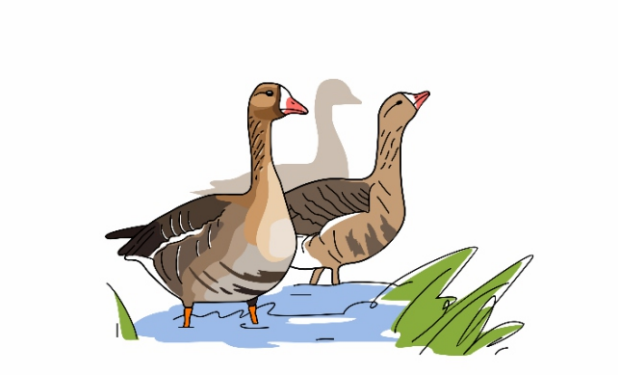


18th Conference of Goose Specialist Group

27 – 30 March 2018
Klaipėda, Lithuania

Conference abstracts



18th CONFERENCE OF GOOSE SPECIALIST GROUP

Conference abstracts

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PREFACE

We are pleased to welcome you at the 18th Goose Specialist Conference at Klaipėda University, Lithuania, on behalf of the Baltic Valley Association and Goose Specialist Group.

The topics of the 18th Goose Specialist Conference vary from the assessment of current state of goose populations and their ecology to the impact of global change and other anthropogenic activities. We hope that our invited keynote speakers will inspire all the participants. Waterfowl ornithologists from Europe, Asia, and America will share their knowledge in 50 oral presentations and 28 posters. There will be three workshops which involve participants to active discussions about wind farm effects, innovative tracking methods, and geese monitoring.

We are sure that the field trip to the Nemunas River floodplains wil l impress everyone as it is one of the most important staging area for geese on their migration route from Western Europe towards Russian Arctic.

We hope that this 18th conference of Goose Specialist Group will further strengthen the interaction among scientists and practitioners from different countries around the World. We believe that this conference will provide new perspectives and solutions to present and future challenges in protection and conservation of goose populations. Let's be inspired by our common passion to explore the world of waterfowl.

Local organisers from Klaipeda University

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KEYNOTE SPEAKER

STATUS AND DYNAMICS OF NORTH AMERICAN ARCTIC GOOSE POPULATIONS: ABUNDANCE, SURVIVAL, RECRUITMENT, AND MOVEMENT

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Keywords: abundance, survival, recruitment, movement

I review dynamics of abundance, survival, recruitment and movement in some goose populations that breed in Canada's arctic and subarctic and winter in the US. The greatest change seems to have occurred with the population of lesser snow geese that nests in Canada's central and eastern arctic and winters in the midcontinent of North America.

An escape from formerly restricted winter range confined to coastal brackish marshes along the Gulf of Mexico into agricultural areas farther inland appears to have boosted annual survival probability, motivating population increase. This was further assisted by a large redistribution of nesting geese and summer range expansion north and westward into the central arctic during the 1980s and 1990s, from eastern arctic and subarctic nesting areas.

The colonization of the central arctic by snow geese was probably preceded by the establishment of a nonbreeder moult migration from arctic and subarctic regions of SW Hudson Bay.

This colonization of tundra habitat previously unoccupied by breeding snow geese, e.g., south of Queen Maud Gulf, increased the carrying capacity of their summer range and was accompanied by increased recruitment, further fueling population increase.

Ross's geese, previously largely confined to the central arctic, benefited from sympatric nesting with colonizing lesser snow geese, as well as eastward expansion in winter range of Ross's geese. Predator-swamping and general

increases in breeding probability and nesting success likely improved recruitment by both Ross's and lesser snow geese leading to exponential growth in both populations.

The simultaneous eastward expansion in winter range of Ross's geese likely increased winter carrying capacity, leading to improved survival. Exponential population increases by lesser snow and Ross's geese motivated the concern in North America about "destruction of arctic ecosystems", leading to concerted efforts to reduce survival through unfettered hunting opportunities with the objective of population decline.

While harvest of both snow and Ross's geese had increased, populations continued to grow at such a rate as to outpace increases in harvest, resulting in a continued decline in harvest rate during attempted population reduction. Population reduction efforts were ineffectual.

Instead, midcontinent snow geese appear to have achieved a new equilibrium population size of about 12-15 million birds, with very high survival >.90, and very low recruitment viewed from a historical context. Declining age ratios suggest that carrying capacity of their current range has been reached. In other words, that most abundant of arctic goose populations has self-regulated and seems impervious to attempts to manage them through hunting.

In view of these facts, and emerging knowledge about their effects on arctic ecosystems, it may be time to modernize views about the ability to manage these birds, and perhaps consider them not as a wildlife management problem, but instead as a resource that is capable of very high levels of sustainable harvest throughout the year.

KEYNOTE SPEAKER

STATUS AND ABUNDANCE OF EURASIAN GOOSE POPULATIONS: WINNERS AND LOSERS

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Keywords: geese, population size, geographical trends

The recent global audit of northern hemisphere goose populations revealed that there were between 39.0 and 39.2 million individuals of 68 populations of 15 species. Most populations showed increasing/stable trends over the last 10 years, but our ability to truly judge trends is highly variable among populations. Most European populations are increasing or stable, with some notable exceptions. Greatest declines are suspected in Central and Eastern Asia, where good population definition, estimates and count data are generally lacking, with the notable exception of excellent count data from Korea and Japan. This situation is rapidly improving in China, where telemetry is rapidly contributing to our understanding of flyway structure in Far East Asia and count networks and coordination with flyway partners are also being established. The geographical contrasts in goose population trends are no coincidence, with stable/increasing numbers associated with areas where geese have access to agricultural landscapes where they can escape from limits imposed by limits to natural feeding habitats. This contrasts with China, for example, where goose populations are largely confined to natural habitats (generally of declining quality) and show greatest declines, in contrast to the same populations wintering in Japan and Korea which are stable or increasing. In conjunction with the generally increasing North American goose populations exploiting agricultural landscapes suggests that contemporary burgeoning northern goose populations are those that have been most able to shift from traditional wetland habitats to feed on rich, unlimited opportunities offered on modern farmland.

KEYNOTE SPEAKER

A BARNACLE GOOSE COLONY ON SPITSBERGEN HAS LOW REPRODUCTIVE OUTPUT BUT SLOWLY ADAPTS TO CLIMATE CHANGE

Maarten J.J.E. Loonen and many others

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Keywords: population dynamics, species interaction, environmental effect, behavioural adaptation

A barnacle goose colony is studied with individual marked birds since establishment of the colony until saturation over a period of 30 years. Effects of density dependence and climate change are observed, monitored and modelled. For migratory birds flying to the Arctic, climate change influences spring migration. The more north the geese come, the warmer it has become. In my study area snowmelt starts 0.4 days per year earlier on average but is still highly variable. Geese cannot react on annual variation but do adapt to the new climate stepwise. Neverteless, annual variation in snow melt may change geese from capital to income breeders but also impacts the timing and speed of moult.

Climate change does affect the whole Arctic ecosystem. Diminishing sea ice brings polar bears as predator to breeding islands But also impacts of changing winters, like rain on snow, has cascading effects on plant growth and predation pressure in summer. We have observed new predators and parasites following a warmer climate, causing fitness effects on geese.

Herbivores are not often focus in pollution studies. Our recent work has shown that geese are affected by pollution and that behaviour and pollution affect eachother in both directions.

Geese can be seen as ecosystem engineers. They change vegetation composition and productivity and provide food for lower and higher trophic levels. Trophic cascades are indirect effects of higher trophic levels affecting abundance in several lower trophic levels. Goose grubbing has been described as a trophic cascade, but we will report on the effect of a trophic cascade generated by barnacle geese in Arctic lake systems.

WORKSHOP I

INTERACTION OF GEESE AND WIND FARMS

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The rate of wind farm installation across Europe increased markedly during the late 20th and early 21st centuries, as governments have sought to secure renewable energy supplies and reduce greenhouse gas emissions to combat climate change. A number of studies were undertaken concurrently to assess the effects of the wind farms on goose populations, with a particular focus on collision risk, barrier effects and the potential for birds to be displaced from feeding areas and roost sites. Three presentations given during the workshop will consider recent information on the interactions between geese and wind farms at different spatial scales. Firstly, tracking geese and swans in relation to wind farm development across the migratory routes will be described, to illustrate the importance of considering both offshore and onshore sites in cumulative impact assessments. Secondly, study of changes in goose flight patterns following the installation of a wind farm in Lithuania found that geese avoided passing among wind turbines < 500 m from each other. Thirdly, spatially-explicit models, developed to simulate the likely consequences for wintering geese of different wind farm configurations on Bulgaria's Black Sea coast, are used to suggest optimal locations for turbines in the landscape with respect to geese. All three studies were developed with a view to defusing conflict between wildlife conservation and renewable energy interests. Workshop participants will be invited to provide additional comment on whether current knowledge of goose/wind farm interactions is sufficient, and to discuss whether there are areas of research that require further study.

WORKSHOP II

HOW TO ANSWER RESEARCH QUESTIONS WITH TRACKING DEVICES?

Thomas Lameris[1], Andrea Kölzsch[2]

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Continuous development of tracking methods has improved our ability to gain insight about the hidden life of our geese and swans, and many ecological questions can be answered with tracking. However, careful consideration of study design, data to be collected and its frequency is often necessary to properly solve research questions and management fproblems. Some questions are even not solvable with tracking and other methods have to be considered.

In this workshop we aim at introducing a suite of questions that can be addressed with tracking and want to discuss how to best design such studies. We introduce new sensor data, like acceleration and magnetometry, and discuss their uses and usefulness for goose and swan research. Tag and study design are further crucial points that have to be considered for a successful project: Which birds should be caught where and equipped with what kind of tracking devices? Which tracking devices are currently available and which one best fits which question? With much room for questions in this interactive workshop we aim at triggering discussion between researchers, field experts and tag manufacturers. We encourage participants to bring one of their own research questions that they plan to answer with tracking.

WORKSHOP III

COORDINATION OF GOOSE MONITORING IN EUROPE

Gitte Høj Jensen*[1], Kees Koffijberg[2], Szabolcs Nagy[3], Anthony Fox[1], Jesper Madsen[1]

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Recently, the European Goose Management Platform (EGMP) was established under the umbrella of AEWA, to deal with developing goose management issues and future monitoring of key goose populations. Currently the EGMP Data Centre at Aarhus University, Denmark, together with the International Waterbird Census (IWC) from Wetlands International and SOVON Dutch Centre for Field Ornithology, are in the process of investigating the status of current goose monitoring networks, databases and workflows of goose population reporting.

Since the review of Tony Fox and others made in 2010 for the Goose Specialist Group, it has become increasingly difficult to assess population status and trends based on the combined output of the current monitoring schemes. We have identified two major gaps in the current system: 1) there is a problem with goose coverage in many range states and, 2) reporting of monitoring data is too slow for the EGMP management process.

We are aware that the monitoring network in each country is unique and that means that we shall have to make a country-by-country approach to establish the current degree of effective monitoring coverage, identify the gaps in coverage and mechanisms to fill these and establish how to increase the efficiency and speed of reporting.

To this end, we have sent out a questionnaire to national coordinators of waterbird monitoring to get an overview of the status of goose monitoring and reporting in each of the EGMP range states. During this workshop, we explain the needs for goose monitoring and we will summarize the information provided by the countries, as well as discussing how monitoring, data collation and reporting can be improved.

ORAL AND POSTER PRESENTATIONS

GEOMORPHOLOGICAL IMAGING OF ECOLOGICAL NICHE CHARACTERISTICS OF THE WHITE-FRONTED GOOSE WINTERING IN THE SYVASH SUBREGION

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Keywords: White-fronted Goose, ecological niche, wintering, Syvash subregion

Results of the winter counts of the White-fronted Goose at 2005-2017 were analysed by the image received from the Landsat 8 satellite ("ArcMap 10.0." and "R: A Language and Environment for Statistical Computing").

The ENFA-analysis show that the geomorphological predictors are statistically reliable markers of the ecological niche of the White-fronted Goose during the wintering season in the Syvash subregion. The best indicators of a marginal axis of the ecological niche are VRM and LS, while the indicators of a specialization axis are the elevation of relief and the index of diffuse insolation. Among vegetative indices, LSWI and hydrothermal composite are markers of the marginal axis of the ecological niche, and LSWI and NDVI are markers of the specialization axis. The obtained quantitative patterns allowed making an assessment of the spatial variation of the habitat-preference index.

It is established that this procedure makes it possible to form an integral representation of the degree of preference of various habitats in the White-fronted Goose basing on the combined data obtained by remote sensing of the Earth.

CAUSES OF DEGRADATION OF GEESE WINTERING AREAS IN SOUTH OF UKRAINE

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Keywords: geese, degradation of wintering, south Ukraine

Since the late 2000s, there has been a decrease in the number of wintering Rufibrenta ruficollis, Anser anser and A. albifrons, and since 2014 these species have almost stopped wintering in the region.

Natural causes:

– drying up bottoms of large depressions (inaccessible to poachers) induced by the long-term decrease of the groundwater level;
– more prolonged periods with a virtually continuous ice cover and deep snow cover;
– possible reduction in the size of the populations wintering in the south of Ukraine.

Anthropogenic causes:

– cultivation of the corn for grain was ceased;
– poisoning of geese due to negligence of deratization of winter crops;
– increasing disturbance – hunters, grazing, agricultural field tillage, fishing, etc.;
– mass and almost widespread poaching in the absence of protected roosting areas;
– reduction in the number and size of rice paddies, fields of winter crops and ponds because of the cessation of fresh water supply to Crimea in 2014-2017;
– since 2014, the birds have been scared away because of the militarization of the Crimea and adjacent areas of Syvash Bay.

The combined effect of these factors has led to the rapid reduction in the number of geese in the south of Ukraine and resulted in the westward shift of their wintering areas.

THE TAIGA BEAN GOOSE IN LATVIA

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Keywords: staging, hunting bag

According to the International Single Species Action Plan for the conservation of the Taiga Bean Goose, individuals from two sub-populations pass Latvia on migration and of those staging, about 300 birds are hunted annually. How well does this information agree with the current situation?

Except for small numbers among the first-arriving geese in spring Taiga Bean Geese are rarely reported from Latvia nowadays. For instance, a check of 200,000 staging geese in the spring of 2017 revealed only six Taiga Bean Geese. In 2014–2017, the Latvian Hunter's Association asked hunters to submit photos of the heads of the bean geese they had bagged. Of photos submitted in the first three autumns, 139 were of Tundra Bean Geese and two of Taiga Bean Geese. With an average annual hunting bag of 1,100 bean geese, these figures correspond to an annual hunting bag in Latvia of about 15 Taiga Bean Geese. As hunting data were obtained from all parts of the country, there are good reasons to accept this figure as being close to the true number.

IMPACT OF WIND TURBINES AND OTHER LANDSCAPE OBJECTS ON HABITAT SELECTION OF MIGRATING BIRDS

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Keywords: wind power, displacement, Anserinae, unmanned aerial vehicle (UAV), fouraging site.

