GOOSE BULLETIN

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

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

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Editorial

In the preface of his book "The geese of Europe and Asia" from 1905 Alphéraky wrote:

"To many it may seem strange or even improbable that such large, conspicuous, and familiar birds as geese should hitherto have been imperfectly studied and some of the forms confounded with one another, not only by sportsmen, but by many ornithologists; but that this is an indubitable fact is, I think, fully demonstrated in the present volume.
After finishing the description of the geese of the Palaearctic region, I could not help feeling greatly disappointed. Having undertaken the task in the hope that I should be able to give as full information about each separate species as I had furnished for the ducks in my *Utki Rossii*, I became convinced that I had not succeeded in my attempt.
In spite of the comparatively large amount of material which passed through my hands, and despite the diligence with which I studied almost the whole of the sporting and scientific literature concerning these birds, I found so many defects in our knowledge and so many questions left open that I cannot regard the present work otherwise than as preparatory to future investigation, and not as a complete monograph."

In the 1990's members of the Goose Specialists Group tried again to collect all goose knowledge of their time and to close knowledge gaps. The results of their efforts were compiled in the book "Goose populations of the Western Palearctic". And again it showed that many knowledge gaps remained und new knowledge gaps were recognised. For that reason the members of the Goose Secialist Group surely never will run out of interesting items to study!

For that reason the GOOSE BULLETIN never will run out of mansucripts, but the editorial board only can produce a GOOSE BULLETIN issue as long as you actually do send material and manuscripts!

The next issue of the GOOSE BULLETIN is planned to appear in May 2017, which means that material for this issue should have reached the editor-in-chief not later than the 31st of March 2017.....but earlier submission is, of course, always permitted, if not actively encouraged!

The Editorial Board

17th meeting of the Goose Specialist Group 2015 in Salekhard, Russia.

Petr M. Glazov[1] & Barwolt S. Ebbinge[2]

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The 17th conference of the Goose Specialist Group of the IUCN-Species Survival Commission and Wetlands International was held jointly with the Russian Goose, Swan and Duck Study Group of Northern Eurasia from 30 November to 6 December 2015 in Salekhard, Yamalo-Nenets Autonomous Okrug (YaNAO), Russia.

Programme

The meeting was devoted to research, conservation and sustainable use of waterfowl in northern Eurasia, and was attended by 92 participants from 15 different countries, viz. Belgium (1), Canada (1), China (1), Finland (4), France (1), Germany (2), India (1), Japan (2), Kazakhstan (2), Netherlands (7), Russia (62), Ukraine (1), South Korea (3), United Kingdom (3), USA (1).

Participants of 17th conference of the Goose Specialist Group in government conference hall. (photo: M. Ivanov).

Before the meeting, a seminar on management and control of waterfowl hunting was attended by 45 local YaNAO game managers and hunters. Eighty oral presentations were given on the four conference days (1-4 December), during 13 sessions and three round-table-sessions. An abstract book was presented before the conference and is available online: http://onlinereg.ru/Salekhard2015/Salekhard2015_abstracts.pdf
All papers will be published in the Russian journal *Casarca*.

Topics included the impact of hunting, surveying techniques using small aircraft, catching and marking techniques, determining migratory pathways using transmitters, breeding biology, interbreeding among waterfowl species (phylogenetic analysis of true geese (*Anser*)), climate change, impact on waterbirds of economic development in northern Russia (gas & oil) and intraspecific nest parasitism.
Among the new results were the extent of inter-breeding between established species, which provided new insights on the concept of species, and shed new light on the current discussion between Norwegian and Swedish researchers about whether the newly introduced Lesser White-fronted Geese in Swedish Lapland are of a genuine nature.

Even more spectacular was the finding that three of the 23 moulting Bewick's Swans marked by Sofia Rozenfeld and Didier Vangeluwe in Yamal migrated to Poyang Lake, in the Yangzte River Basin in China (two birds) and one in the Evros Delta in Greece, where increasing numbers of Bewick's Swans are wintering. There was a particular focus on the Taiga Bean Goose, for which there are still knowledge gaps regarding the status and migration routes for birds breeding in Russia and which continues to decrease in numbers throughout much of its range.

Organizing Committee opening the 17th conference of the Goose Specialist Group (photo: M. Ivanov)

Acknowledgements and recommendations

Participants of the Conference noted with satisfaction that the Conference was held in a friendly and constructive spirit, and featured presentations that touched on many relevant questions of the study, conservation and sustainable use of waterfowl. Results of active discussion of the presentations are of great importance for the further advancement toward the resolutions of these questions in Russia and the development of efficient international cooperation.

Participants of the Conference express thanks to the Goose, Swan, and Duck Study Group of Northern Eurasia (GSDSG) and other co-organizers and sponsors of the Conference, as well, they especially noted the support and hospitality of the leadership of the Yamalo-Nenets Autonomous Okrug.

Participants of the Conference considered it necessary to set out the considerations and recommendations mentioned below as the Conference resolution.

The many discussions were synthesized into a valuable set of recommendations, and the Conference Resolution is now available online: http://onlinereg.ru/salekhard2015/resolution_eng.pdf.

Change of guards

At the end of the meeting, Dr. Barwolt S. Ebbinge, who led the group for 16 consecutive meetings between 1998 (Bulgaria) and 2014 (China) after being elected as chairman in 1996 in the UK stepped down as Chair of the Goose Specialist Goose and passed this task on to Mr. Petr M. Glazov (Institute of Geography of the Russian Academy of Sciences in Moscow) who will now lead the group.
This was the fourth meeting in Asia (1999 Japan, 2008 India, 2014 China, 2016 Russia (Western Siberia) and it was noted how rewarding it is to see how the gaps in our knowledge are now increasing being filled as Korean, Japanese and Chinese colleagues have joined and contribute to the workings of our group.

Excursions
During the conference, participants made an excursion to Obdorsky ostrog, one of the earliest settlements to be founded in Siberia. Salekhard was founded as a Cossack fortress in 1595, and was originally called Obdorsk. The display about Obdorsky ostrog provides visitors with a lot of information about the history of Salekhard.
Modern Salekhard is one of the most interesting and dynamic developing cities of the Russian North. Fish canning and saw-milling reflect the regional economy, as does its function as a base for the northern gas fields of western Siberia. Salekhard is situated on the Ob River at the Arctic Circle on the main flyway of migratory waterfowl from the breeding areas in Western Siberia to their wintering grounds in the south along the Black Sea and Europe.

A post-conference excursion was organized to the winter tundra where participants were able to take part in the "Yamal Olympic Games", the traditional Nenets winter games: Reindeer riding, Archery, Throwing tynzyan (belt lasso), Running hunting skis, Raw-hide tent installation, Jumping over the sledge and taking hot tea in a traditional Nenets house – Chum.

"Yamal Olympic Games" in the tundra (photo: V. Yakovlev)

The 17th meeting of the GSG was supported financially by the Russian Foundation for Basic Research (RFBR), by the gas company "Gazprom Dobycha Urengoy", by the YaNAO government and by UNDP/GEF Minprirody of Russia.

The next meeting of the Goose Specialist Group

The 18th meeting of the GSG will be will be held in Klaipeda, Lithuania from 27-30 March 2018 and will be hosted by the Klaipeda University and Lithuanian Ornithological Society, and will include a field visit to the Nemunas River floodplain.

Nowadays the Nemunas River delta is the most important staging area for geese on migration from Western Europe towards the Russian Arctic. Annually the site is visited by 1-1.5 million geese (Greater White-fronted, Bean, Greylag and Barnacle Geese). During peak migration, 50,000-75,000 geese concentrate in the area, predominantly Greater White-fronted Geese.

White-fronted geese in the Nemunas River delta (photo: P. Glazov)

The Organizing Committee of the 18th conference has created a special website with information on the conference http://apc.ku.lt/geese/

More information about this meeting will be made available at http://www.geese.org/gsg/.

Wintering Pink-footed Geese *Anser brachyrhynchus* in the coastal polders of Flanders (Belgium) during 2015/2016: persistent trends in habitat use.

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Introduction

Winter 2015/16 was the 57th season we collected detailed data on the numbers, distribution and habitat use of Arctic geese wintering in the eastern part of the Flemish coastal polders (called 'Oostkustpolders'). The field work is organised with the cooperation of many volunteers in seven teams. During each mid-monthly count and for almost every single flock of geese, the habitat they occurred was noted, which enabled an analysis of feeding preferences.

The occurrence of Pink-footed Geese *Anser brachyrhynchus* in Belgium in 2015/16 confirmed ongoing trends in numbers and habitat use that are reported in this paper. Generating systematic long-term time series such as these observations contribute to a better understanding of the factors affecting population regulation, especially with regard to the possible effects of global warming (KUIJKEN et al 2006, DEVOS & KUIJKEN 2012). Our counts are integrated in the International Species Management Plan for the Svalbard population of the Pink-footed Goose, coordinated the African-Eurasian Waterbird Agreement AEWA (MADSEN & WILLIAMS 2012).

Numbers

The within season abundance of Pink-footed Geese during 2015/16 are based on six mid-monthly counts (October - March), the annual 'Pink-pop count' of 1/11/15 and one extra survey at the end of December (28/12/15) (Fig. 1). The first birds arrived in small numbers quite early (26/09/15), but the flow did not continue, with *c.*1,500 individuals by mid-October and 5,842 by 1/11/15.

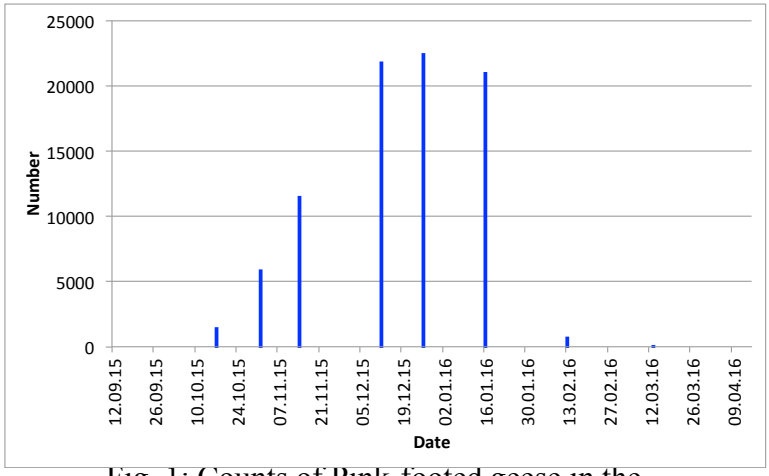

Fig. 1: Counts of Pink-footed geese in the Oostkustpolders, 2015/16

Subsequent mid-November and mid-December numbers did not reach normal levels of recent years. The very low winter-maximum of only 22,390 Pinkfeet was reached on 26/12/15, the traditional peak period. During 2015/16, the numbers remained above 20,000 from mid-December to mid-January.

Extremely mild temperatures during November and December 2015/16 probably induced very early departures of Pinkfeet to the north, with records of some neck ringed birds seen in Flanders that returned into Denmark even before January 1st. However, a cold week in mid-January caused some delay in the spring departure with quite large numbers staying until early February.

Age counts from October until early November found 18.6 % juveniles (sample size ca. 1,800 birds). This is well above the average for the entire population (13.8 %, MADSEN et al. 2016), indicating that families with juveniles tended to migrate further south than failed breeders or immature subadult birds.

Trends 2001-2016

The annual peak numbers of Pinkfeet wintering in Belgium, has averaged *c.* 35,000 since 2001, but has showed a decreasing trend during the last decade (Fig. 2). This is likely the result of more birds staying in Denmark all winter. Netherlands (Friesland) numbers have also remained very low (pers. comm. F. COTTAAR, MADSEN et al. 2016). The percentage of the (growing) total Svalbard population wintering in Belgium was on average *c.* 60% from 2001 onwards and *c.* 50% during the last decade. For 2015/16 this figure declined to just below 30% (Fig.2), probably reflecting the mild winter weather conditions and the trend of increasing numbers of Pinkfeet wintering in Denmark.

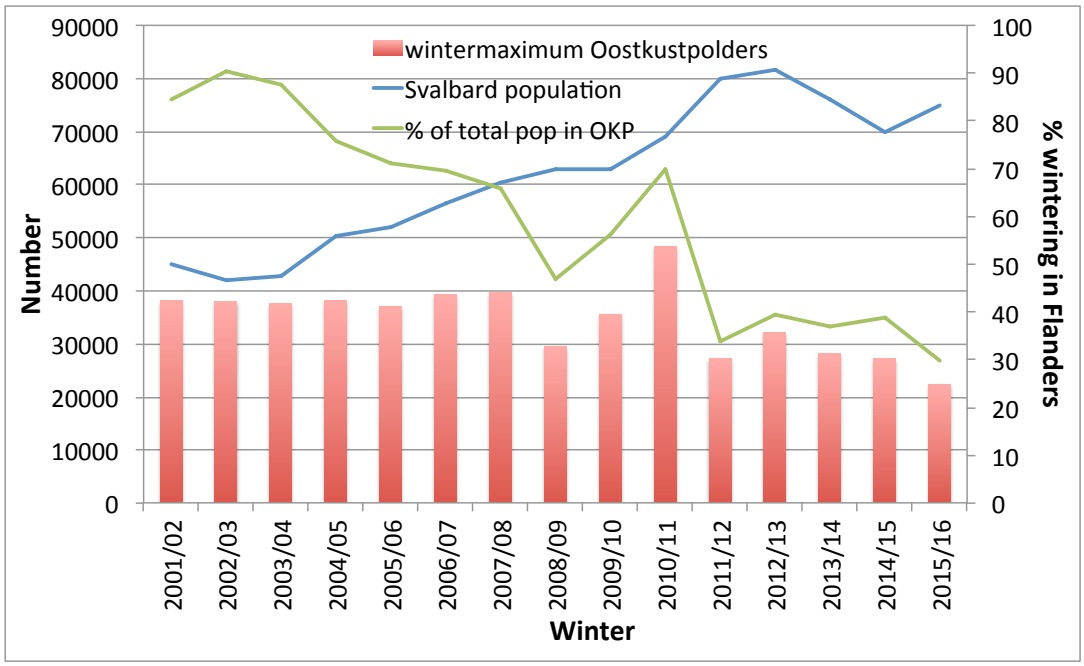

Fig. 2 Development of Pinkfeet numbers wintering in Flanders (Oostkustpolders), compared to the increasing Svalbard population (data from MADSEN et al. 2016, AEWA)

Despite these lower numbers, the Oostkustpolders are still of vital importance as a 'safe harbour' for the Pinkfoot population, especially during cold seasons (as illustrated by the peak count in 2010/11, see Fig. 2). It is important to remember that a national shooting ban on Arctic geese has existed for Belgium since 1981.

Distribution

The distribution of Pinkfeet wintering in Belgium has remained fairly constant and traditionally has been limited to the Oostkustpolders. This site-fidelity is in contrast to the more mobile White-fronted Geese *Anser albifrons* that use several wintering areas all over Flanders (KUIJKEN & VERSCHEURE 2007, 2008). Only exceptionally are small flocks of Pinkfeet observed outside the Oostkustpolders, notably in the IJzer valley, where increasing numbers of Whitefronts overwinter (DEVOS & KUIJKEN 2012). In this area, a flock of 260 birds including two neck-ringed individuals stayed for some days in November 2015, but a new tradition for regular wintering has not yet developed (pers. comm. K. DEVOS).

Outside the coastal polders, observations of Pinkfeet are casual and limited to single birds or families. During winter 2015/16, the Natuurpunt website 'http://waarnemingen.be' received 970 records of Pink-footed Geese (on average 275 birds), of which 69 observations (on average only three birds) were outside the province of West-Vlaanderen.