It has been known since the late eighties, that wind turbines can have negative impacts on birds. These negative impacts include direct habitat loss and avoidance of birds to wind turbines and associated structures, resulting in displacement and reduction of fouraging habitats. Additionally, increased political interest in renewable energy has caused an increase in wind power installations and resulted in a tenfold increase in the amount of wind power produced in europe from year 2000 to 2015. Likewise, landscape structures such as roads, hedgerows and buildings can have negative effects on birds and cause disturbance and displacement. Thus, knowledge onf the extent of disturbance and displacement of birds due to landscape structures can be an important tool for mitigating measures to minimize negative effects of the increasing number of wind turbines.

The aim of this study is to examine the impact of different landscape objects on larger migratory birds that are relevant in the construction of wind turbines and replacement habitats. This will be investigated by using an unmanned aerial vehicle to collect aerial photos of fouraging birds and analyse displacing effects of different landscape structures using Geographical Information System. Additionally, the study will examine accumulated effects of landscape elements and different variables, such as flock size, flok species composition, and weather conditions. The project started February 2017 and will be finished May 2018.

COMPARING GOSLING GROWTH BETWEEN ARCTIC- AND TEMPERATE- BREEDING BARNACLE GOOSE POPULATIONS

Chiel Boom[*1,2], Henk P. van der Jeugd[1,2], Boas Steffani[1], Kjell Larsson[3], Götz Eichhorn[1,2]

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Keywords: Branta leucopsis, growth rate, migration, lifestyle, adaptation

Growth patterns of goslings are shaped by selection pressures and constraints at the breeding and rearing grounds. Furthermore, arctic-breeding geese have to leave the breeding grounds in time to migrate to their wintering grounds. Therefore, breeding in different environments is expected to result in adaptation to the local environmental conditions and to a migratory lifestyle. Over the past decades, an originally arctic- breeding long-distance migrant, the barnacle goose (*Branta leucopsis*), expanded its breeding range southwards. Nowadays, barnacle geese also breed successfully in temperate regions, thereby shortening their migratory journeys and sometimes giving up migration altogether. During the breeding period, temperate-breeding geese (and their goslings) experience different environmental conditions compared to their arctic-breeding counterparts. We have gathered gosling growth data from arctic (Barents Sea) and temperate (Baltic, North Sea) barnacle goose populations, of which the North Sea population is no longer migratory. In our presentation we will show how growth patterns differ between arctic and temperate breeding populations. Furthermore, we will highlight the importance of both the breeding environment and the lifestyle of the geese in shaping these patterns.

MIGRATION AND REDISTRIBUTION MOVEMENTS OF GREYLAG GEESE ALONG THE NORTH-WESTERN EUROPEAN FLYWAY

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Keywords: Migration strategy, Western Europe, GPS tracking, Greylag goose

The strong increase of the North Western European Greylag Goose population raises new management issues. Greylags wintering on Spanish sites and those breeding in Norway are of special attention assuming that geese from Norway become more abundant among greylags migrating over France and reaching Spain relatively to those originating from other northern European countries. The present study is based on the tracking of 36 geese tagged with GPS devices during the post-breeding moulting period on sites along the western and northern coasts of Norway and on southern Iberian wintering sites. Post and pre-breeding migrations of geese from Finnmark started about 3 weeks later than those from the western Norwegian coast. Spring migration was one month shorter than the fall migration. Whatever their wintering areas and migratory trips, greylags returned closely to their initial breeding grounds the following spring, showing the high fidelity to their breeding site or phylopatry. Interestingly, all geese from Finnmark used the Swedish and more rarely the Finnish coasts for stopovers. Geese tagged in Spain started their spring migration between the beginning of February and March. Stopover durations in Spain (7±2days) and France (6±2days) were short but were 3-4 times longer when they stayed in the Netherlands (22±3days). Our results do not support the hypothesis that migrants travelling further south arrive later than those wintering closer to their breeding sites.

THE DIFFERENCES IN MIGRATION PERFORMANCES BETWEEN SPRING AND AUTUMN OF FIVE GEESE ALONG EAST ASIAN-AUSTRALASIAN FLYWAY

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Keywords: Migration speed, Geese, East Asian-Australasian Flyway

It has been widely hold that the spring migration is faster than autumn migration. Faster spring migrator may increase its fitness by arriving earlier at breeding site. For geese, however, reports about the differences between spring and autumn migration has revealed mixed results. In this study, we tracked hundreds of geese of five species (Swan goose, Bean goose, Greater White-fronted Goose, Graylag goose, Lesser White-fronted goose) using GPS-GSM trackers along the East Asian-Australasian Flyway, to exam the differences in migration performance differences between spring and autumn of each species, and also the differences between species.

A FEW FOCALS MAY NOT TELL THE WHOLE TRUTH: CONTRASTING INSIGHTS FROM LIGHT-BELLIED BRENT GOOSE SATELLITE TELEMETRY, GOVERNMENT MONITORING AND CITIZEN SCIENCE

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Keywords: *Branta bernicla hrota*, telemetry, interpretation, limitations

We used satellite telemetry to track the northbound migration of light-bellied brent geese from spring staging areas in Denmark to high Arctic breeding areas and their subsequent return to wintering sites on either side of the North Sea. Because data were only available from relatively few telemetry-tracked birds in four years between 1997 and 2012, we compared their movements with those extracted from observation data of migrating and staging goose flocks extracted from national bird monitoring programmes, as well as citizen science portals. In the first two study years, all spring tracked birds migrated over the sea along the western coastline of Norway. In the two later years, half of the tracked birds took an alternative more eastern route flying over the central mountain ranges of southern Norway, before continuing along the coast further north. All but one of the tagged birds returned from Svalbard to autumn stage in Lindisfarne in northeast England. During both study periods, results showed that the migratory routes taken by several satellite tracked birds were apparently not representative of those taken by the vast majority of birds in the population. For instance, there was little evidence for the existence of a regular eastern spring migration route over the mountains Norway citizen science databases. In contrast, there are records of thousands of birds flying along the southern and western coasts, in many years equating to the total numbers in the known annual population size. In autumn, it was evident from national waterbird monitoring schemes in United Kingdom and Denmark that numbers were equally split between the two countries when they arrived to stage in autumn. We discuss possible explanations for these discrepancies between our results, and recommend researchers whenever possible combine information from both telemetry and monitoring to avoid misinterpretations from overreliance on results from tracking studies.

ARE GEESE AN IMPORTANT COMPONENT OF DIET FOR THE WHITE-TAILED EAGLE NESTILNGS IN LITHUANIA?

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Keywords: predator, prey, impact

We studied White-tailed Eagles diet in coastal (up to 32 pairs) and inland (up to 21 pair) plots. During 249 inspections of successful nests in May – June between 2001 and 2016, we collected and identified prey items. Geese were identified to the following species / groups: *Anser fabalis*, *A. albifrons*, *A. anser*, *A. fabalis/anser* and *A. albifrons/erythropus*. We estimated the effect of spatial and temporal variation on the occurrence of geese in the nests of eagles (0 = absent, 1 = at least one individual) through generalized linear mixed models (binomial error structure and logit link function, eagle pair identity as random factor). A total of 47 individuals of *Anser* spp. (2.8%) were found out of all 1705 identified prey items. All goose individuals were found in 12% of sampled nests. Most numerous goose species was *Anser albifrons* (14 ind.), as well as 19 individuals identified as A. *albifrons/erythropus.* Considering very tiny proportion of *A.erythropus* in the flocks of geese in Lithuania, we suppose that ca. 70% of geese predated are White-fronted Geese. Six individuals were identified as *A. anser*, five as *A. fabalis*, and three as *A. fabalis/anser*. The best model indicate that occurrence of geese as prey item is more likely in the nests of White-tailed Eagle coastal pairs compared to the inland pairs. Indeed, 79% of all goose items were found in nests located in the coastal area while in this study plot we sampled 56% of all nests.

THE STATUS OF DARK-BELLIED BRENT GEESE (*Branta b. bernicla*) IN WESTERN EUROPE IN 2012-2016

Barwolt S. Ebbinge[1], Kane Brides[2], Neil Calbrade[3], Preben Clausen[4] Sébastien Dalloyau[5], Sophie Le Drean-Quenec'hdu[6], Klaus Günther[7], Kees Koffijberg[8], Jürgen Ludwig[9], Eldar Rakhimberdiev[10], Bernard Spaans[11]

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Keywords: population size, annual survival rate, breeding succes, Brent Geese

Midwinter and spring counts along the coasts of western Europe between 2012 and 2016 have been collated. These counts are compared with a survival analysis of colour-ringed birds and with age ratio assessments. Years of peak productivity (always coinciding with lemming peak years on the Taimyr peninsula) have not occurred since 2005, but also years when Brent almost completely fail to produce any young hardly ever occur anymore.

As a check on the reliability of the mid-wintercounts survival estimated from annual age-ratio assessments and these counts (averaging 89 % annual survival) are compared with survival estimated from resightings of colour-ringed birds (averaging 88 % annual survival)

The population of Dark-bellied Brent Geese as a whole shows a slight further increase in numbers, numbering in mid-winter on average 260,000 in the period 2012-2016.

THE PYASINA DELTA AS A MOULTING AREA FOR GREATER WHITE-FRONTED GEESE

Barwolt S. EBBINGE[1], Yakov I. KOKOREV[2] , Gerhard J.D.M. MÜSKENS[3], Bart A. NOLET[4], Natalya SOKOLOVA [5]

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Keywords: moult migration, wing moult, Greater White-fronted Geese, mixing of populations

An combined analysis of ring recoveries and resightings of Greater White-fronted Geese caught and marked as moulting birds in the Pyasina Delta, western Taimyr, and counts of eastward moult migration in western Siberia shows that huge numbers of non- or failed breeders migrate to moult on the Taimyr peninsula.

This migration is further supported by tracking White-fronted Geese with satellite telemetry.

In the Pyasina Delta Greater White-fronted Geese from both the populations wintering in eastern Europe and Turkey and those wintering along the North Sea coast occur.

There is no evidence that Greater White-fronted Geese from East Asia use the Pyasina Delta as a place to moult their flight feathers.

PREVALENCE OF ANTIBODIES TO INFLUENZA A VIRUS IN ARCTIC AND TEMPERATE-BREEDING BARNACLE GEESE AND THEIR EGGS

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Keywords: avian influenza virus, AIV, migration, maternal effects.

The Arctic is considered a relatively pathogen-poor environment. Most arctic-breeding birds however occupy the Arctic only seasonally. On their travels to and from arctic breeding grounds they move through a variety of other environments for staging, and there they may come into contact with more and diverse pathogens. Thus, it is largely an open question if arctic-breeding populations do actually benefit from their (energetically costly) migrations by escaping pathogen rich environments or not. Such question is furthermore of interest with respect to the spread of zoonotic diseases like, for instance, avian influenza A viruses. I study this problem in the barnacle goose, a traditionally arctic-breeding species that recently has colonised new environments in the temperate zone along the flyway. Such a study system allows intraspecific comparisons of arctic long-distance migratory, temperate short-distance migratory and sedentary populations, all sharing common wintering grounds along the North Sea. In my presentation I will investigate prevalence of antibodies directed at AIV in eggs, growing young and moulting adult geese from colonies along the Barents Sea, the Baltic and the North Sea.

DISTRIBUTION OF GREYLAG GEESE (*Anser anser) RINGED DURING BREEDING SEASON IN THE NEMUNAS DELTA*

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Keywords: migration, wintering, graylag geese

Increasing Greaylag Geese populations in Europe have positively affected breeding population in Lithuania. One of the biggest increase of breeding pairs Graylag Geese was recorded in wetlands around Curonian lagoon in Nemunas delta. Breeding and moulting geese from 2012 - 2017 annually are ringed in Nemunas delta. In the end of June, juveniles and adults birds caught using nets built on shore of Kintai fishponds. Additionally in spring 2017 using canon nets was caught seven adults individuals. Totally in few seasons 47 birds was ringed with white neckbands. From ringed birds 80% of them were resighted later, moe than 400 sightings. Greylag Geese marked in Nemunas delta region, was recorded wintering in Geramany, Poland, Denmark and Hungary. The most important wintering place for Graylags from Nemunas delta is Germany (Mecklenburg-Vorpommern). On migration Graylags where recorded in Poland. During moulting and post moulting period birds from Lithuania was recorded in Lithuania and Estonia. There is few records of Graylags ringed in Lithuania in the 1980's wintering in France, Spain, and United Kingdom. Data from the nowadays indicate a much shorter migration route, average of 650km to wintering grounds. Graylags are staying in breeding grounds very long period. They arrive to breeding grounds in mid of February and stays until middle of December. Geese fin breeding areas use territories of grasslands around waterbodies, and stays close to breeding areas until snow covers the feeding areas.

MULTI-SPECIES MANAGAMENT OF GEESE IN NEW AGRICULTURAL LANDSCAPES: FROM FIELD AND FARM TO FLYWAY

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Keywords: crop damage, conflict, human dimensions, preventive measures

There are more geese than ever sharing agricultural landscapes with humans. These systems offer ideal conditions for geese, leading to population increase and changed migratory habits in some species. Another consequence is increasing conflict with agriculture, which can be very costly for society. Stakeholders are asking for comprehensive measures for a more synthetic multi-species management of geese in today´s agricultural landscapes. However, this is a challenge as much of the knowledge base about diet, field choice, habitat preferences, movements and other behavior stems from decades when climate, crops and goose numbers were quite different from what they are today. In response to knowledge gaps, stakeholder requests and imminent management challenges we have launched a project addressing: 1) movements and habitat utilization by geese, 2) the efficiency of tools to alleviate crop damage, e.g. sacrificial crops and scaring devices, 3) socio-ecological patterns and processes in goose management systems, and 4) flyway-level management plans by providing current data on survival, breeding success and long-distance movements for model development and parameterization. The project has an explicit multi-species multi-actor trans-disciplinary approach in order to facilitate management spanning spatial scales from field and farm to flyway.

CHANGES IN THE TRENDS OF COMMON WINTERING GOOSE SPECIES IN THE LAST THREE DECADES IN HUNGARY

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Keywords: Greylag Goose, Greater White-fronted Goose, Bean Goose, monitoring, trend analyses

We analysed the Hungarian Goose Monitoring data in the period of October and March between 1986/1987 and 2016/2017. The surveys were organized by the Institute of Wildlife Management and Vertebrate Zoology at the University of Sopron.

During the last three decades significant changes were observed in the population of the three most common geese species. Strong increase was detected in the population of Greylag Goose (*Anser anser*) and Greater White-fronted Goose (*Anser albifrons*). An opposite trend can be observed in the case of Bean Goose (*Anser fabalis*). Its population has showed a continuous decrease. Trend analyses of these species provided the following results. The annual change in trend slope (%) and in the number of individuals based on the average and maximum population:

- Greylag Goose 11.5% (481 ind.) and 14.4% (945 ind.),
- Greater White-fronted Goose 9.5% (2243 ind.) and 6.3% (3555 ind.),
- Bean Goose –3.6% (–2273 ind.) and –3.3% (–3766 ind.), respectively.