All over the traditional wintering range of the Oostkustpolders, the Pink-footed Geese are quite mobile. This is partly due to their daily rhythm, as they like to find more remote and quiet corners to rest, compared with active feeding which often takes place close to roads and farms which is in part due to the long-lasting shooting ban (KUIJKEN 2010). However the agricultural activities of crop harvesting and caring for livestock in the open are gradually lasting longer due to increased mild weather in early winter, notably in the last decade. Until late in December this can cause considerable disturbance, as does the active scaring employed by some farmers. Increased bird watching and recreational hiking does not cause pressure on the tranquillity of the goose areas so far.

Changes in habitat use continue

Since 1991, we have observed striking changes in habitat use by Pinkfeet in the Oostkustpolders (KUIJKEN et al 2006, KUIJKEN & VERSCHEURE 2007, KUIJKEN 2010). In the early 1990s, almost 100% of the geese fed on permanent (mostly grazed) grassland, but gradually foraging on arable land with different crop leftovers or wasted harvests (e.g; wet and frozen potatoes) has become more common (Fig. 3).

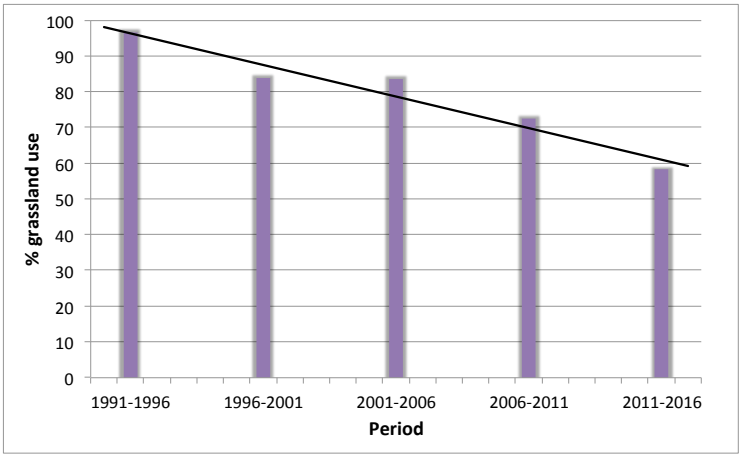

Fig 3. Trend of decreasing grassland use by Pinkfeet in the Oostkustpolders (25 years)

During 2015/16, the majority of Pinkfeet were still observed on permanent grasslands (59.9%). Maize stubble, winter wheat and potato leftovers were used by 14.0%, 8.1% and 8.1% of the Pinkfeet, respectively. Other crops and bare ploughed land were of minor importance. It is important to note that the use of cultivated land parcels is rather temporary until most food items are depleted (mid-December). The occurrence on freshly sown winter wheat is mainly the result of remaining fragments of former crops (mostly sugar beet and potato) that are still visible at the surface after ploughing. Harvested maize and potato fields became a very attractive 'junk food' for all species of geese in recent years. However, feeding on crops and ploughed land needs the presence of nearby meadows, depressions and ponds, so the geese can undertake frequent exchange flights for drinking, preaning, etc. The preservation of the original grasslands with micro relief is an evident priority in nature conservation, but a real concern in view of further industrializing agriculture.

We examined land use data related to farming are based upon the annual agricultural survey published by the Federal Government of Economy, General Direction of Statistics.

Overviews of the area occupied by different crops are available for Belgium, for the Flemish Region or for the Provinces. Detailed figures for separate municipalities are less complete over the years. We used the regional data for the Flemish region, showing the same trends as in the coastal province of West-Vlaanderen.

There has been an increase in the area of maize and potato fields over the last 25 years (Fig.4). The significant trends coincided with the further shrinkage in the area of remaining permanent grasslands (Fig. 4).

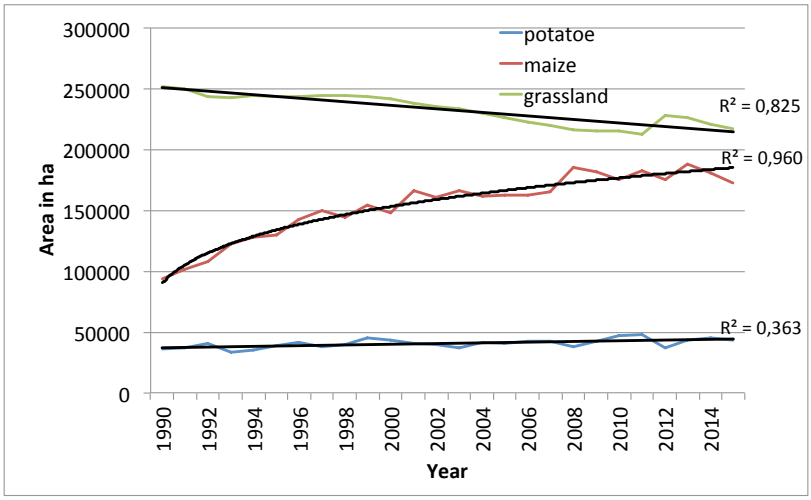

Fig. 4. Significant trends in areas of grassland, potato and maize crops (in ha) for the Flemish region, 1990-2015; (data from the Federal Government of Economics; http://statbel.fgov.be)

For wintering geese, but also for meadow birds and biodiversity in general, this intensifying agriculture has mostly adverse consequen-ces. In the coastal polder area larger complexes of grasslands with high nature value were designated under Natura 2000 (KUIJKEN 2010). Most of these SPAs are the traditional wintering grounds for geese, but despite the protective status some grasslands were converted into arable land.

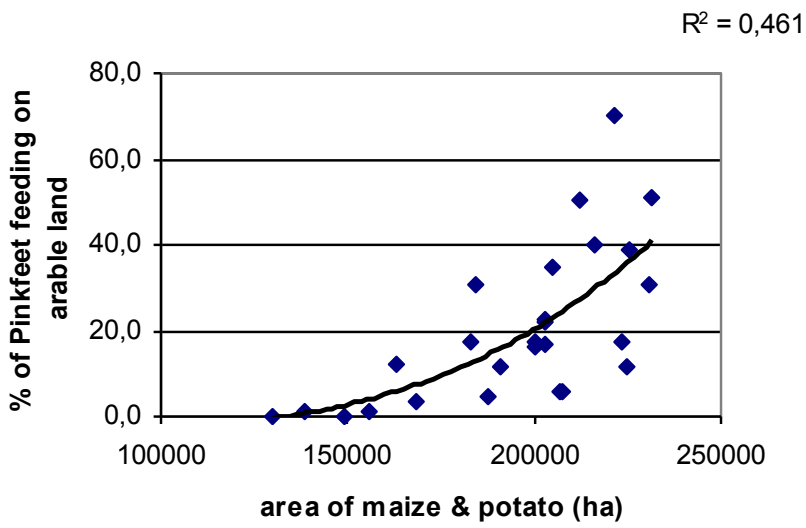

Fig. 5 Percentage of Pinkfoot feeding on arable land (Oostkustpolders) related to the area of maize and potato crops in Flanders (1990-2015)

The decreasing trend in grassland extent (Fig.3) and the growing preference for harvest leftovers by feeding Pinkfeet (and also White-fronted geese) seem to be a response to the agricultural changes in Flanders (Fig. 4). There is a significant relation between the availability of maize and potatoes and the presence of feeding Pinkfeet on arable land (Fig. 5).

The consequence of this behavioural change is reflected in the distribution of the geese within the Oostkustpolders.

A representtative area of the wintering grounds has been designated as SPAs under the EU Bird and Habitat Directives (*c.* 13.500 ha in Natura 2000), with mainly large complexes of permanent grasslands.

Pinkfeet in the Oostkustpolders on traditional grasslands

However, in the last decades an important area of these grasslands has been transformed by drainage and ploughing into cultivated land, even within Natura 2000 areas (KUIJKEN 2010).

Combined with the new preference for some crops, although mostly temporary in early winter, the presence of geese within the SPAs is gradually decreasing. During 2015/16, fewer than half of the Pinkfeet were counted outside the Natura 2000 areas (43.2%); this figure used to exceed 75% or more in the 1990s.

Some grassland restoration initiatives for 200-300 ha are ongoing with EU-LIFE support, as well as from compensation schemes of lost Natura 2000 area by motorway construction or harbour expansion, etc. This programme is included as the action for Flanders in the International Species Management Plan for the Pink-footed Goose under the African-Eurasian Waterbird Agreement (AEWA) (MADSEN & WILLIAMS, 2012, MADSEN et al. 2016).

Pinkfeet in the Oostkustpolders on maize (left) and potatoes (right)

Summary

Winter 2015/16 was characterised by relatively low numbers of Pinkfeet wintering in Belgium, coinciding with an extremely mild first half of the winter. The percentage of the Svalbard population wintering in the Oostkustpolders in Flanders is still decreasing and dropped under 30%, mostly as a result of increased wintering in Denmark which may be related to global warming.

Trends during the most recent decades on changing habitat use show a shift from grassland use to foraging on harvest remainders of mainly potato and maize and continued during winter 2015/16. This behavioural response seems to be due to an increase in the area of growing crops and a decrease in the area of grasslands. As a matter of concern, grassland restoration projects are currently ongoing in the coastal polders.

Acknowledgments
The authors wish to thank the enthusiastic cooperation and support of many skilled volunteers during decades for their indispensable help in achieving the annual simultaneous mid-monthly counts.

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NATUURPUNT; website http://waarnemingen.be

The results of autumn counts of Lesser White-fronted Goose and other geese species in the Ob valley and White-sea-Baltic flyway in September 2015

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Introduction

In recent years, a significant body of data on the numbers and status of Lesser White-fronted Goose *Anser erythropus* populations has been obtained during spring and autumn goose migration periods in the Dvuobie, bounded by the Yamalo-Nenetski Autonomous District (YaNAD) and Khanty-Mansiiski Autonomous District (KhMAD, or Yugra), as well as in the Yamal Peninsula (ROZENFELD & STRELNIKOV 2011; ROZENFELD 2014; ROSENFELD et al. 2015). At the same time, our knowledge of the state of other populations of Lesser White-fronted Goose including those in Fennoscandia, Western Russia and particularly in the Nenets Autonomous District remains highly insufficient. We here present a brief review of the available data at present.

Nesting

Recent publications cite two nesting sites for the Lesser White-fronted Goose on the tundra west of the Pechora River delta: 1) in the upper reaches of the Neruta River; and 2) in the Velt River basin on the Malozemelskaya Tundra. There are also reliable records of nesting Lesser White-fronted Geese from Bilshezemelskaya Tundra (Nenets Automonous District NAD, Arkhangelsk Province) on the Padimeityvis River (MINEEV & MINEEV 2013). These authors estimated the population density in the Padimeityvis River basin at 0.2 individuals per square kilometer (MINEEV & MINEEV 2014). In addition, the same researchers (MINEEV & MINEEV 2011) supposed that Lesser White-fronted Geese could nest in Vorkuta District (Komi Republic), on the Seida River, which runs along the NAD boundary in its middle reaches. In this area, the authors had seen single individuals, pairs and groups of Lesser White-fronted Geese, sometimes in flocks of Bean Geese *Anser fabalis*. Some Lesser White-fronted Geese were also seen to exhibiting nesting behaviour. The habitats where the birds had been encountered were those typically preferred by Lesser White-fronted Geese for nesting. The density of Lesser White-fronted Goose populations in those tundra habitats was reported to be 0.2 individuals per square kilometer on the Seida River itself and 2.1 individuals per square kilometer on the streams surrounding the main watercourse of the Seida River (MINEEV & MINEEV 2011).

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In the east of Bilshezemelskaya Tundra, Lesser White-fronted Geese breed in the upper reaches of the Bolshaya Rogovaya River and the middle reaches of the Khey-Yakhi River (MOROZOV 2006). There, the abundance of Lesser White-fronted Geese is rather low, and some sites where the species used to nest in large numbers in the past no longer exist (MOROZOV 1995; MOROZOV & SYROYECHKOVSKI, 2002). There are no data relating to nesting Lesser White-fronted Geese from the Kanin Peninsula in the past 50 years.

Spring migration

In the past, Lesser White-fronted Geese were observed in many parts of the Nenets Autonomous District during spring migration. Based on data obtained by A.YA. MOSKVIN, Lesser White-fronted Geese occur during their spring migration on the Barents Sea coast around Kolokolovaya Bay and in the lower reaches of the Neruta River (MINEEV & MINEEV 2009). In spring, some Lesser White-fronted Geese have been recorded flying along the Barents Sea coast in the even more distant past, near the Strait of Senegei (MINEEV 1986).

Autumn migration

In contrast to spring observations, the autumn migration of Lesser White-fronted Geese is almost unstudied in the territory of NAD. One place where Lesser White-fronted Geese are known to regularly rest during their autumn migration is at the confluence of the Shoina and Torna Rivers. Satellite imagery showed that similar habitats exist in the southeast of the Kanin Peninsula and in the coastal area of the Malozemelskaya Tundra (LITVIN 2014). Some summer records of non-breeding Lesser White-fronted Goose have been reported from marshes at Lake Toravey and on Dolgi Island (MOROZOV 2006).

Fifteen years ago, MOROZOV & SYROYECHKOVSKI (2002) estimated 500–700 Lesser White-fronted Geese before the breeding season and 500–1,000 individuals in autumn in tundra areas between the Kanin Peninsula and the Polar Urals in the territory of NAD (MOROZOV 2006).

Fig. 1. Layout of the routes and the surveyed area

Materials, methods and the survey period

The autumn counts were conducted on 7–29 September 2015 using an A-27 ultra-light hydroplane to survey the Dvuobie as well as the coastal areas of the Kara, Barents and White Seas (Fig. 1).

The total length of our count routes was 12,400 km. This was the first time that such an extensive bird count had been undertaken using an ultra-light aircraft within the Russian part of the range of the western population of Lesser White-fronted Geese.

All the birds were counted within a 2 km strip off the aircraft (1 km on each side) at a height of 30-50 m. The routes were plotted according to the requirement that the distance between them should be more than 2 km. For more precise number estimations and detailed assessment of the specific composition of the flocks, photographs were taken with a 7D *Canon* camera equipped with a 100–400 mm. lens. If the number of birds in a group exceeded 100 individuals, a series of photographs of different parts of the group were taken and the proportion of various species and young-to-adult ratio estimated. These data were then extrapolated to the entire group. To ensure reliable photograph geo-tagging, the time settings in the camera and in the GPS navigator had been synchronized beforehand. The photographs were then linked to their respective tracks using *GEOSETTER* (open source software). In total, we analyzed 11,549 photographs.

All GIS layers used for analytical work were created in *MapInfo* format (scale 1:100,000).