Over time the spatial pattern of geese has also changed. The population of the Greylag Goose grew all over the country. Formerly the Greater White-fronted Goose was common only in the eastern part of Hungary; nowadays there overwinter large numbers in the western part of the country, too. Bean Goose typically occurred in Western Hungary, but due to the population decrease nowadays it has few occurrences. The habitat conditions in the time of investigation have not changed significantly, they were the same for all the three species. In the last decades, habitat reconstruction of wetlands has been carried out in many places in Hungary. Which was useful for the two species, it is certainly good for the Bean Goose, too. It follows that the reason for the decreasing of Bean Goose is outside of the territory of Hungary.

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RUSSIAN POPULATION OF THE BARNACLE GO OSE: MODERN CONDITION AND TRENDS

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Keywords: Barnacle goose, population size, colonies

The Russian population of the Barnacle Goose started growing in 1980-s. The population size has increased from 10 000 birds up to 1200 000 in last 50 years. The population growth led to the expansion of the species from the native breeding range on Vaygach Island and Novaya Zemlya to other coastal areas of the Russian Arctic and even to the Baltic Sea. The main colonies established on Kolguev Island and the Kanin Peninsula. In last three years isolated cases of the Barnacle Goose nesting were observed on the Western Taimyr Peninsula.

The number of Barnacle geese on Kolguev was estimated at 70 000 – 80 000 breeding pairs, on Vaygach – 9000 pairs, on the Kanin Peninsula – 10 000 pairs. In total, the number of the breeding birds in Nenets District was estimated at 200 000 – 210 000 individuals. Taking into account that every season 25-30% of the population do not breed, the total number of birds by the end of breeding season (together with juveniles) is about 500 000 – 600 000. The whole population size was estimated at more than 1000 000 in wintering grounds, therefore we could suggest that the greatest colonies of Barnacle geese are located in Novaya Zemlya. Data from satellite transmitted birds support this assumption.

Whereas in the native breeding area Barnacle geese nested on cliffs and small islands, new colonies were formed mainly on salt marshes and sandy dunes. Extremely high ecological plasticity of Barnacle geese allows them to occupy very different nesting habitats.

FAMILY SIZE DYNAMICS IN WINTERING G EESE

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Keywords: juvenile proportions, foraging flocks, family separation, differential migration

Many species live in family groups where juveniles receive different levels of parental care. The families of geese and swans often stay together through one or more migration events. How their social status influences migration timing, winter movements and space-use is not yet well understood. We explored family size dynamics of wintering greater white-fronted geese (*Anser a. albifrons*) using 17 years of observation data on foraging flocks and GPS tracks of 13 complete families. We found that only between December and February, families with more juveniles wintered farther from the breeding grounds, where flocks were smaller. Generally, the number of juveniles in a family decreased and flock size, number of families in flocks and juvenile percentage in flocks increased throughout the winter. Additionally, flock size and composition was related to daily temperatures, precipitation and wind speed. Surprisingly, juvenile proportions were not related to summer predation. Families that undertook more flights were more likely to split. Our results suggest that white-fronted geese are differentially migratory by age and social class in both autumn and spring. This is important for consideration of the effects of climate and habitat change on large migrants that subsist in families long after hatching and their conservation and management.

THE STATUS OF MIGRATORY GOOSE POPULATIONS WINTERING IN BRITAIN AND IRELAND

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Keywords: abundance, Britain & Ireland, migratory goose, population estimates

The Goose & Swan Monitoring Programme (GSMP) monitors the abundance of seven out of the 11 migratory goose populations that winter in Britain and Ireland, and the scheme produces non-breeding population estimates at a flyway scale for all but one of these.

The Pink-footed Goose *Anser brachyrhynchus*, Svalbard and Greenland Barnacle Goose *Branta leucopsis*, and Canadian Light-bellied Brent Goose *B. bernicla hrota* populations have generally been increasing (current population estimates are 481,341, 41,700, 80,670, 36,811, respectively), whilst the Icelandic Greylag Goose *A. anser* population has seen periods of growth and decline (90,471). The Greenland White-fronted Goose *A. albifrons flavirostris* population has been declining since 1999 (current population estimate is 20,556) and is of highest conservation concern amongst the geese. The small flocks of wintering Taiga Bean Geese *A. fabalis fabalis* have also been declining (recent winter peak of 239 individuals).

The GSMP is a partnership scheme that involves a number of different organisations, but key to its success is the volunteer networks that give their time to support the programme and without who such large scale surveys would not be possible.

A DYNAMIC WIND FARM SENSITIVITY MAP FOR GEESE IN BULGARIAN DOBRUDZHA AS A TOOL FOR SPATIAL PLANNING

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Keywords: red-breasted goose; white-fronted goose; wind-turbine; sensitivity map; collision; displacement

Geese are perceived to be relatively sensitive to wind farm developments, with potential impacts arising from collision, displacement from feeding patches, and barrier effects. Consequently, planners need tools to guide decisions about where to site wind farms for minimal impact on goose and other bird populations. For the wintering goose populations of Bulgaria's Black Sea Coast, we used spatially explicit models to separately map the risks arising from collision, habitat displacement and barrier effects. The maps were synthesized into a dynamic and flexible wind farm sensitivity map that can be used to guide spatial planning. We used the spatial models to simulate different wind farm configurations for the region and to examine their impact on goose populations, including the globally threatened red-breasted goose. If all currently proposed turbine developments proceed, there is potential for major reductions in habitat suitability for geese in the region. Conversely, if the same number of turbines were sited in the area but in optimal locations with respect to geese, there would be minimal impact. This approach is applicable to other regions where important goose populations coincide with rapid wind farm development, and can be a valuable tool in defusing conflict between wildlife conservation and renewable energy interests.

BIRDRING, MOBILE APP FOR BIRD RING OBSERVERS

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Keywords: mobile app, observation, resighting, colour ring, neck band, geese.org

BirdRing is a mobile app to record sightings of birds with (colour) rings or neck bands and send the data to websites and researchers. Currently, the app communicates directly with multiple websites including geese.org (geese and swans) and griel.nl (metal rings of all species in the Netherlands). BirdRing supports many species, including all geese and swans.

BirdRing helps observers to easily save resighting data, prevent mistakes, compose ring codes and send observation data to the website or email address of the researcher. Life histories of birds are accessible in the app, so observers can view it in the field. BirdRing also has a SpotFinder included, that can help to find the best spots for bird ring reading.

Using BirdRing is completely free for both observers and researchers. BirdRing is available in 12 languages, currently has about 1100 frequent users all over Europe and is given a consistent 5 out of 5 star rating in the Google Play Store.

In the presentation, I will demonstrate the app, show how easy it is to use and how it benefits geese research.

THE EFFECT OF NEST FLEAS ON BREEDING BEHAVIOUR AND NEST SUCCESS OF ARCTIC BARNACLE GEESE (*BRANTA LEUCOPSIS)*

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Keywords: parasites, breeding behaviour, experiment

Ectoparasites, such as nest fleas (order Siphonaptera), can be detrimental for their host. High flea numbers in birds' nests can diminish current and future reproductive success by negatively influencing offspring condition and survival and the likelihood of parents to return as breeders. Most studies on the effects of nest fleas on host fitness have been performed in altricial bird species. This means that adult and offspring are both exposed to fleas until fledging. However, little is known about the effects of fleas in nests of precocial birds. Research on lesser snow geese (*Chen caerulescens*) and Ross's geese (*Chen rossii*) in the Canadian Arctic indicated that fleas have a negative impact on nest success. Flea infestation in Arctic goose colonies seems to be a relatively recent phenomenon and is potentially linked to warming climates. It was hypothesized that high flea abundance may reduce nest success by affecting female breeding behaviour. We investigated this hypothesis in a flea infested barnacle goose population on Spitsbergen. We monitored the natural variation in flea infestation and nest success during five study years and in 2016 we carried out an experiment to test whether fleas affect female breeding behaviour. In this experiment we manipulated nest flea abundance by selectively killing fleas using a microwave. Female breeding behaviour was monitored by both wildlife cameras and temperature loggers. With these data we gain insight in the role and influence of fleas in determining the fitness of a precocial species.

LEGAL OR ILLEGAL GEESE?

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Keywords: Barnacle Goose, Invasive species, Legislation

On June 8. 2011, a local court in Northern Finland fined two Finnish citicens tor having released "an invasive alien species" into Nature. The verdict was confirmed by the Court of Appeals. The point is: The "invasive species" was *Branta leucopsis*, the Barnacle Goose.

So questions arise:

- Biology and Conservation:
    - What is an alien species?
    - What is an (invasive) alien species?
    - How should they be dealt with?
    - How about the Barnacle Goose in Finland?
- Law and society:
    - How is an alien species defined in (EU) legislation?
    - What actions are required or forbidden?
    - Are there precedent cases?
    - Can biological concepts be re-defined by authorities?

The talk will dwell shortly on these questions and – of couse – present the most recent news on the prolonged legal process, which is still going on having among others been considered by the Commission of the European Union.

GEESE WINTERING IN GREECE (1968-2015)

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Keywords: wintering geese, Greece, wetlands

Greek wetlands are among the southernmost wintering sites for geese nesting in north Europe and Russia. Geese wintering in Greece were annually counted during the International Waterbird Census (one count in January) from 1968 to 2015 with a break in 1975 and 1977-1981. At least four goose species were regularly recorded wintering in Greek wetlands while four more species are considered irregular or accidental visitors. The majority of geese were Greater White-fronted *Anser albifrons* (84% of the total geese wintering in Greece) followed by Greylag *Anser anser* (10%) and Red-breasted *Branta ruficollis* (1%). The number of wintering geese ranged from 41021 (1969) to 147 birds (1990) with a mean number of 5210 birds ±7420 SD. Geese were recorded in at least 20 wetlands, the great majority, however, was recorded in natural grasslands around six large wetlands of northern - northeastern Greece. The wintering population of Greater White-fronted Goose has increased during the study period and especially after 1994. The Red-breasted Goose population exhibited, also, an increasing trend after 1997 with high fluctuations. On the other hand, the Greylag Goose population has decreased dramatically. It is noteworthy that the entire Lesser White-fronted Goose *Anser erythopus* Fennoscandian population wintered in northern Greece with increasing trend (53 birds in 2015). Habitat loss and degradation, as well as, illegal killing are considered to be the main threats for wintering geese in Greece.

USING REMOTE SENSING METHODS FOR EVALUATION OF CHANGES IN GOOSE FEEDING AREAS IN NEMUNAS DELTA

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Keywords: flood, shoreline, remote sensing methods

Nemunas delta has a great importance for migratory waterbirds during spring season, which stop in flooded areas for resting and feeding on their way back from wintering areas to breeding grounds. The most abundant migratory geese species using Nemunas delta are greater white-fronted goose (*Anser albifrons*), bean goose (*Anser fabalis*), and barnacle goose (*Branta leucopsis*).

The main goal of this work is to evaluate temporal size changes of the potential feeding areas, which are important for geese in Nemunas Delta. We used SAR images and shoreline change detection analysis for a period of February to May 2017, which cover the most important known areas for geese in the region. Geese mostly use flooded areas for roosting, while they feed away from the flooded areas. As the flood water shrinks, geese use freshly opened areas which were not reachable for them previously.

This work present potentials to use remote sensing methods to evaluate temporal changes of important areas for waterbirds.

DEVELOPMENT AND STATUS OF GREYLAG GOOSE *ANSER ANSER* POPULATION IN LATVIA

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Keywords: Anser anser, breeding population, distribution range, recolonization

The Greylag Goose *Anser anser* population in Latvia has increased since early 1970-ties as a result of hunting ban. At the beginning of the period the estimate of the breeding pairs was below 10, but as of 2017 the estimate might be as high as 200–500. Also the distribution range of coastal Lakes: Lake Engure, Lake Pape, Lake Kaņieris and Lake Liepāja has increased to about 20 different locations, where breeding is confirmed in 2013–2017 breeding seasons. Analyzing this development historically, we conclude that the recolonization after the ceased regular breding at the beginning of 20th century was possible due to increase of suitable habitat (forming of large red-beds) and hunting ban.

THE RED-BREASTED, WHITE-FRONTED, BEAN GEESE AND BEWICK'S SWANS NUMBERS AND BREEDING PERFORMANCE ON THE WESTERN TAIMYR PENINSULA IN 2000-2017

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Keywords: Taimyr Peninsula. geese, numbers, breeding performance

Monitored: 1) 400 km of Agapa River, from 70.11N, 86.15E to the river mouth (71.26N, 89.13E) in 2004, 2007, 2010, 2013, 2017; 2) 230 km of Pura River from 71.55N, 88.36E to 72.18N, 85.45E in 2015, 2017; 3) 300 km2 near Willem Barents Station (WBS, 73.23N, 80.32E), including Lemberova, Maximovka and Efremova Rivers and Kara sea coast in 2000 to 2016. At Agapa River Red-breasted Goose (RBG) numbers fluctuated 54-68 nests per season, the local population is stable. White-fronted Geese (WFG) fluctuated 5-25 breeding pairs, number increased. Bean Geese (BG) near Peregrine Falcon nests fluctuated 1-7 nests, population decreased. Near WBS RGB numbers fluctuated 1-11 breeding pairs, population is stable. WFG numbers fluctuated 3-23 breeding pairs, increasing. The northernmost nest of BG in WBS area was at 73.08N, 80.41E Along Pura River in 2015 7 RBG nests were found, several hundred RBG moulted on the river, in 2017 15 RBG nests were recorded. In cold 2017 season RBG nested on Pura River, but did not nest in warmer conditions 100 km south, in Agapa River downstream. In 2015 5 WFG nests were recorded, few WFG moulted along Pura River, most of them for moult migrated to the north, to Pyasina Delta. In 2017 10 WFG nests were found. In 2015 and 2017 only few BG breeding pairs were in Pura River survey area. For the moult BG from Pura River did not migrate, they molt in thousands on Pura River. Number of staging Bewick's Swans increased sharply. In cold 2017 they had reduced clutch size.

ASSESSMENT OF THE POPULATION DEMOGRAPHIC STATUS AND CALCULATION OF THE SUSTAINABLE HUNTING BAG FOR WATERFOWL ON THE BASIS OF RING-RECOVERY DATA

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Keywords: Population demographic status, sustainable harvest, waterfowl

We derived the formula for the bird annual mortality rate calculation (Biology Bulletin,2017,44:998-1006). Equation permits producing “mortality pattern”: a chart of interrelations between theoretical and real rates of numder decrease in given bird cohort. On the base of this pattern, we derived numerical index (NI) of population demographic status. It is calculated in percentages as a sum of differences between real and theoretical mortality rates in each year, divided by the number of years minus 1, then divided by N (the number of birds in a sample) and multiplied by 100. Using additional coefficients we derived transformed NI (TNI) to adjust NI for the stable population to be zero. TNI makes possible to reveal a population trend: whether the population is stable, decreasing or increasing. Positive TNI indicates that population condition is good, negative – is bad and numbers of the population or species are declining. TNI as a proposed criterion of the rational use of the game waterfowl species. It indicates whether we can continue hunting a particular species or the species needs protection. We demonstrate that if we harvest not more than 1/3 of the total numbers of each age cohort (yearlings we can harvest up to 2/3), the population numbers become stable. At lesser harvest the numbers start to grow. On the basis of these rates it is easy to calculate what proportion of the autumn waterfowl number we may harvest, producing tables of allowed hunting bag for each species.

RED-BREASTED GEESE BEHAVIOUR DURING FORMATION OF A MIXED COLONY TOGETHER WITH TAIMYR HERRING GULLS AT THE RIVER ISLAND

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Keywords: Red-breasted Goose, behavior, colony formation

Colonies in many bird species starts from a flock. There are two categories of birds that form colonies. First one can be called «wants»; these birds from the very beginning "know" what they want and select breeding sites on their own mind. These birds settle at new places and are initiators of the future spatial clusters of nests. Second category is "opinions", that choose breeding sites under influence of position of "wants" or the initial flock (Ytreberg, 1956). Red-breasted Goose (RBG) "wants" once arriving in spring, leave a flock quickly and occupy territories either near peregrine falcon nests, or on steep river banks, in the mainland tundra or within colonies of gulls on islands. Observations and video recording were made on Tab island, Pura River (72.17N, 85.43E), Taimyr, 4-23 June 2017. Initial flock of 40 RBG arrived to the island on 8 June. In spite of aggressive interactions between pairs, the flock did not disintegrate. From time to time aggression turned into peaceful periods when RBG graze on dry grass or sleep next to each other. On the same day three pairs left the flock and occupy territories at the maximal distance from the flock, thereafter first nests appeared. Rest of RBG alternated the flock and new nesting sites. Next nests appeared either near flock place or near "wants". RBG preferred to compete for territories that are already occupied by other pairs. On 23 June the mixed colony contained 23 gull nests, 6 RBG nests with clutches and 2 nest bowls.

DISTRIBUTION AND NUMBER OF TAIGA BEAN GOOSE (*ANSER FABALIS FABALIS*) IN EUROPEAN NORTH-EAST OF RUSSIA

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Keywords: Taiga Bean Goose, distribution, number, North -East of Russia

Information about number and distribution of the Taiga Bean Goose was collected during 1970-2017 in Komi Repulic and Nenents autonomous district.

The Taiga Bean Goose is regularly meet in basins of rivers and brooks on the northern forest border. Birds also usually meet in belt forest in basins of rivers and brooks situated in tundra zone. Pairs and flocks of geese were met in basins of rivers: Indiga, Sula, Soima, Shapkina, Kolva, Adzva, Bolshaya Rogovaya and Usa. Geese regularly met in molting flocks in Urdjuzhskoe lake area, in lower courses of Riveres Chernaya and More-Y.

In taiga zone pairs, flocks (up to 50 individuals) and broods of the Taiga Been Goose were observed in following areas. In upper stream of Zilma River, on the Usvanjur swamp, in basins of rivers Bolshaya Sinya, Pysa, Vorykva, Shyugor, in upper streams of rivers: Mezen, Vym, Ilytch. Breeding Taiga Bean Goose was noted in the beginning of last century (Andreev, Bianki 1910) in the middle course of Vychegda River. They also were met in 2012 in the same area. Every year flocks (30-40 individuals) of migrating bean goose meet on meadows of Sysola River. Migrating Taiga Bean Goose were shot in spring periods of 1984 and 2017 on the Cape Chaika and mouth of Kara River (Yugorskij peninsula) and in Varandei village area.

By expert estimations the total number of the Taiga Bean Goose in Komi Republic count 1200-1500, and in Nenets autonomous district - 500-700 pairs of geese.

GOOSE PARENTS LEAD AND TEACH MIGRATION AT LOW COST

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Keywords: group migration, formation flight, goose family, leadership, energy expenditure

Most geese and swans perform long-distance migrations in large, social groups, often in echelon or V-formation. The "energy saving hypothesis" proposed that such birds use upwash generated by the preceding bird to increase flight efficiency. However, for family groups, the "communicat ion hypothesis" for social learning might be a valid alternative. We were able to follow two complete families of greater white-fronted geese (*Anser a. albifrons*) with GPS/accelerometer tags during spring migration. Their tracks revealed V-formation flight with much scatter. Measures of wing tip spacing, depth and flight height indicated that the communication hypothesis, i.e. social learning, was more important for our migrating goose families. Notably, one of the goose parents was flying at the front of the formation at all times, this for 80% being the father. Contrary to theory, the father expanded less energy when leading than when following, but was leading during strong supportive winds most of the time. The opposite was true for the mother, spending more energy when leading, usually with low or negative wind support. We propose that for social family migrants, communication and learning rather than energy saving is the main driver of formation flight. Furthermore, the leading bird(s) in a flight formation might be fixed and not exert more energy than when following, especially for heterogeneous groups or if the species can make use of supportive winds.

CHANGES OF STOPOVERS AND HABITAT USE OF WHITE - FRONTED GEESE DURING SPRING MIGRATION

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Keywords: spring migration, resource selection, climate change, remote sensing, GPS tracking

Forage availability during spring migration is crucial for the survival and successful reproduction of many migratory species. With careful timing in relation to spring growth and small-scale selection of suitable food sites, many geese and swans are known to maximise their foraging rate. However, especially for Arctic breeders, recent levels of climate, habitat and management change alter the conditions that they meet at spring stopovers. Using high resolution GPS tracks of >150 greater white-fronted geese (*Anser a. albifrons*) during 2006-2017 and optical and SAR time series data from Sentinel 1 & 2 (20x20m) and MODIS (500x500m) we determined and compared habitat preferences according to vegetation and land-use intensity. Most notably, we found large differences between individuals and stopover sites within years. Furthermore, our data indicate that the selection of stopover sites has changed between the years, possibly also altering migration routes and timing. We will further examine how habitat characteristics of previous and new key stopovers have changed and how that might relate to recent climate and habitat changes. This will allow us to conclude if the apparent differences in migration routes and stopover usage is due to individual variability or consistent, adaptational change.

SPATIAL AND TEMPORAL ASPECTS OF THE ARCTIC GEESE NESTING SUCCESS ON THE LEMMING-FREE ISLAND

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Keywords: geese, nests, clutch size, nest predation, nest success

We studied nesting success of Greater White-fronted, Bean and Barnacle Geese, nesting in high numbers on the lemming-free Kolguev island. Arctic and Red foxes, as well as Gulls and Skuas predate on nests during incubation period thus decreasing nesting success. In these stable environments, with no lemming cycles influencing predators, we found no signs of pronounced inter-seasonal fluctuations of nesting success, which are typical for the geese populations nesting in Arctic areas with lemmings. Based on the analysis of 4260 nests fate of three geese species during 6 seasons (2006-2008, 2011-2012, 2017), we found that nesting success was highest in Barnacle Geese, reaching up to 94%, and was the lowest (though hardly lower than 70%) in Bean geese. Such aspects of nest predation as complete and partial clutch losses varied between and within species, depending on spatial aspects of nest distribution, clutch size, habitats used and breeding phenology. Both complete clutch loss and partial clutch loss tended to be similar in nearest neighboring pairs. Complete predation was higher in small clutches of 2-3 eggs, while partial predation dominated in big clutches (4-6 eggs). Proportion of untouched clutches was smallest in clutches of 5-6 eggs, while about half of 2-egg clutches survived untouched until hatching. Very little predation occurred a fter peak of hatching, when gulls and foxes switched their activity to newly hatched goslings, thus favouring better late nests survival.

WHAT ARE THE SUBSPECIES OF BEAN GOOSE MIGRATING IN THE SOUTH OF WESTERN SIBERIA?

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Keywords: Bean goose, *Anser fabalis middendorffii*, *Anser fabalis johanseni*, Werstern Siberia, conservation

It is considered that between western (*Anser fabalis rossicus* and *A. f. fabalis*) and eastern subspecies (*A. f. middendorffii*, *A. f. serrirostris*) of the bean goose *Anser fabalis* there is a border that runs along the Yenisei River. Thus according to these data only the western subspecies occurs in Western Siberia (WS). Nevertheless, as early as 1898 G.E. Ioganzen assumed that *A. f. middendorffii* can migrate via the south of WS. More later H. Johansen and J. Delacour described *A. f. johanseni* – the form of bean goose which was typical for southern WS. Finally, M. Ruokonen with collegues showed that it genetically identical to *A. f. middendorffii*. In 2009–2017 we gathered 40 samples of bean geese from Tomsk region (taiga zone of WS) and 22 from Altai Krai (steppe zone of WS), which were shot by hunters in spring. With the aim to determine the subspecies identity of these geese, we analyzed d-loop sequences of the mtDNA. Surprisingly, among all individuals 45 % in Tomsk region and 59,1 % in Altai Krai proved to belong to *A. f. middendorffii*. We suggest that the western border of the range of the *A. f. middendorffii* may have shifted from Yenisei up to Ob river. Otherwise we can turn back to idea of validity *A. f. johanseni* which genetically is closely related with *A.f. middendorffii.* Despite the urgent need of conservation of this subspecies, it is under sever hunting pressure in Tomsk region and Altai Krai. Obtained data is a serious argument to stop hunting of geese in the WS.

THE CHANGING OF MIGRATION OF BARNACLE GEESE (*BRANTA LEUCOPSIS*) IN THE LENINGRAD REGION IN THE LAST DECADE

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Keywords: Barnacle goose, *Branta leucopsis*, migrations, stopovers

Barnacle goose was very rare migratory species in the Eastern part of the Gulf of Finland during the greater part of the last century. A significant increase in numbers of this species during migrations began in the end of 80s of the last century. Recent years, 300-350 thousand birds flies through the Eastern part of the Gulf of Finland in the spring, and 600-650 thousand birds - in the outumn. The migration goes through four main channels: Kurgalsky Peninsula – Vyborg Bay, the Central part of the Gulf of F inland –Vyborg Bay, the Northern coast of the Gulf of Finland – Vyborg Bay, South coast of the Gulf of Finland Nevskaya Guba – South shore of Ladoga lake. The majority of birds fly through the first three tracks. Autumn migration occurs in the opposite direction. Significant shifts of the time of the migrations has showed. Spring migration starts at the beginning of the 3rd decade of April, autumn migration - in the beginning of the 2nd decade of September. The peaks of the migrations, as in previous decades, marked in the second half of May and first half of October. First migration stopovers appeared in the last decade: 1500-2000 birds - on Kurgalsky Peninsula, 400-500 birds - in island of Maly Tyuters, 500-600 birds - in island Moschny, 400-500 birds on the capes Northern coast of the Gulf of Finland. These changes are associated with the continuing populations growth of Barnacle geese in Arctic and with the expansion of its stopovers areas in Baltic region

REPRODUCTION SUCCESS OF GREYLAG GOOSE ON THE FISHPONDS AT SOUTH BALATON (HUNGARY)

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Keywords: breeding waterbird survey, survival rate, prefledging gosling, Lake Balaton

In Hungary, scarce information has been published on the nesting waterfowl population, especially its growth. These data are typically based on estimates. Greylag Goose occurs in almost all wetlands along the southern shore of Lake Balaton. Its breeding population is remarkable and has been stable for decades in this area. Breeding waterbird surveys have been carried out on fishponds in three different sites for several years. The average number of goslings (4.1–4.8 gosling/family) based on the total of 362 families surveyed did not differ significantly among the three sites. There was no difference either in the average number of goslings between the years. This result suggests the absence of year effect or site effect in the survey period. In the fishponds of Irmapuszta (at Balatonlelle) the average daily gosling mortality was 0.03 gosling/family, which equals to 0.8 gosling/family decrease monthly. According to this decreasing tendency the calculated survival rate of prefledging goslings was between 52.3% and 62.8%.

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LESSER WHITE-FRONTED GEESE WESTERN FLYWAY: MIGRATION, STAGING SITES AND BEHAVIOUR

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Keywords: Lesser Whitefronted Goose, *Anser erythropus*, migration, tracking, Stop-over-sites

Lesser Whitefronts (LWFG) are the most threatened goose species of the Western Paleartic and decreased dramatically over the last 60 years. Most of the Norwegian LWFG migrate to SE Europe and Asia for wintering, but several analyses of historical data have found Lesser Whitefronts winter in DE and NL regulary. The Swedish population is the onliest confirmed breeding population in the EU To protect Swedish LWFG populations of extinction in the 1980th a project to reinforce the wild population was started. These birds use the "western flyway" from Sweden to The Netherlands. In a project on behalf on German Birdlife NABU Niedersachsen we tagged wild born LWFG in Sweden with GPRS-GPS backpacks and studied migration routes and behaviour. The migration routes and important staging sites were analysed by using Brownian Bridge tools. By using ACC data of one of the tags we analysed birds behaviour on the staging sites. Results of feeding, comfort and disturbance behaviour will be discussed.

By this gaps in knowledge about staging sites on spring and autum migrations were closed. We found an unknown and important site at Lolland (DK) and were able to confirm stop-overs of LWFG at N Germany as well as mapping important pre-breeding sites.

CHANGING TRENDS IN NUMBERS, DISTRIBUTION AND FEEDING BEHAVIOUR OF ARC TIC GEESE WINTERING IN THE COASTAL POLDERS OF FLANDERS, BELGIUM

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Keywords: feeding behaviour, site fidelity, global warming, agricultural practices, Pïnk -footed Goose, White-fronted Goose

Numbers and distribution of Arctic geese wintering in the coastal polders of Belgium are monitored over almost 60 years. White-fronted geese have an expanding presence in many parts of Flanders; Pink-footed geese remain remarkably faithful to the Oostkustpolders as an exclusive wintering region.

Annual numbers vary depending on weather conditions, but maxima tend to decrease since two decades. Possibly global warming enable geese wintering more to the north.

Some striking changes concerning goose feeding behaviour are registered. The traditional preference of Pinkfeet and Whitefronts for permanent grasslands is increasingly replaced by feeding on crops, especially potatoes, sugar beet and maize left-over's. This preference occurs until these remaining food items are not longer available or profitable and grasslands regain their importance.

This behavioural shift seems to be a functional response to the changes in agricultural land-use. Notably a significant increase of maize cultivation came up in last two decades. Intensive exploitation practices are combined with an artificial lowering of water levels. In addition the prolonged vegetation growth period as a result of milder winters enables longer cattle grazing far into December

Probably the recent preference for feeding on crops may be designated as one of the factors behind the exponential population growth, notably of the Svalbard breeding Pink-footed goose. Many permanent grasslands and meadows are disappearing or degrading and are losing both their acreage and nature values. Restoration projects are currently managed.

WHAT LIMITS GEESE TO ADJUST TIMING OF MIGRATION TO A RAPIDLY WARMING ARCTIC?