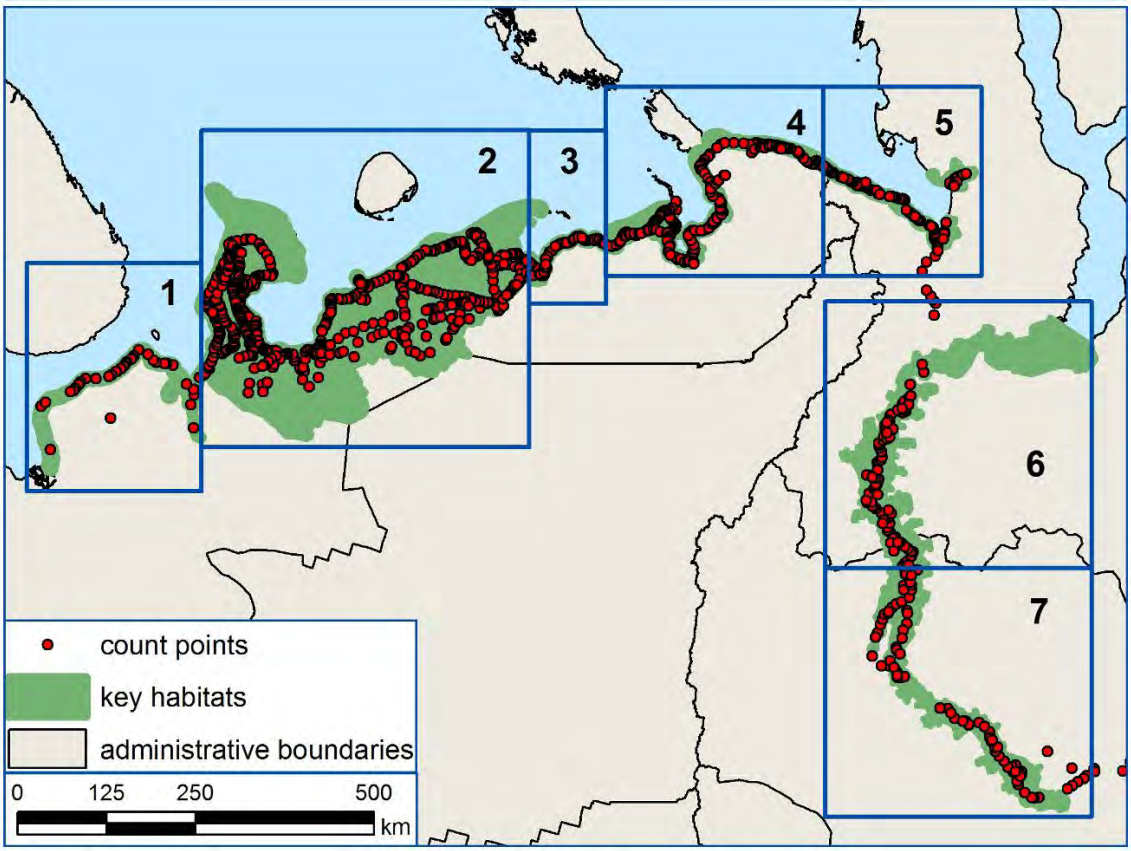

Fig. 2. Distribution of waterfowl on the habitat map of the surveyed area (small-scale overview). Red dotes shows the distribution of geese

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Estimations of the total numbers

We consider all quantitative count data to represent minimal numbers of birds present. The location of encountered birds (on the ground, on water, or in mid-air) was ignored in this analysis. We took the number of birds counted along each route as individual samples and assessed the population number in the region based on the sum of samples weighed relative to the lengths of the routes.

To assess the degree of underestimation associated with this method and to choose an appropriate method for extrapolation, it was necessary to take in consideration the mosaic structure of the landscape in the surveyed territory, the areas of the biotopes suitable for waterfowl, as well as the density of each species in each delineated biotope. To solve this problem we used a landscape map made from satellite image interpretation. The landscape map was created on the basis of freely accessed *Landsat* satellite images. A total of 45 *Landsat-8* images (2013–2014) and 17 *Landsat-5* images (2009–2011) were used to cover the entire territory.

The analysis of satellite images and class delineation was first carried out using the automatic neural-network classification method (with teaching) in *ScanEx IMAGE Processor* software. Additional processing and refinement of the obtained vector layers and the area counts was made using *Quantum GIS* software. For primary classification of biotope we also used the Landscape map of the USSR 1: 2,500,000 (1980), and Legend to Landscape map of the USSR (1987).

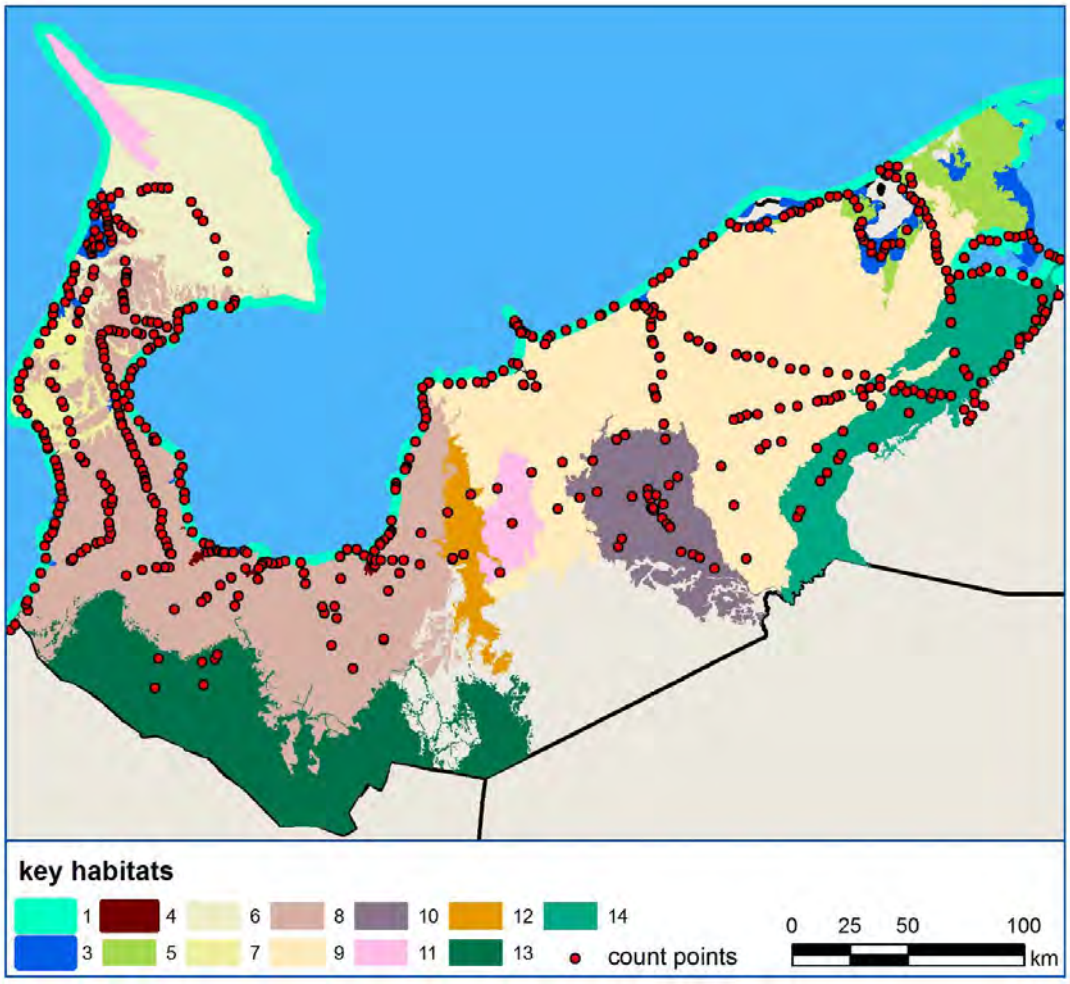
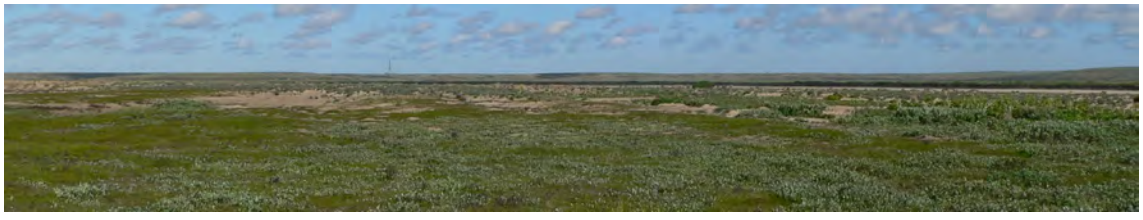


Fig. 3. Distribution of waterfowl on the habitat map of the surveyed area (close-up of part 2). For a description of each habitat type see text.