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Keywords: Global warming, Arctic region, Barnacle goose, Spring migration

Climate change is occurring at different rates along the flyways of migratory birds, with typically more rapid changes in their breeding grounds than their wintering grounds. Migrants may be unable to advance migration timing to match this shift in environmental conditions, as they are (1) constrained in time to prepare for an earlier migration, or (2) as their wintering grounds do not provide cues that correctly predict the optimal timing of migration. We explored which of those is a more important limiting factor for advancing migration timing in barnacle geese breeding in Arctic Russia. We found that geese are initially not time-constrained to advance fuelling for migration, but seem to use day length as a cue to initiate fuelling. Departure from the wintering grounds does not seem to be based on conditions in the Arctic breeding grounds, and in some years geese depart when the snow has already melted on their breeding grounds. While geese can fine-tune migration and advance arrival in early springs by accelerating migration speed, they become time-constrained to adequately adjust reproduction timing, as they first need to refuel on the breeding grounds after a fast migration before they are able to breed. A lack of cues or outdated cues to predict the rapidly advancing onset of spring in the Arctic appears to be the most important limitation for migratory geese to adjust migration timing to Arctic climate warming.

MEDIEVAL BELIEFS ABOUT THE BARNACLE AND BRENT GOOSE ORIGIN

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Keywords: *Branta leucopsis, Branta bernicla*, barnacle, folklore, medieval beliefs

In Medieval Western Europe, there was a long-standing belief that Barnacle geese (*Branta "Anas" leucopsis*) and Brent geese (*B. bernicla*) germinate and "ripen" in fruits of special trees growing on the coast of Ireland, or develop in shells of barnacles, which form colonies on drifted logs. This theory was first mentioned in "Topographia Hiberniae" by Giraldus Cambrensis (1186) and later repeated in other medieval manuscripts. Both species nest in remote areas well above the Arctic Circle, so the Europeans saw these birds only during the migratory and winter periods on the coasts of the North Sea and France and filled in the unknown part of their life history with the folktale about this bizarre metamorphosis. W. Barents was the first to bring in Europe chicks and nests of the Brent Goose from Novaya Zemlya in 1597. But this myth may have persisted as long as it did (for almost 700 years, up to the early 19th century) not only because of the remote similarity of barnacles to goose head and neck, but also because the goose meat was allowed to be eaten during Lent, as far as it was believed that they were of the "plant origin", or closer to fishes than to birds. The trail of this story can be followed not only in Western European folklore and literature (e.g., it was used by Shakespeare), but also in Latin and English names of both bird species and crustaceans: two *Lepas* species *L. anatifera* and *L. anserifera*, the English Barnacle Goose, and the Latin *Branta bernicla*.

MONITORING OF GEESE IN ESTONIA UNTIL 2017

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Keywords: goose monitoring, numbers, trends, Estonia

The Estonian state monitoring of geese has been carried out every three year, since 1994. The species monitored are Greylag Goose Anser anser, Bean Goose Anser fabalis, White-fronted Goose Anser albifrons and Barnacle Goose Branta leucopsis. The Lesser-White-fronted Goose Anser erythropus has a special monitoring scheme separately. The breeding population of Greylag Goose Anser anser in Estonia was estimated at 600 pairs in 2017. The breeding population has not changed remarkably during last decade but long period trend is decreasing. The total counts of autumn staging greylag geese have varied between 4,000 and 16,000, the long period trend indicate a slight decrease of numbers of geese during the last twenty five years in Estonia in 1990-2017. One of the mean reasons for population decline has been obviously the over hunting of geese in 1990s. The breeding population of the Barnacle Goose in Estonia has increased until 1999, after that the numbers has decreased and has stabilised at the level 70-120 pairs. One of the mean reasons for population decline has been the raised predation of foxes and white-tailed eagles. The numbers of spring staging Barnacle Geese has increased until 1999, after what the numbers has decreased rapidly during few years and has than varied widely, between 70,000 to 140,000 birds. The main reason for the relatively small numbers of staging barnacle geese in West-Estonia has been the increase of staging geese in the Netherlands and North-Estonia at the same time. The numbers of spring staging Bean Geese and White-fronted Geese has increased in the last two decades in Estonia. Especially strong increase has the White-fronted Goose.

THE USE OF PRE-BREEDING SITES OF LESSER WHITE-FRONTED GEESE – POSSIBLE IMPLICATIONS FOR WATERBIRD CONSERVATION

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Keywords: Lesser Whitefronted Goose, pree-breeding sites, tracking, water birds, conservation

Lesser Whitefronts (LWFG) in Sweden breeds on high altitudes in remote mountain areas. The core breeding area is found on 650-820 meter altitude giving a short window of opportunity for breeding for this herbivorious and ground-nesting species. To be able to optimize the start of breeding they need return to breeding grounds with high precission in relation to snow and ice melt. In a joint effort with German Birdlife NABU Niedersachsen we tagged wild born LWFG in Sweden with GPRS-GPS backpacks and studied behavior on prebreeding sites of LWfG during 2014-2017. By using ACC data of one of the tags we analysed birds behaviour on the sites. We can show that LWfG use prebreeding sites as a base for scouting expeditions to breeding grounds and adapt to year specific factors. The time spent on lower altitude prebreeding sites varied significantly between years and the different factors affecting the birds behavior will be in focus.

Many of the wetland dependent bird species breeding on high altitudes in north of Sweden, including waders and ducks, also use the same sites. The presented results for LWfG and the possible implications for conservation of bird species with similar habitat need and behavior will be discussed.

IMPACT OF HUNTING AND AGRICULTURAL ACTIVITY ON GOOSE SPRING MIGRATION IN EUROPEAN RUSSIA

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Keywords: Greater White-fronted goose, spring migration, European Russia, hunting impact, impact of agricultural activity

Spring migration is a stage of the annual cycle when the maintenance of energetic reserves is critical. Therefore, geese have to make stopovers during their migration from the wintering grounds to the breeding area at places with high-energy food resources. Agricultural land and wetlands are key stopover sites for geese during spring migration. Especially, the distribution of agricultural lands plays a pivotal role in the formation of their migratory flyways.

Hunting pressure furthermore influences the choice of stopover sites. The dates of the hunting period differ in different regions of Russia. Moreover, illegal hunting has a big impact on goose behavior. As resting places geese very often choose protected areas.

We study two of the most numerous goose species migrating through the central part of European Russia, the Greater White-fronted goose and the Bean goose. More intensive agricultural activity in the regions of Chernozem resulted in the choice of protected areas as stopover sites whereas in the regions of Noncernozem the distribution of agricultural lands is more important.

We used data of satellite tracked Greater White-fronted and Bean geese to analyze the distribution of geese in different habitats. The degradation of agricultural landscapes in the last 30 years seems to have resulted in a change of the migratory routes and stopover sites. Thus, existing protected areas are no more efficient for the protection of the goose populations during migration. Geese more often choose agricultural lands close to big cities for their stopovers, where hunting pressure is high. We have also shown that during the hunting period geese move around more often and need more time for refueling.

LETHAL SCARING – BEHAVIORAL AND SHORT TERM NUMERICAL RESPONSE OF GREYLAG GOOSE ANSER ANSER

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Keywords: Birds, Geese, Crop protection, Harvest losses, Management, Preventive measures

Lethal scaring is one method used to alleviate crop damage by grazing geese. During lethal scaring, a few geese are shot to achieve a deterrent effect on other flock members. An additional aim may be to reinforce the effects of non-lethal scaring measures. As the populations of geese increase in large parts of the world, an increased need for tools within the multifaceted area of goose management has been highlighted. Lethal scaring can potentially be one method, but currently little evidence exists about the effectiveness of the method. I tested whether grazing greylag geese Anser anser show numeric and behavioral response due to lethal scaring in targeted fields, using a Before-After-Control-Impact (BACI) study design. Number of geese was counted and the flight initiation distance (FID) for an approaching person was measured – before and after lethal scaring was performed. The number of geese significantly decreased in the lethal scaring fields after the shooting (63% less) but were also reduced in numbers on the control fields (17% less). However, geese did not seem to become more afraid of an approaching person after the lethal scaring had been conducted (FID before 134 m (±15.3 S.E.) and after 149 m (±14.1 S.E.) in lethal scaring fields). In conclusion, this study shows that lethal scaring can substantially decrease the number of greylag geese in damage prone fields for at least three consecutive days, hence this method may also work as a tool to reduce crop losses.

DELINEATION OF FLYWAYS OF LIGHT-BELLIED BRENT GEESE (*Branta bernicla hrota)* IN GREAT BRITAIN AND BEYOND, WITH IMPLICATIONS FOR CONSERVATION MANAGEMENT

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Keywords: Kernel Density Analysis, flyway delineation, brent geese, conservation

The boundary between the East Atlantic (EA) and the East Canadian High Arctic (ECHA) fly-way populations of Light-bellied Brent Geese (LBBG) wintering in the British Isles has hitherho been determined through ringing data and expert judgement. Both populations are of major conservation concern, hence knowledge of this boundary is crucial in relation to their protection. We combine ringing data with a GIS based analysis of bird count data and known movements of EA geese associated with continental winter temperatures to improve flyway delineation. We find major differences in LLBG densities in Great Britain in cold versus mild winters. This in combination with ringing data enable us to define three distinct areas that represent the boundaries between the EA and ECHA in Great Britain. The east coast of England from Northumberland to Essex is occupied by the EA population; the east coast of Scotland is a contact zone; and the south, west and north coasts of Great Britain is used by ECHA birds. We also use ringing data to adjust delineation of the two flyways outside Great Britain. We compare sites with individual counts of >1% of the EA and ECHA populations with Special Protection Areas designated for LBBG in Great Britain, and find that several sites occupied by the EA population have frequently supported >1% of the population, but not designated for the geese. We recommend these should be assessed more carefully and potentially incorporated as LBBG protection areas under relevant legislative instruments in the future in order to maintain and possibly increase the EA population.

RISK ASSESSMENT OF LEAD POISONING AND PESTICIDE EXPOSURE OF THE WINTERING POPULATION OF RED-BREASTED GOOSE (*Branta ruficollis*) IN SE EUROPE

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Keywords: Red-breasted Goose, Waterfowl, Lead poisoning, Pesticides, Conservation

The Red-breasted goose *Branta ruficollis* is aglobally threatened species (IUCN Vulnerable) which has suffered severe decline in the late 1990s and early 21st century. Working on the wintering grounds on the Black Sea Coast, we address two potential causes of decline of this species for the first time: lead poisoning, and contamination from pesticides. We quantified the densities of spent Pb shot in three wetlands used by the geese in north-east Bulgaria, and analysed the Pb concentration in the faeces of red-breasted geese and the more abundant Greater White-fronted Geese *Anser albifrons*, using Al concentration as an indicator of soil ingestion. Pb shot densities in sediments were low, and we found no evidence for Pb shot ingestion in red-breasted geese. On the other hand, we found that the geese were feeding on wheat whose seeds were treated with four fungicides: thiram, tebuconazole, difenoconazole and fludioxonil, and the two first were even detected in geese faecal samples. Using data on the daily food intake, we estimated the exposure levels of the geese to these fungicides, both by measuring the concentrations remaining on seeds and by estimating the amount used to coat the seeds at the time of sowing. We found that the exposure rates estimated during the sowing period for both geese species can exceed the recognized hazardous doses for thiram, and to a lesser extent for the buconazole, which indicates that some pesticides may be playing a previously overlooked role in the decline of red-breasted geese.

DEVELOPING AN INDIVIDUAL-BASED MODEL TO SUPPORT MANAGEMENT OF WINTERING PINK-FOOTED GEESE IN BRITAIN

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Keywords: Pink-footed Goose, individual-based simulation model telemetry

We aim to develop an understanding of how the wintering Pink-footed Goose *Anser brachyrhynchus* population moves around Britain in winter, and the potential causes of cumulative mortality, by tracking a large number of individuals from multiple sites, and using the data to inform an individual-based simulation model of the population movements. The movement model can then be related to maps of wind farm and powerline locations, and literature-based estimates of avoidance rates, to estimate cumulative mortality. These in turn can be examined in the light of existing estimates of other sources of mortality, such as hunting. The estimation of collision risk posed by wind farm development for a given bird population is complex. The overall collision rate is determined by the frequency of passes through wind turbine footprints, and the proportion of these passes that result in a collision. The frequency of passes is an outcome of the frequency and location of flight-lines, the flight height, and the position of wind turbines. To estimate the cumulative mortality rate incurred by a population as a result of wind farm collision, these data need to be combined into a model that simulates bird movements across a landscape. Such models can estimate the proportional additional mortality caused by a single specific wind farm development, as well as the total population mortality caused by all windfarms in the range.

GOOSE NUMBERS AND DAMAGE LEVELS - IS THERE A RELATIONSHIP?

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Keywords: agriculture, large herbivorous birds, land use conflicts, conservation, Sweden

Populations of large herbivorous birds have increased in Europe over the last decades, resulting in increasing conflicts between conservation and farming interests. Hence, it is essential to estimate the relationship between bird numbers and damage levels for the development of future informed decisions regarding goose management. Despite its importance, there is currently a lack of studies investigating this relationship. In Sweden, damage data is available at a nationwide level as a result of a compensation scheme initiated in 1995, where damage caused by large herbivorous birds is inspected and registered. We used 16 years of data on reported damage to investigate how population size indices of these species relate to damage levels at long (over the study period) and short (inter-annual) temporal scales. At the long-term, population indices relate positively to crop damage levels for barnacle goose, greylag goose and common crane, collectively being responsible for 90% of all damage reported, but not for bean goose or whooper swan. At the short-term, no significant associations were found, presumably due to inter-annual variation of other factors such as weather, time of harvesting and management effort in different areas. By revealing these relationships at a nationwide scale, our findings provide valuable knowledge that can be used for tailored and targeted management decisions in order to mitigate the conflicts between societal interests, conservation and agriculture.

THE EFFECT OF HUMAN DISTURBANCE ON THE BEHAVIOR AND HABITAT CHOICE OF ARTIC GEESE IN LOWER SAXONY (GERMANY)

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Keywords: Barnacles geese, Greater white fronted geese, human disturbance, GPS/ACC, Flight Detection

After deep depression in the 1960th wintering geese population have recovered significantly all over Europe during the last 50 years. This increase, the changes in agricultural practice and structural transformations in the farming sector caused growing human-wildlife conflicts. Due to act of parliament Lower Saxony's ministries of agriculture and environment spends an increasing amount of money for EU co-funded agri-environmental schemes for farmers to protect wintering grounds of Arctic and Nordic geese. To reduce claimed damages caused by geese the ministry of agriculture uses management types as hunting bans and the establishment of refuge areas (Special Protection areas according to EU law). Next to this, a lot of disturbance takes place which is caused by cars, helicopters, farmers and other forms of human activity. However, the energetic effect of these types of disturbance is rather unknown. We are investigating the effect of disturbance by making use of GPS/ACC loggers that transmit their data over the GPRS network. We provided 80 Barnacle geese and 80 Greater white fronted geese with these transmitters. From the data we are able to calculate daily time budgets of behavior performed by the tagged goose as and in which kind of habitat this is performed. Because our major interest in this research is disturbed behavior we are especially interested in flight behavior. To analyze this, we included flight detection software which ensures that each flight made by the tagged goose is identified, so we are able to calculate flights per day but also the time spent in flight and the distance of each flight.

CHANGES IN GOOSE MIGRATION PATTERNS AT A WIND PARK

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Keywords: wind energy, goose migration, impact

Wetlands in the western part of Lithuania attract both large flocks of waterfowl and wind energy companies because territories with spring floods near Nemunas delta are one of most windy area in the country. This work is based on four-year monitoring data at a wind turbine park (17 turbines, 2.1MW each) which was build at partly sessional flooded grasslands, dry grasslands and arable lands close to Čiūteliai and Lankupiai villages.

The study area was important for spring goose concentrations and eight species of geese with dominance of Great White-fronted geese (95% of all geese) were recorded during surveys. Geese consisted of 77-88 % of total bird abundance.

The wind turbine park was suitable feeding habitat for waterfowl's daily visits thus, they number varied from 500 to 33.300 birds per day. More than 300.000 geese flied through the wind turbine park each spring at the average passage height of 60-80 meters. Changes in flight patterns were recorded after wind turbines park started operating but it did not influence number of passing geese. Geese avoided passing among wind turbines which are less than 500 meters from each other. However, during intense migrations geese were passing the area with much lower avoidance level. Regarding the results of carcass searches, no causalities of geese were found during 4-year period in the wind turbine park.

GOOSE AND SWAN DISTRIBUTION AND ABUNDANCE DURING SPRING MIGRATION IN THE NEMUNAS DELTA

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Keywords: Geese, Nemunas delta, stopover site, numbers

Nemunas delta is the most important territory for migrating waterfowl in Lithuania. Spring floods make a very productive feeding habitat for geese, swans and ducks. In the Nemunas delta flooded grasslands and surrounding areas like arable land are intensively used for waterfowl grazing and roosting during spring migration. In Nemunas delta region, geese stay from couple of days to several weeks. First arrive Graylag Geese (in the end of February) and the other species are present later. The last migratory geese stay by the middle of May. This presentation is based on bird count data from springs 2011 and 2012 in the territory where 12 main stopovers sites were indicated. In different sites from 1500 to 17000 geese and 250 -1300 swans were counted per day. Highest number of geese was recorded in Rupkalviai ornithological preserve and Sausgalviai village. Most abundant species was Greater White-fronted Goose (GWfG) – 95% of all geese individuals. The most abundant swan was Whooper Swan – 74% of all swans' individuals. The maximum numbers counted per one-day were 43000 Great White-fronted geese and 3700 Whooper Swans. In comparison in the 90's most abundant species was Bean Goose. The highest number of geese were recorded at the first part of April, while swans reached peak at the end of March. The high number of waterfowl using the territory indicated the importance of this place for waterfowl on migration to Northern territories.

SOME RESULTS COOPERATION BETWEEN NORWAY AND RUSSIA ON STUDIES OF THE LESSER WHITE-FRONTED GOOSE

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Keywords: Lesser White-fronted Goose, migration, satellite tracking

Lesser White-fronted Goose *Anser erythropus* (LWfG) is globally threatened, being recognized asVulnerable by the International Union for Conservation of Nature (IUCN), denoting a European species of global conservation concern. It is listed in Annex 1 of the European Council Directive on the conservation of Wild Birds (79/409/EEC, 2 April 1979), in Column A of the Action Plan under the African-Eurasian Migratory Waterbird Agreement (AEWA), and in Annex II "Strictly protected species" of the Bern Convention. It is also listed in the Red Data Book of Russian Federation as vulnerable, declining in numbers.

Surveys and tagging efforts of LWfG were carried out in the European Russian tundras in the framework of a long-term collaboration between NOF-BirdLife Norway and The Goose, Swan and Duck Study Group of Northern Eurasia (RGG). Tagging of LWfG with satellite transmitters carried out in the years 2004-2017 in different parts of Bolshezemelskaya Tundra, Russia, have brought new and important data onstop-over sites of LWfG. These data explained migration route for part of the European population of LWfG and detailed information on staging areas and wintering grounds of LWfG.

Totally, 28 adult geese have been tagged in breeding grounds throughout 13 field years.In result it was revealed that LWFG from the eastern part of European Russia follow the same rout as the geese from Taimyr and Western Siberia. They migrate mainly along the Ob' River valley, staging there for a while, and then follow to northern Kazakhstan, where there is another stop-over place.Passing the Urals from the south, the birds fly to the Manych valley and the northern-western coast of the Caspian Sea. Many of these geese stay there for short period, while some others fly to Azerbaijan and further south without stop.

Besides previously well-known stop-over sites in Northern Kazakhstan, Caspian Sea and Manych valley some new staging areas have been revealed –

Verkhne-Tobolskoye reservoir, Shalkar-Karashatau Lake and some more minor sites in Northern Kazakhstan and Red Lake near Stavropol at the Caucasus foothills.

More important data about wintering grounds has been obtained due to satellite tagging. Over 2000 LWfG winter in Aras reservoir on the border of Azerbaijan and Iran (Lampila, Eskelin, 2015). In addition, some LWfG winter in the west of Iran near the border with Iraq and in LakeVan in Turkey as well. There was no opportunity to investigate these territories so far, but 3 out of 4 tagged birds were killed there. One more finding has been made in 2016 when a bird reached the border of Uzbekistan and Turkmenistan (Talimardzhan reservoir), stayed there during the winter and then died.

Quite interesting information was obtained on molting grounds. Goose tagged in 2014came back to the breeding area in 2015. Its breeding attempt was unsuccessful and in the end of June this bird flew away from breeding area and molted in the center of Taimyr Peninsula. The distance from breeding area till molting site is 1400 km northeastwards.

Thus, our efforts have shown that geese breeding within comparative small area during the molt, migration and winter use huge territory covered the space from Taimyr to Mesopotamia.

THE SIGNIFICANCE OF LOCAL ANTHROPOGENIC EFFECTS ON THE MOVEMENTS OF WINTERING GEESE IN THE PANNONIAN REGION

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Keywords: wild goose migration, Pannonian region, anthropogenic, ecological character shifting, regional dispersion

Besides weather circumstances and food supply availability as fundamental ecological factors for the dispersion of wintering populations, little is known about local anthropogenic effects at wintering sites. In many cases, these disturbances lead to major movements between wintering sub-populations, or the permanent decrease of populations.

Here, case studies will be presented from important wild goose stopover and wintering sites of the Pannonian region that highlight local anthropogenic effects resulting in the reorganization of wintering goose populations. These effects are most commonly seen through inappropriate management (e.g. fishing or water management), tourism, poor habitat management and other anthropogenic effects such as hunting, wildlife photography and the uncontrolled use of drones and gliders.

Significant and prolonged disturbances might result in the abandonment of traditional wintering sites or their importance could be lost. Such an event was recorded at one of the most important night roosting sites of the Pannonian region, the Old Lake of Tata.

To understand the significance of different human-induced effects, extensive and frequent monitoring is needed.

THE-LONG TERM CHANGES IN MIGRATION OF CENTRAL EUROPEAN GREYLAG GEESE *ANSER ANSER*

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Keywords: *Anser anser*, migration behaviour, range shift, wintering fidelity, wintering range, stop-over sites

Global climate change can cause pronounced changes in species' migratory behaviour. Numerous recent studies have demonstrated climate-driven changes in migration distance and spring arrival date in waterbirds, but detailed studies based on long-term records of individual recapture or re-sighting events are scarce. Using re-sighting data from 430 marked individuals spanning a 60-year period (winters 1956/1957 to 2015/ 2016), we assessed patterns in migration distance and spring arrival date, wintering-site fidelity and survival in the increasing central European breeding population of Greylag Geese *Anser anser*. We demonstrate a long-term decrease in migration distance, changes in the wintering range caused by winter partial short-stopping, and the earlier arrival of geese on their breeding grounds. Greylag Geese marked on central Europe moulting grounds have not been recorded wintering in Spain since 1986 or in Tunisia and Algeria since 2004. The migration distance and spring arrival of geese indicated an effect of temperature at the breeding site and values of the NAO index. Greylag Geese migrate shorter distances and arrive earlier in milder winters. We suggest that shifts in the migratory behaviour of Central European Greylag Geese are individual temperature-dependent decisions to take advantage of wintering grounds becoming more favourable closer to their breeding grounds, allowing birds to acquire breeding territories earlier.

Moreover, we analyse effect of variable climatic conditions and local population density in aim to assess temporal and spatial changes in use of individual staging sites in both Northwest/Southwest Europe flyway and the Central Europe/North Africa flyways.

LIFETIME REPRODUCTIVE SUCCESS OF GREYLAG GEESE (*ANSER ANSER)* BREEDING IN SOUTH SWEDEN

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Key words: *Anser anser*, Lifetime reproductive success, population dynamics, recruitment, survival

During 1984–2009, 664 adults and 1,944 goslings of Greylag Geese *Anser anser* were neck-banded in a study area in southwest Sweden. The marking program was initiated to study the birds' migration patterns, but over the years, various aspects of their breeding ecology and population dynamics were also investigated, including their lifetime reproduction. Of those marked as goslings 71% survived the first year), 52% reached at least 3 years old and the oldest bird recorded was aged o25 years. About 50% were recruited to the breeding population at three years of age, but some birds were not seen with small young until much older. Of 1,187 geese that survived for at least two years, 25% produced at least one brood of small young, and 18% produced at least one fledged young. The maximum number of broods with fledged young produced by an individual during its known lifetime was nine, but 50% of the geese known to have bred successfully produced only one brood of fledged young. Ten percent of the geese seen with small goslings produced 47% of all fledged young. The maximum number of fledged young for a Greylag of known age was 32, but two geese marked as adults followed for 16 and 17 years respectively, produced 40 fledglings each.

BRENT GEESE FUELLING IN THE MIDST OF PLENTY: DEPARTURE RESERVES PERSIST AS FITNESS CORRELATE

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Keywords: GPS/ACC-tracking, migration, pasture, reproduction, saltmarsh.

In brent geese (*Branta b. bernicla*), breeding success depends on the amount of body reserve acquired prior to migration, which is thought to increase with access to food at the fuelling site. Here we studied how fuelling on agricultural pasture or natural saltmarsh affected time budgets, migratory timing and reproductive success. We made a comparison of fueling rates based on a combination of high-resolution GPS-tracking, acceleration-based behavioural classification, thermoregulation modelling, and measurements of food digestibility and excretion rates. On pastures, geese experienced higher harvest rates, similar or superior food quality, and reduced competition compared to saltmarsh. As a result, brent geese using pastures advanced their fuelling and migration schedules compared to those using saltmarsh. On pastures, geese loafed extensively and took frequent digestion pauses, suggesting that traditional time constraints on harvest and fuelling rates are absent on modern-day fertilized grasslands. Nonetheless, a mark-resighting analysis revealed that departure weight of geese from pastures is still correlated with recruitment success. The persistence of this correlation after a prolonged stopover with access to abundant high-quality food, is a paradox. It may suggests that between-individual differences in departure condition are not so much enforced by food quality and availability during stopover, but reflect some aspects of individual quality.

LONG-DISTANCE AND LOCAL MOVEMENTS OF GREYLAG GEESE IN PRESENT-DAY AGRICULTURAL LANDSCAPES

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Keywords: *Anser anser*, GPS transmitters, migration distance and timing, neck collar

Recent changes in environmental conditions together with increasing goose populations have completely changed the ballgame for geese in Europe. To better understand their current distribution and foraging patterns, this project will explore how geese utilize the agricultural landscape, with focus on their movements, field selection and foraging patterns. We fitted 199 Greylag geese with neck-collars and 64 with GPS transmitters at 5 locations in Sweden. The tagged geese will be used for studying movement patterns at a field-to-field level. However, the GPS transmitters also deliver data that can be used together with re-sightnings of neck-collared geese to unravel large-scale movement patterns of the Swedish Greylag goose population. Preliminary results from GPS positions received June--November 2017 indicate a varation in migration patterns and wintering grounds, depending on the origin of the geese. Geese breeding and molting in the southern parts of Sweden seem to migrate shorter distances, and have spent most of their time during the autumn months in Denmark, or in the southernmost parts of Sweden, while the geese marked farther north migrated earlier and moved longer distances, with the majority spending the autumn in Germany and the Netherlands.

THE IMPACT OF GRAZING BY WINTERING GEESE ON CROP YIELDS IN BULGARIAN DOBRUDZHA AND ITS RELEVANCE TO AGRI -ENVIRONMENTAL SCHEMES

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Keywords: Red-breasted Goose, White-fronted Goose, Wheat, Agriculture, Crop yield impact, Compensation scheme

Geese are widely perceived to damage agricultural crops, leading to economic losses and subsequent conflict between farmers and conservationists. However the extent of damage has been shown to be varying in wide ranges from almost no deductible impact to yield losses over 50%. Therefore it is difficult to base and imply similar yield losses values in a little or not well studied area like Bulgarian Dobrudzha. The area is known for its huge wintering concentrations of geese that in recent years have peaked up to 50,000 Red-breasted Geese (*Branta ruficollis*) and over 200,000 Greater White-fronted Geese (*Anser albifrons*). The wintering geese feed exclusively on winter wheat, but the losses so far have been poorly known with contradictory results (Hulea, 2000; Dereliev, 2002). We set up a two ye ars crop exclosures experiment to manipulate grazing impact and used droppings counts to measure the goose grazing intensity. Crop yield on the first year of the study showed no detectable impact of the geese grazing, while in the second year of the experiment a 13,2% yield loss was registered. A negative relationship was found between grazing intensity and crop yield based mostly on the lower stem density in the heavily grazed plots. We used this relationship to infer total yield loss and calculate the loss impact for the study territory. The results of the study were incorporated in a newly designed agri-environmental scheme in Bulgaria as part of the National Rural Development Program for the period 2015-2020. However generality of these reults remain uncertain due to the variation of the factors that might influence the grazing intensity and its impact on crops in relation to the weather, stage of crops etc.

BENEFITS AND DISADVANTAGES OF PROTECTED NESTING: CASE OF GEESE-PEREGRINE INTERACTION IN RUSSIAN ARCTIC

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Keywords: Geese-Peregrine interactions, breeding ecology, Greater White-Fronted Goose, Lesser White-Fronted Goose, Red-Breasted Goose

Breeding under protection of Peregrine Falcon or other avian predators is known for most of goose species in Russian Arctic. Our study area covers Erkuta river basin on Southern Yamal (68.13N, 69.09E) where four goose species are breeding. There are 20 known Peregrine territories in the study area covering ca. 250 km^2. Extensive goose nests search performed in 2016-2017, while occasionally they were registered since 1999. Absolute majority of goose nests were found in close vicinity of Peregrine nests.

Greater White-Fronted Goose is the most common species within study area. In 2016 most of the nests (9 of 12) were found close to Peregrine nests, as well as all three nests in 2017. The main problem for nests close to falcons was nest parasitism. In 2016 at least in 3 of 9 nests we find dumped eggs, in 2017 egg dumping registered for 2 of 3 nests. Clutch size in such nests can be 10-15 eggs, what could lead to problems with incubation.

Lesser White-Fronted Goose breeds only close to peregrine nests upstream Erkuta. First nest was found in 2006. Breeding LWFG were recorded also in 2012 and 2014-2016 with maximum 7 nests a year (2016). In 2017 no any nests were found possibly as an effect of very late season and absence of some Peregrine pairs.