As a result, we created a landscape map of the study area within which we delineated 17 habitat types. We then overlaid all the points where geese had been encountered upon the map catgories (Figs. 2-3). The final total area over which our quantitative data could be extrapolated was 9,150,674 hectares.

Description of the key habitats

1. Coastal zone 500 m in width (from coastal line inland). The zone was delineated to include any shore habitats adjacent to the sea excluding marshes (3), and river estuaries (4). This habitat was considered as a key one for all the migratory birds, being the main land corridor within which most waterfowl migrate. It was also used for bird total number calculations to separately assess the parameter of migration intensity. Total area: 1 298 km^2.
2. The floodplain of the Mezen River (to the mouth of the Peza River inland) covered with grass-sedge meadows (inundated or otherwise), patches of small-leaved mixed forests, or, less frequently, spruce forests and stands of willow and alder on banks. Total area: 205.3 km^2.
3. Intertidal coastal plains (i.e. flooded during high-water periods), with a large number of river meanders, streams, kettle holes and lakes; covered with halophytic marshy meadows dominated by grasses and sedges, or with tundras of dwarf shrubs and grasses or, otherwise, with cotton-grass bogs. These habitats also include adjacent marine littoral zones. Total area: 3 376.8 km^2.
4. Estuaries or river outlets with halophytic grass-sedge meadows, combined with adjacent lowland bogs dominated by grasses and green mosses. Total area: 460.2 km^2.
5. Transitional bogs and lowland bogs with hummocky microrelief and small shallow hollows; dominated by sedges, cotton grasses and mosses. Total area: 3 602.4 km^2.
6. Flat and undulating, terraced, partly bogged plains with small hills and ridges, numerous thermokarst kettles and lakes, frost-heavings and polygons; covered with different types of tundra formed by dwarf birches or willows, dwarf heather shrubs, grasses, sedges and mosses. Total area: 6 542.7 km^2.
7. Undulating plains with small hills and ridges, karst lakes, thermokarst lakes or residual lakes; covered with different types of birch or willow tundras combined with various types of humpy or ridgy bogs formed by small birches and willows, grasses and dwarf heather shrubs, sometimes with minor lakes. In the south of the study area this landscape type includes open woodlands and low forests formed by birch and spruce. Total area: 1 315.8 km^2.
8. Upland bogs and transitional bogs of tussocky or hummock-ridge structure (including complex aapa-type bogs), sometimes with small lakes (primarily of thermokarst origin); dominated by grasses, sedges, cotton grasses dwarf heather shrubs, mosses (including *Sphagnum* species), and lichens. Combined with tundras formed by dwarf birches or willows, dwarf heather shrubs, grasses, sedges and mosses. In river floodplains there are more species rich grass-sedge meadows, lowland grassy or mossy bogs and open woodlands formed by pine, spruce and birch. Total area: 14 675.3 km^2.



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9. Undulating and flat plains with scattered hills and ridges, thermokarst kettles and lakes, frost-heave and polygons; covered with tundras dominatd by dwarf birches or willows, dwarf heather shrubs, grasses, sedges and mosses in combination with various bog types including upland bogs, transitional bogs and lowland bogs, all with smoothed or hummocky microrelief, ridges, hollows and small lakes; dominated by grasses, sedges, cotton grasses dwarf heather shrubs, mosses (including *Sphagnum* species in hollows). In the southern part of the study territory there are low isolated stands of spruce and birch. Total area: 17 705.5 km^2.
10. Upland bogs and transitional bogs of tussocky or hummock-ridge structure (including complex aapa-type bogs) sometimes with small lakes (mostly of thermokarst origin); overgrown with grasses, sedges, cotton grasses dwarf heather shrubs mosses (including *Sphagnum* species in hollows), and lichens. Combined with patches of tundras formed by dwarf or small willows and birches dwarf heather shrubs, and mosses. There are also isolated low stands of birch-spruce forests around lakes Korgovoye, Bolshoye, Srednee, Nizhnee, Urdyuzhskoye, Tyrabeito as well as patches of floodplain with wet diverse grass-sedge meadows, minor small-leaved stands, spruce stands or mixed stands; sandy banks are overgrown with willow and/or alder. Total area: 3 518.0 km^2.
11. Plains with ridges, hills, rocky outcrops, cliffs and outliers; dominated by tundras formed of dwarf birches or willows, dwarf heather shrubs, mosses and lichens, with grassy/mossy bogs and patches of open woodlands formed by birch. Total area: 1 013.8 km^2.
12. Flat plains with thermokarst lakes; mostly covered by low spruce-birch forest or open woodlands of birch or/and spruce. This complex landscape also includes tundras dominated by small birches or willows, dwarf shrubs, grasses and mosses or grassy/mossy bogs. Total area: 1 206.9 km^2.
13. Lowland bogs and transitional bogs of tussocky or hummock-ridge structure (including complex aapa-type bogs) sometimes with small lakes, in particular, of thermokarst origin; formed by grasses, sedges, cotton grasses dwarf heather shrubs mosses (including *Sphagnum* species), and lichens; combined with birch-spruce forests or larch forest with the undergrowth formed of dwarf shrubs, mosses and lochens. Total area: 7 615.6 km^2.
14. Floodplain of the Pechora River (in limits of Nenets Autonomous District), with ridges and lowlands with numerous river arms and oxbows and lakes; covered with diverse grass-sedge meadows, grassy or mossy bogs, patches of small-leaved or mixed forests; more rarely with spruce forests, interrupted by willow-alder stands on sandy banks. Total area: 4 545.2 km^2.
15. The watercourse of the Ob River, with numerous tributaries and lakes in the floodplain; becomes visible only in periods when the water level is at its lowest. Total area: 4 425.7 km^2.
16. The most elevated parts of the Ob River floodplain with elevated banks, small and rare bogs; overgrown with willow or willow-alder forests often with a large proportion of birch, or otherwise, with pine-larch forests and spruce-birch forests. Total area: 6 695.8 km^2.
17. Regularly flooded part of the Ob River floodplain, extensively bogged, with muddy and sandy banks; covered with halophytic diverse grass-sedge meadows often dominated also by bent grasses or rushes, sometimes with patches of shrubby willow stands. Total area: 17 956.8 km^2.

Calculation of bird densities and estimated numbers of species

We calculated the densities of bird species in different habitats as well as their estimated density and abundance using a GIS project made up of the following four layers:

1. delineated habitats;
2. count localities;
3. territories surveyed from aircraft;
4. administrative borders of (NAD).

The quantitative data were taken from summary tables containing all the count results. Calculations requiring the use of geographic operators were made in the *GIS Manifold System* (version 8.00); other calculations were made in the *Paradox* 9.0 database management system. Data processing for each of the count areas included the following stages:

1. Calculating the total area of all polygons belonging to all habitats within each studied territory.
2. Calculating the total area of all polygons belonging to each certain habitat within each studied territory.
3. Calculating the surveyed area within each studied territory (identified as the total area of intersection of the following two layers: delineated habitats (1) and territories surveyed from aircraft (4).
4. Calculating the total area occupied by each habitat within the surveyed part of each studied territory (identified as the total area of intersection of the following two layers: delineated habitats (1) and territories surveys from the aircraft (4), the latter being grouped by habitats.
5. Identifying the habitat type for every count locality.
6. Calculating the total number of birds belonging to each species counted within each habitat type in each studied territory.
7. Adding the sum of the area calculated at step 4 to the resulting table compiled at the end of step 6.
8. Calculating bird densities typical for each habitat within the surveyed part of each studied territory.
9. Calculating bird estimated numbers in different habitats within the surveyed part of each studied territory (obtained by multiplying the density of birds typical for a habitat (as calculated at step 8) to the area occupied by the habitat within each studied territory (as calculated at step 4). The bird-estimated number is identified as the result of extrapolation of the bird number counted from the aircraft for the entire area of each studied territory (i.e. including the parts not covered by direct field counts).
10. Calculating the total estimated number of each bird species in all the habitats (identified as a sum of all the above parameters calculated at step 9).