Bean Goose is the rarest species of the area. In 2016 we found single nest of Bean Goose close to Peregrine nest with probably mixed clutch with Lesser White-Fronted Goose.

All four regularly occupied nesting sites of Red-Breasted Goose in the study area are close to Peregrine nests. Only once we found a RBG nest as far as 2 km from the nearest breeding Peregrine.

SPRING STOPOVER OF THE GREATER WHITE-FRONTED GOOSE *ANSER ALBIFRONS ALBIFRONS* IN THE BIEBRZA BASIN (NORTH-EASTERN POLAND)

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Key words: Greater White-fronted Goose, spring staging, spring migration, neckband, stopover duration

Stopover is a very important stage of bird migration due to the necessity of refueling energy stores. For the Greater White-fronted Goose *Anser albifrons albifrons* migrating in spring, one of the most important stopover sites in Europe is the Biebrza Basin in north-eastern Poland. The aim of our study was to determine the effects of selected factors on the stopover duration of geese in this area. During the field studies we collected 635 resightings of neck-banded individuals. The data were analysed using the Cormack-Jolly-Seber and Pradel models to estimate the total stopover duration. Stopover duration of adults was shorter than that of immatures and it decreased during the progress of the season. The mean stopover length of both sexes did not differ. Stopover duration of males was constant throughout the season, while for females it decreased, contrary to the expectations of pair members migrating together. The main factor seeming to influence the stopover duration was the oncoming breeding season and greater time constraint to reach the breeding grounds.

PARTICIPATION OF GEESE, WINTERING IN THE UKRAINE, IN THE CIRCULATION OF AVIAN INFLUENZA VIRUSES

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Keywords: geese, Ukraine, influenza viruses

In November-March 2010-2015 in the south of Ukraine, the 148 samples of biological material was taken from excrements from 16700 individuals of *Anser albifrons* and 25 samples from 2575 individuals of *Rufibrenta ruficollis*.

During the laboratory virological study of samples for the period 2010-2015 the hemagglutinating isolates belonging to the influenza virus subtypes H6N1, H9N2, were isolated only in *Anser albifrons*. In addition, 2 paramyxoviruses were found: PMV-1 and PMV-7. Influenza viruses are isolated from birds in Askania-Nova (12 isolates), on the coast of the Sivash lagoon (9). Materials of 2016-2017 are still in the process of laboratory treatment. Surprisingly, no isolates were received from such a numerous species in the years of research as *Rufibrenta ruficollis*. At migratory and wintering stopovers, this bird is often recorded in joint gatherings with *Anser albifrons*, but unlike the latter, it is not a carrier of arboviruses.

Our research gives grounds to predict the probability of appearance of new strains of viruses which may infect other wild and domestic birds.

OVERLAP OF ELECTRICITY GRID AND GEESE STAGING AREAS IN LITHUANIA

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Keywords: high voltage electricity grid, geese staging areas, impact

Some wetlands in various parts of Lithuania attract large flocks of migratory geese due to suitable feeding and roosting conditions for birds. However, in certain sites, those areas are also densely depicted by the high voltage electricity lines grids. This overlapping shows the sensitivity of these places in terms of higher risk of geese collision with the overhead electricity lines wires.

Data was collected in 2014 – 2017 by the Lithuanian Ornithological Society (LOS) and its partners. The data on the high voltage overhead electricity line grid was presented by the national operator AB LITGRID.

The level of the potential risk of collisions with the electricity wires was evaluated basing on the abundance of the migratory geese, which used certain areas around the high voltage electricity overhead lines for feeding.

Six areas were identified as places of potential high risk for Greater White-fronted and Bean geese, eight places of medium risk and eleven as low risk areas. All mentioned areas were used for feeding only, while roosting night staging areas were indentified in the surroundings and geese were passing through the areas of the overhead electricity lines location when flying from night staging to feeding sites. Thus, the risk of collission with the wires was evaluated as possible risk for migratory geese.

So far no practical field studies on the number of such collisions were performed. However, LOS data identified the areas where special monitoring observations should be conducted. The periods for such monitoring fieldwork were identified for each potential risky site.

ADDRESSING THE DECLINE IN THE NW EUROPEAN BEWICK'S SWAN POPULATION: A REVIEW OF PROGRESS TO DATE

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Keywords**:** *Cygnus columbianus bewickii*, productivity, population trends, International Species Action Plan, survival, threats.

Following a 38% decline in the NW European Bewick's Swan population, from 29,277 birds in 1995 to 18,057 by 2010, an International Single Species Action Plan with the overall goal of halting the decline and returning the population to at least 23,000 was adopted by African-Eurasian Waterbird Agreement (AEWA) in 2012. Key actions within the Plan included: 1) determining demographic reasons for the decline, 2) assessing potential population interchange, and 3) identifying and addressing threats to productivity and survival. Here we review the results of recent analyses of long-term datasets (including age assessments and re-sightings of marked individuals) and shorter-term studies, to describe current thinking on potential reasons for population trends recorded over several decades. There was no significant change found from the 1980s onwards in the percentage of juveniles within the population or the mean brood sizes recorded. Survival was higher in the 1970s to 1980s (a period of population growth) than in the 1990s–2010s, but the main decrease in survival was later than the onset of the population decline. Tracking studies have indicated that at least some of the swans wintering on the Evros Delta in Greece (where numbers have increased markedly during the 21st century) follow the migration route of the Caspian Bewick's Swan population. Threats to survival and breeding success considered in the analyses include weather conditions at different times of year, population density, food supply during winter and predator levels.

TRACKING SWANS AND GEESE IN RELATION TO WIND FARM SITES

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Keywords**:** *Branta leucopsis*, cumulative effect, *Cygnus columbianus bewickii*, *Cygnus cygnus*, offshore, terrestrial.

Serial wind farm development along migration routes is an important consideration in determining potential cumulative effects on avian populations. Tracking swan and goose migration therefore was undertaken by WWT to inform the UK Government's Strategic Environmental Assessment (SEA) programme for offshore wind farm development. Of 20 Whooper Swans tagged in NW England and 15 in SE England, 39% and 21.5% respectively crossed at least 3 wind farm sites during migration from Britain to Iceland. Moreover, flight lines for 81% of 26 tagged Barnacle Geese tracked from SW Scotland to Svalbard passed across at least one proposed/operational wind farm during migration, with 50% of tracks crossing sites in Britain and 60% crossing sites in Norway. Forty-five offshore wind farm footprints (including 11 operational sites) were crossed by 22 Bewick's Swans fitted wi th UHF-GSM-GPS data loggers, of which 33 (63%) were in German waters, 12 (23%) Dutch, four (8%) British, two (4%) Belgian and one (2%) in Sweden. Moreover, 15 swans with detailed (at least hourly) location data encountered (i.e. tracks were <80m from turbines) 322 onshore wind turbines. The study illustrates the importance of considering both offshore and onshore wind farms in cumulative impact assessments. International communication and sound data on wind farm development in range states are crucial if strategic and project-specific assessments are to determine cumulative effects precisely.

ASSESSMENT OF GOOSE HUNTING DISTURBANCE TO WATERBIRDS IN WETLANDS: IMPLICATION FOR BUFFER ZONE EXTENT

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Keywords: Shooting disturbance, waterfowl management, behaviour, noise

In Denmark it has been decided to move forward the start of the hunting season for Greylag Goose (*Anser anser*) from 1 September to 1 August (starting in 2018), but on the condition that shooting does not cause disturbance to waterbirds in wetlands. Hence, it has been proposed only to allow shooting in agricultural fields with a buffer zone to wetlands, where shooting is not allowed. However, the extent of buffer zones needed in relation to shotgun shooting is poorly documented. We experimentally simulated goose shooting at various distances to wetlands and observed the behavioural reaction by waterbirds (primarily ducks, geese, waders). We hypothesized that the behavioural response would increase with noise level, length of exposure to shooting and flight initiation distance by the species as a measure of its vulnerability to disturbance. Because noise propagation is highly dependent on meteorological conditions, we conducted field experiments under various weather conditions. In this presentation, we present the results of the field study and discuss the implications for design of buffer zones.

TAIGA BEAN GOOSE IN WESTERN SIBERIA (YAMALO - NENETSKY AUTONOMOUS OKRUG)

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Keywords: Taiga Bean Goose, Western Siberia, migration.

Work was carried out in 2014-2017. In Yamal TBG nests on the taiga rugged rivers. According 1997-2010 estimates the number of nesting birds dropped from several thousand birds to - 800-3000 individuals and breeding range was reduced. According our aerial autumn and spring surveys only 933 TBG were registered. In 2015-2017 nesting in the 11 sites was confirmed. The relative density of nesting pairs is low and varies from 0.01 to 0.04 per km of river, the size of broods is 3.9 chicks. The record of the Taiga bean goose outside the taiga zone on the Gydan peninsula indicates that non-breeding birds migrate to molting in the tundra zone. The data from 7 birds tagged in 2016-2017 shows that the important stopovers are in the Xinjiang Uyghur (China), to the territory bordering the Kazakhstan. TBG from Yamal has no important stopover sites in Russia. Thus, it is necessary to concentrate conservation efforts in the nesting areas. Priority measures are the closure of the spring hunt on bean geese, and the opening of the autumn hunt not earlier than September 5. It is necessary to expand the guard zones of the Pyakolsky Reserve and the Verkhne-Tazovsky State reserve by creating a cluster on the Khudosey river. Also we need to include the Taiga bean goose in the Red data book and as a special protection objects of the Kunovatsky Reserve and prevent the construction of oil and gas complex facilities in the water protection zone of the tributaries of the Taz River in its middle reaches.

WILD BIRDS AS CARRIERS OF ANTIMICROBIAL RESISTANT BACTERIA

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Keywords: waterfowl, gulls, bacteria, antimicrobials

Migratory birds are investigated as potential carriers of antimicrobial resistant bacteria that can be spread globally. The aim of this study was to investigate the carriage of multi-resistant bacteria in waterfowl and gulls. Faecal samples from gulls, swans, geese and ducks (n=416) were collected on parks, riverbanks, grasslands and municipal dumps in Lithuania. *Staphylococcus* and *Escherichia coli* were selected for testing. Minimal inhibitory concentrations were determined and interpretation of the results was based on EUCAST clinical breakpoints. Isolates resistant to at least 3 antimicrobial classes were treated as multi-resistant. Staphylococci were isolated from 176 samples (42.3%) from which 64 samples were from waterfowl. Fifty seven isolates out of 176 were multi-resistant however, only 3 isolates were from waterfowl while the rest of the samples were from gulls. *Escherichia coli* were isolated from 142 samples (34.1%) from which 44 isolates (31%) were treated as multi-resistant. The majority of multi-resistant isolates (40 out of 44) were from gulls and only 4 isolates were from waterfowl. The isolates demonstrated resistance to beta-lactams, sulphonamides and tetracyclines most frequently.

According to the data obtained it may be outlined that wild birds are carriers of antimicrobial-resistant bacteria but the highest prevalence are demonstrated in gulls that feed on dumps. Nevertheless, antimicrobial resistant bacteria may easily spread through water and infect other hosts including waterfowl.

The study was funded by grant (SIT-6/2015) from the Research Council of Lithuania.

CAN PINK-FOOTED GEESE (*Anser brachyrhynchus*) ADAPT TO CLIMATE CHANGE BY COLONIZING NEWLY AVAILABLE BREEDING AREAS ON SVALBARD?

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Keywords: arctic amplification, phenological mismatch, genetic differentiation, migration, personality, energy budgets, time budgets, GPS tracking, satellite imaging.

In the Arctic, the climate has warmed more rapidly than in temperate regions. As a result, migratory Arctic-breeding birds have become phenologically mismatched with their food in the breeding areas. On the other hand, rising temperatures have caused new areas to become snow-free early in the season. These areas have a later growing season and by colonizing these areas birds may regain a match with their food. Both processes need to be studied to be able to predict how populations of Arctic breeding birds will respond to further climate change. On Svalbard, Pink-footed Geese traditionally nest in the west, but are now invading new areas the east, where the growing season starts later. We aim to see (1) if the birds in the east arrive and breed later, but earlier after the local snowmelt and relative to the local food peak, than birds in the west; (2) if in the east bigger broods are raised, and in better body condition; (3) if birds from the east and west are genetically differentiated, which may be expected because of the male dispersal, strong female philopatry, and socially learned migration in this species; (4) if and where the migratory routes and timing differ between birds from both areas; (5) if personalities of birds from both areas differ, i.e. aggression and exploration; and (6) if and when year-round time and energy budgets differ between birds from both areas. The main approach is tracking female geese with GPS collars. This poster summarises the plans for a PhD.

WILD GEESE IN A PUBLIC BATH IN FRANKFURT A M MAIN/GERMANY

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Keywords: Egyptian goose, urban wildlife, public bath, damage, unwanted animals, nuisance animals, wildlife management, hunting

Measurement against wild geese in a public bath in Frankfurt am Main, Germany. Up to one hundred geese including Greylag, Canadian and Egyptian geese, went feeding on the lawn of one of Europe biggest public open air bathes. After two years of non-lethal measurement nothing helped but hunting. The paper tells the history of the measurements. Hunting will continue during winter and Hesse state where Frankfurt in located has the order to develop a German-wide concept to manage Egyptian geese according to the EU invasive species listing. This project will be considered in the process. The results should be deployed to other public bathes and others cities as well.

EFFECTS OF DIFFERENT MANAGEMENT REGIMES AT A SPRING STAGING SITE FOR BARNACLE GEESE – TOWARDS SATISFYING GEESE OR FARMERS – OR BOTH?

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Keywords: barnacle goose, staging site, goose management regimes

Annual monitoring has been carried out at a spring staging site for barnacle geese on the coast of Norway since the late 1980s.

Goose distribution and numbers staging in the study area have varied dependent upon local agricultural management and goose management regimes. In the first years of the study (1989-1995), barnacle geese fed largely undisturbed on most of the study fields in the evenings (during daytime they were mostly either feeding or roosting in coastal areas – on saltmarshes or small islands).

Between 1996 and 2007 the two main goose islands within the study area (Tenna and Sør-Herøy) were divided into refuge and scaring zones. Virtually all of the agricultural fields were within the scaring zone, whereas the refuge zones were almost exclusively saltmarshes and small islands, some of these islands being grazed by livestock during summer. Round-the-clock scaring in this period resulted in the geese moving to a new neighbouring island (Nord-Herøy) to feed. Round the clock scaring took place within the scaring zones, and goose flocks were chased until they settled in refuge areas.

From 2008 until the present a new scheme was in place, where farmers can opt to receive management payments to tolerate barnacle geese on their land. Participation in the scheme is voluntary, and the payments made are calculated from goose counts, and paid according to a three-tier system, of high, medium and low goose grazing intensity. Those that are not part of the scheme either scare geese from their own land or accept that they feed on their land.

As scaring is less intense today then the geese no longer use the island of Nord-Herøy which was important to them during years of intense scaring. This shows that Nord-Herøy was used as an overspill area during periods of intense scaring. At one farm on Sør-Herøy scaring is in act more intense now than previously, and this has resulted in geese moving to the neighbouring island of

Tenna where scaring is minimal. These cases illustrate how geese can adapt to changes in management regimes and utilize those areas that are set aside for them.

The effects of these different management regimes have been assessed both in terms of the effects on goose numbers and distribution, as well as a general attempt to assess how the farmers feel (as expressed by anecdotal accounts in the field). Our assessment indicates that the best situation for the geese is to be allowed to feed undisturbed, whereas how the various farmers feel about the use of various different regimes is very individual. From the farmer's point of view, some have always been "goose-friendly", whereas at the other end of the scale some have been staunchly "anti-goose". The attitude of each individual farmer is a determinant as to whether any goose regime, or a change in a current regime, is likely to succeed or not.

ANSERIFORMES OF THE SOUTHWESTERN PART OF WESTERN SIBERIA

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Keyword: Western Siberia, Omsk, forest-steppe, urbanization, biological diversity

At the end of the one before last century forest-steppe near fortress Omsk had the features of civilization throughout big nature area in the form of rare villages and telegraph-poles (Seebohm, 1878). The places for marsh and hunting wetlands began right off the city; the places for goose hunting were situated in 20-30 versts' distance from them. They caught different anseriformes: Whooper Swan, Greylag Goose, Mallard, European Wigeon, Aythya sp., Common Goldeneye, Smew, Northern Shoveller, Northern Pintail and Gadwall. Hunting on them started not earlier than on the 15th of July, and continued practically all the year round, stopping just at the period from the middle of April until the end of June. They shot goose and ducks from time to time in spring (Melnikov, 1887). Every day they got nearly 10 000 swan skins near Tukalinsk settlement (140 km north to Omsk) in 1876-79 (Finsh, Brehm, 1882). Along the road West to Omsk a lot of ducks and swans on all lakes and rivers were observed (Finsh, 1877). In the sixties of the 19th century a two hours' hunting near city brought anseriformes so as one couldn't shoot during the week at the end of the eighties of the same century. Even then it was insisted that Omsk locations would become “desert” in 1880, if strong measures concerning wilderness protection didn't assume (Melnikov, 1887). One hundred years have passed, and the situation concerning anseriformes became only worse, though many of them began adapting to man's influence.

Our observations biodiversity of anseriformes of forest-steppe and steppe of near Irtysh region and Omsk since 1973 up to the present moment. For description of species' distribution the ball scale of birds’ abundance per 1km^2, suggested by A.P. Kuzyakin, is accepted (1962). Currently Omsk area is 494 square kilometers and the population is 1 138 000.

We established next influence of citizens of Omsk and environs on abundance of Anseriformes: Greylag Gooseв nested on lakes near Omsk in the end of XIX century. In this time it had big flocks during migration in autumn (Sotnikov, 1892). Nowadays this species is very in the nesting period.

Common Shelduck is rare in environs of Omsk (Sotnikov, 1892). Now is very rare in the nesting period. Mallard is rare in environs of Omsk. It is less than Gadwall (Sotnikov, 1892). It is very rare in the nesting period. We counted it more in city Omsk on floodplain lowland bogs and on floodplain of left-bank of Irtysh River – Natural Reserve "Birds harbor". Green-winged Teal is common species in environs of Omsk (Sotnikov, 1892). Now is very rare in the nesting period. Gadwall was marked more than Mallard. Now is very rare.

European Wigeon is a common species in environs of Omsk (Slovcov, 1881; Sotnikov, 1892). Now is rare nesting species. Northern Pintail was marked rare near Omsk (Slovcov, 1881). Now is very rare species. Garganey was marked more than other ducks in environs of Omsk in the previous century (Kots, 1910). Now is common in the nesting period. Northern Shoveller was common river duck (Slovcov, 1881; Sotnikov, 1892; Morozov, 1898a,б; Kots, 1910). Now is rare nesting species. Common Pochard was common species. Now is very rare in the nesting period.Tufted Duck was marked by large flocks on lakes (Slovcov, 1892; Sotnokov, 1892). Now is very rare in the nesting period.

During the observation period the following facts are carried out - forest-steppe of near Irtysh region is common for nesting of Mallard, Garganey, Common Pochard, Tufted Duck. These species of birds successfully bear anthropogenous ecosystem transformation. This fact follows statement of many authors that in the 20th century Mallard has become a synanthropic species (Urbanized…, 1994, Avilova, 2001, Avilova et al, 2003). Nesting Mallard is noticed in all 13 cities of Volga region and Ural region of Russia where the adequate researches were carried out (Birds…, 2001). Green-winged Teal, Gadwall, Northern Pintail and Northern Shoveller are rarer but also nest and probably are in the process of synurbanization. Mute Swan, Whooper Swan (hunting on them is forbidden), Greylag Goose, Common Shelduck, European Wigeon are rare and avoid such units. White-fronted Goose, Lesser White-fronted Goose, Red-breasted Goose (hunting is forbidden), Velvet Scoter, Long-tailed Duck, Common Goldeneye, Goosander are found just during migration periods. During all the time the earlier mentioned birds in the publications (Pallas, 1786; Finsch, 1879; Slovcov, 1881; Stepanov, 1886; Sotnicov, 1892; Morozov, 1898; Shuhov, 1925, 1928, 1930; Johansen, 1959; Gingazov, Milovidov, 1977; Milovidov, Shevirnogov, 1977) are not marked: Bewick's Swan, Bean Goose, Brent Goose, Falcated Teal, Red-crested Pochard, Ferruginous Duck, Greater Scaup, Smew, Red-breasted Merganser and White-headed Duck.

STATUS OF EMPEROR GOOSE IN RUSSIA

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Keywords: Emperor goose, breeding Russia, Chukotka, Kamchatka

Emperor goose – endemic of the remote Beringia is one of the least studied goose in the world. It is slowest growing in numbers goose species in North America and population dynamics is still not well understood. Half of species range is in Russia but no overview papers for Russian part of the range were published for 40 years. Our ornithological surveys in Chukotka and Kamchatka in 2000-17 provided new data. Emperor geese were discovered to breed much further South than it was through before and increasing in numbers at several of their breeding and molting grounds in both North and South Chukotka. Scattered breeding of the species is covering most of lowland coasts of Chukotka and overall importance of Chukotka for breeding of Emperors is higher. Wintering of Emperors along western rocky coasts of Kamchatka were never evaluated and might be higher than it was believed until now. As majority of US breeding Emperor geese occasionally visiting Russia for molting the chance of potential transmission of Avian Flu is higher than for other Alaska geese. Late departing Chukotka in autumn (November) and early arrival of Emperors from Alaska in spring mean some birds are not included in sampling for population estimates by US FWS. So overall population might be higher than it is believed. Species is fully protected in Russia but intensive illegal hunting by indigenous people is happening at Chukotka peninsula and norther coasts. Which might be the limiting factor for the population. Legal hunting and egg collecting opened in Alaska in 2017 may be additive to ongoing hunting and slow down and even reverse species population rise. Cooperative project with indigenous communities in Chukotka are needed to address illegal hunting. Coordination on both sides of Bering Strait would help to better understand and manage Emperor goose populations.The abstract should summarize the content of the paper.

USE OF GPS TAGS TO DESCRIBE THE MIGRATION ROUTES, STOP-OVER SITES, BREEDING AND MOULTING AREAS OF TAIGA BEAN GEESE *ANSER FABALIS FABALIS* WINTERING IN NE JUTLAND, DENMARK

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Keywords: telemetry, Taiga Bean Goose, migration, wintering, breeding, staging, moult

The western Taiga Bean Goose *Anser fabalis fabalis* (hereafter TBG) is one of the few currently declining European goose populations, having fallen from 100,000 in the mid-1990s to 45,000 by 2015. These declines and contractions in wintering range have focused conservation attention on the status of this population, culminating in the drafting of an African Eurasian Waterbird Agreement International Single Species Action Plan (AEWA ISSAP).

Denmark is an important overwintering area for TBG, mostly concentrated at 5 major sites in northern Jutland and distributed between a few regularly used sites in SE Denmark (in southern Zealand, Lolland and Falster). In Northeast Jutland a small, apparently discrete flock of around 2,300 individuals overwinter in Lille Vildmose, Nørreådalen and at Tjele Langsø.

Here we present the results from telemetry studies and neck-collar marking of birds at Lille Vildmose, which enable the mapping of their annual migratory routes as an important contribution to the future monitoring of the population within the context of the AEWA ISSAP. Such information has enabled the identification of the previously unknown breeding, staging and moulting areas used by these geese. In addition, the study has allowed us to assess the extent to which the flock at Lille Vildmose overlaps with other TBG populations.

DO YOU LIKE SURPRISES? THE BEWICK'S SWAN IS A TRUE GLOBETROTTER!

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Keywords: Bewick's Swan, migration flyway, conservation

Large waterfowl migration flyways are reputed well known in the Palearctic system. Concomitantly it is generally considered that birds nesting in one area are connected to one wintering area. What we have discovered with the Bewick's Swans nesting in Yamal peninsula, Russia, breaks the codes!

The remote tracking (30 g GPS-GSM tags) of 18 individuals tagged in Baidarata Bay during the period 2015-2017 showed not less than 3 discrete – new - flyways leading to 4 different wintering zones spreaded on 8.300 km ranging from 26° W to 116° E. The western flyway connects Yamal to the eastern Mediterranean and gives the first evidence on the breeding origin of the flock having most unexpectedly colonized the Evros Delta, Greece, since the late 90's. The same route was used to connect with the Volga Delta in northern Caspian Sea. The second flyway takes a south bearing straight to Central Asia. Bewick's Swans from Yamal are wintering in desert area in Turkmenistan and Uzbekistan. A most surprising evidence! The third route is not less astonishing. Several Bewick's Swans originating from Yamal fly 11.000 km SSE to reach the Poyang Lake, China. It was previously thought that the thousands of Bewick's Swans wintering in the Yangtze area were originating from the eastern parts of Siberia.

The consequences of these new findings are important i) to study the process of colonizing the Evros Delta, ii) to participate to the understanding of the factors causing the dramatic decline observed in the population wintering in the southern North Sea, iii) to help to monitor the trend of the flocks wintering in China, iv) last but not least to give new light on the potential transport by wild bids of avian influenza viruses from SE Asia to Western Europe.

It is also worth mentioning that one of the tracked swans has already changed wintering area, shifting from Central Asia to Eastern China from one year to another. The Bewick's Swan is a true globetrotter!

BREEDING OF BARNACLE GOOSE (*BRANTA LEUCOPSIS*) IN THE TEMPERATE ZONE OF NORTH -WEST OF RUSSIA. EXPANSION IS IN PROGRESS.

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Keywords: The Gulf of Finland, Baltic Sea, population growth, Barnacle Goose, *Branta leucopsis.*

The number of migrating Arctic-breeding Barnacle Geese (*Branta leucopsis*) began to increase in the eastern part of the Gulf of Finland in the late 1980s. In 1990s, this species became a mass migrant in the area. First nest of Barnacle Goose was found on Dolgy Reef Island on the northern coast of the Gulf of Finland by the Russian-Finnish border in 1995 (Gaginskaya et al., 1997). By 2006 the size of the breeding population of this species on the rocky islets and skerries at northern coast of the Gulf of Finland had increased to 31 pairs. Several dozens of non–breeding individuals were observed there as well. An explosive growth in the number of nesting Barnacle Geese was observed in 2014–2015 in the eastern part of the Gulf of Finland; 40 nests were found in 2014, 76 nests - in 2015, 75 nests – in 2016. In 2010 Barnacle Geese started to breed on large lakes located to the east of the Baltic Sea. The first nesting of two pairs of this species on Ladoga Lake was recorded on the rocky islands of the Valaam Archipelago in 2010; in 2013 five pairs were nesting here (Agafonova et al., 2016). In 2015 the first nesting was recorded on the similar habitat on the Kizhi Archipelago on Onega Lake (Khokhlova and Artemiev, 2015). The growth of nesting population is less significant in the temperate zone of North-West of Russia than in the western areas of the Baltic Sea and the North Sea due to scarcity of feeding areas in brood rearing period.

A COMPARISON OF MIGRATION STRATEGY BETWEEN THREE POPULATIONS OF GRE ATER WHITE-FRONTED GOOSE USING GPS SATELLITE TRACKING

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Keywords: Migration strategy, Greater White-fronted Goose, GPS satellite tracking

Migration is a common phenomenon across many animal taxa. Greater white-fronted goose(GWFG) is a large waterfowl species with a holarctic breeding distribution. Understanding the migration ecology of different population is fundamental in predicting the population trends and making protection strategy. The recent development of satellite tracking devices and application in migration of bird allows us to view the exactly migration timing and routes of individuals. We tracked some GWFGs in different wintering sites and then compared the migration routes and timing among three populations in Palaearctic region. We found that three populations show various migration strategy.

STATUS AND TRENDS IN WINTERING BAR -HEADED GEESE IN MYANMAR

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Keywords: Bar-headed Goose, Myanmar, wintering habitat, population decline

Bar-headed Geese are wintering in Myanmar at several sites. Most prominent are the river and floodplains of the Ayeyarwaddy River in the Central drylands of the country as well as the Kaladan River in the northern Rakhine state. This charismatic goose species is intrinsically linked with these two rivers. Every winter these geese are migrating from the Himalayan Plateau, Northern China and Mongolia to Myanmar, where they are roosting predominantly on the river channel itself and feeding in the fields nearby. The numbers in geese along the Ayeyarwaddy River has steadily declined since 2001 and might be today as low as 20% or more of its previous population levels. Recent figures of the Kaladan population are not complete but the data from selected sites reveal a similar decline of about 80%. Reasons for the decline are discussed. The protection of selected river stretches as Ramsar sites or Biosphere Reserves is proposed.

TECHNOLOGICAL DEVELOPMENT OF TELEMETRY TOOLS EXPANDS OPPORTUNITIES FOR GEESE RESEARCH – DEVELOPER'S PERSPECTIVE

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Keywords: telemetry, tracking, GPS, GSM, sensors, geofence

Telemetry is an already established tool for geese investigations, which continues developing thanks to technological advances. Today's transmitters allow logging hundreds of GPS positions per day and many more additional sensor records. GPS positions can be logged at up to 1 second intervals and sensor data at up to 50 Hz. Ample collected data are automatically uploaded via GSM telecommunication network, which is also used to communicate with the transmitters, send commands and change settings. To facilitate transfer of particularly large volumes of data, more efficient 3G mode of GSM communication is now available. Sophisticated transmitter software enables focusing data collection for periods and areas that are most relevant for the study questions. It is possible to collect data at different intervals in different geographic regions using geofence feature. Automatic flight detection permits data collection specifically during the flight. Sensor data of tri-axial accelerometer and tri-axial magnetometer can be recorded at independent schedules from GPS position logging and allow classification of bird bahaviors and calculation of activity budgets. Furthermore, transmitters can be set to automatically adjust duty cycles responding to the available power, thus preventing from rapid battery depletion. All these fatures together allow balancing data collection with available power and maximizing transmitter performance to focus on specific research needs.

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NOTES

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