    The analytical maps of estimated density of birds were made by the ranking method (Fig. 4) using different range width depending on the maximum number of counted birds. If the maximum number was less than 1001, we used the following ranges: 0–101; 101–201; 201–301; 301–401; 401–501; 501–601; 601–701; 701–801; 801–901; 901–1001;

    If the maximum number was more than 1000 but less than 5001, we used the following ranges: 0–501; 501–1001; 1001–1501; 1501–2001; 2001–2501; 2501–3001; 3001–3501; 3501–4001; 4001–4501; 4501–5001;

    If the maximum number was more than 5000 but less than 10001, we used the following ranges: 0–501; 501–1001; 1001–2001; 2001–3001; 3001–4001; 4001–5001; 5001–6001; 6001–7001; 7001–8001; 8001–10001.

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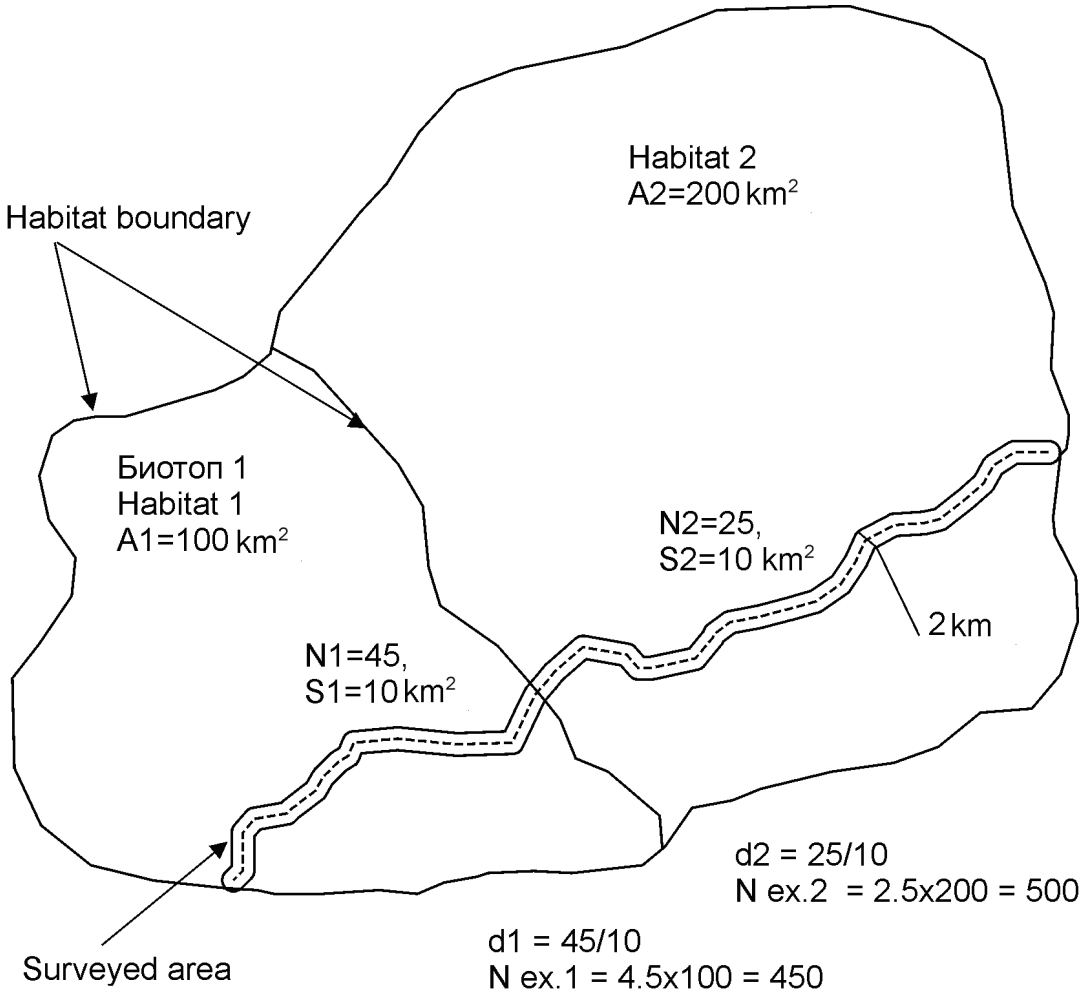

Fig. 4. Calculation of densities and estimated numbers of birds in delineated biotopes

Human impact assessment

Human impact on waterfowl populations in the study area mainly comprised hunting and reindeer breeding. To assess the latter, we registered all the herds of domestic reindeer. To estimate the former, we registered all the hunters encountered in the study area, boats, hides, cabins and hunting bases. The hunting pressure was estimated by analyzing data on ring recoveries of waterfowl species, marked as «bird was shot», available from the database of Bird Ringing Center of Russia.

Results

The data presented here are of significance to enable comparison of waterfowl species richness and bird numbers between different geographical regions. Such information is also crucial to enable a better estimation of numbers of Lesser White-fronted Geese in this area and in the longer term generate population trends. During the autumn counts we counted a total of 7 177 Lesser White-fronted Geese, 38 278 Greater White-fronted Geese, 20 162 Bean Geese, 50 546 Brent Geese, 144 586 Barnacle Geese, and 1 514 Red-breasted Geese (Fig. 5), although we consider these counts to be representing the absolute minima present.

The total proportion of Lesser White-fronted Geese among all the counted geese was around 3% (Fig. 5).

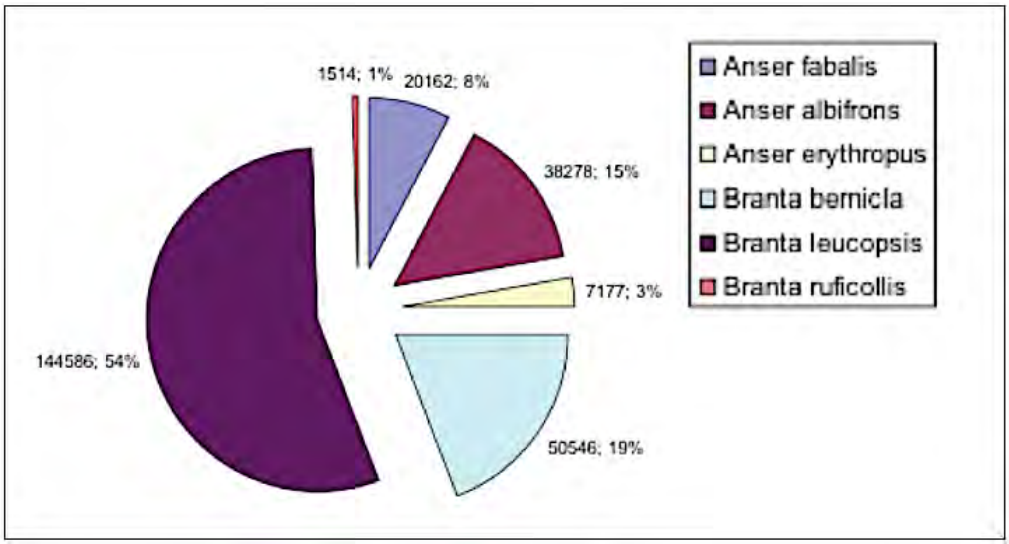

Fig. 5. Relative abundance (%) of four goose species in the study area according to field counts

Assessments of reproductive success of this species have shown that the proportion of young among Lesser White-fronted Geese amounted to 31% (*n*=757). For comparison, the proportion of young birds was 33% (*n* =1,060) for Barnacle Geese, 36% (*n* =676) for Brent Geese, 29% (*n* =139) for Red-breasted Geese, 26% (*n* =1,209) for Greater White-fronted Geese, and 24% (*n* =537) for Bean Geese.

Information on autumn migration

September 2015 was exceptionally warm, with no frosts occurring throughout the month. Most of the observed geese moved within limited territories. We did not encounter any flocks flying high in the sky; nor did we record the previously well-reported southerly migration of any waterfowl species. All the registered gatherings of geese and ducks were at pre-migration stage; the birds never flushed far by our presence (being in the state of pre-migration hyperfagy). We therefore contend that the distances between our tracks were large enough to be sure that no birds were counted twice during successive aerial counts over several days. Evidently, most birds left the survey area after we had finished the autumn counts in 2015.

Lesser White-fronted Goose in the study area

During the autumn waterfowl migration period, Lesser White-fronted Geese were encountered within the study area in most of the localities where we conducted our aerial counts, both in YaNAD and NAD. Lesser White-fronted Geese sometimes formed single species flocks (fig. 6), elsewhere they joined groups of other duck and goose species (fig.7).

Fig. 6. Flocks of Lesser White-fronted Goose

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Fig. 7. Lesser White-fronted Geese in a flock of Barnacle Geese and Bean Geese and in gatherings of wigeon *Anas penelope*

At the present time, we have no data relating to the Lesser White-fronted Goose migration in the north of the European part of Russia, with the exception of one known stopover site (registered from a satellite transmitter) at the western coast of the Kanin Peninsula (LITVIN 2014). The distribution and numbers of Lesser White-fronted Geese in the study area (Fig. 8) demonstrate the important role played by marine marshes along the coast of Baydaratskaya, Khaidypurskaya, Pakhancheskaya and Bolvanskaya bays for this species. West of the Pechora River delta, and in the delta itself, there were fewer records of Lesser White-fronted Geese, they are not very numerous on the marshes, and most of the encounter sites were situated on the Kanin Peninsula, southwest coast of Cheshskaya Bay, Lake Toravey and adjacent marshes. It seems obvious that the first birds ready to undertake their autumn migration had gathered in the Dvuobie during the observation period.

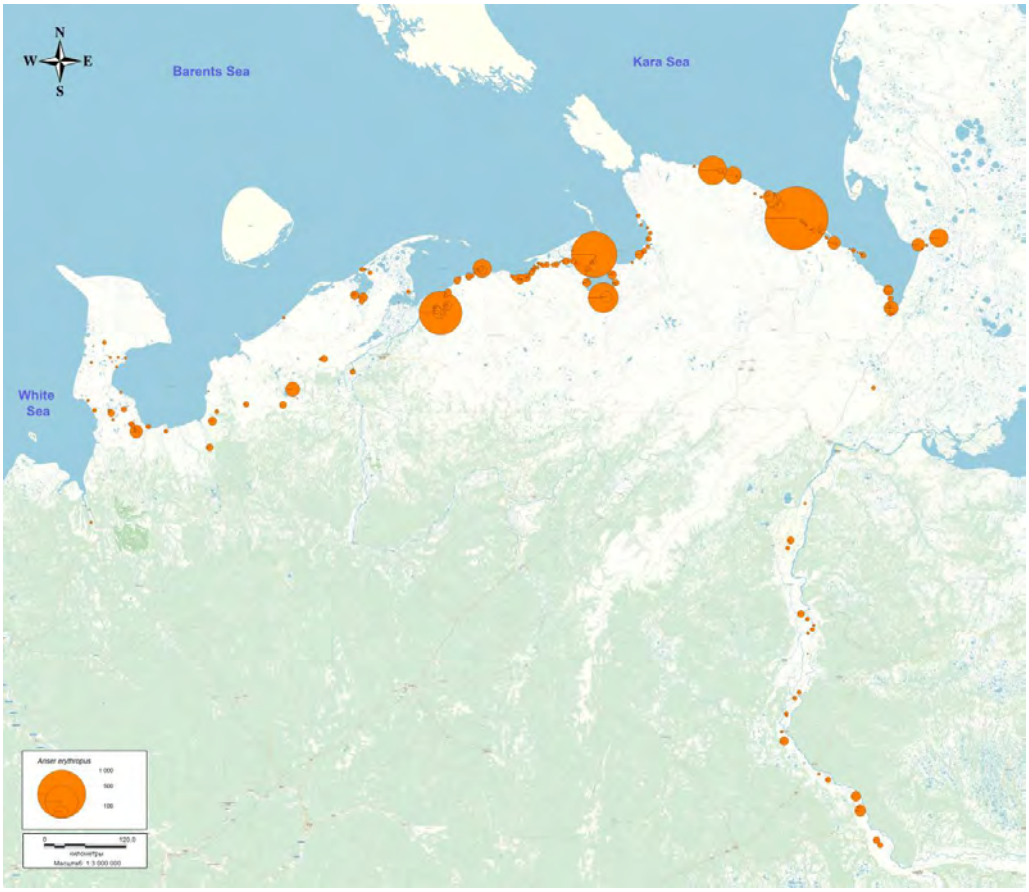

Fig. 8. Distribution and numbers of Lesser White-fronted Goose in the study area

Gatherings of Lesser White-fronted Geese and their key stopover sites

The mapped quantitative data from field observations of Lesser White-fronted Goose flocks delineate several highly important areas where they were staging prior to their autumn migration.

Among these key sites (defined as sites where numbers of Lesser White-fronted Goose exceeded 1,000 individuals), were the following areas: Khaidypurskaya Bay, Pechorskaya Bay (with adjacent coastal zones); entire western coastal zone of Baidaratskaya Bay, as well as all the marshes along the and the eastern coast of Baydaratskaya Bay outside the Yuribey River mouth (Fig. 8).

The density of Lesser White-fronted Geese in the study area

The distribution of densities of Lesser White-fronted Geese in the study area during autumn migration (table 1) show that biotopes 1,3 and 4 were crucially important.

Table 1. Calculations of Lesser White-fronted Goose population density and number.

Biotope	Number (N)	Surveyed Area (SA)	Density (D=N/SA)	Total Area (TA)	Estimated Number (DxTA)
1	1 662	665.3	2.50	1 298.3	3 243
2	6	278.3	0.02	205.3	4
3	4 091	1 580.5	2.59	3 376.8	8 741
4	174	130.8	1.33	460.2	612
5	224	378.9	0.59	3 602.4	2 130
7	5	204.9	0.02	1 315.8	32
8	325	1 906.5	0.17	14 675.3	2 502
9	34	1 336.0	0.03	17 705.5	451
10	122	472.0	0.26	3 518.0	909
11	22	117.4	0.19	1 013.8	190
14	25	1 061.2	0.02	4 545.2	107
15	14	260.7	0.05	4 425.7	238
16	8	738.7	0.01	6 695.8	73
17	376	2 849.1	0.13	17 956.8	2 370
	7 088	11 980.3	0.59	80 794.9	21 602

Large numbers of Lesser White-fronted Geese were encountered on tundras and coastal marshes, and rather small numbers in the Dvuobie support our conclusion that the 2015 autumn migration began exceptionally late. According to data obtained by our colleagues in Kazakhstan, mass migration of geese occurred there during the first ten-day period of October 2015 (A. TIMOSHENKO, pers.com.).

The estimated numbers of Lesser White-fronted Geese in the entire area was 21 600 individuals. These figures for Lesser White-fronted Geese numbers can be compared to previous assessments of population size. Compared our 2014 data with previous data based on autumn counts conducted in Northern Kazakhstan (table 2), we concluded that in Kazakhstan, in average, up to 23 000 birds are present but this number is subject to strong fluctuations depending on the annual proportion of young individuals and detection probabilities associated with the different census methods applied.

Table 2. Results of Lesser White-fronted Geese counts in Northern Kazakhstan (2010-2014)

Year	Number	Source
2010	18 786	ROZENFELD 2011
2011	17 516	TIMOSHENKO 2011; ROSENFELD 2011
2012	30 788	ROSENFELD, TIMOSHENKO & VILKOV 2012
2013	28 044	ROSENFELD & TIMOSHENKO 2013; ZUBAN & VILKOV 2013
2014	19 963*	TIMOSHENKO & VOLKOV 2014, ZUBAN & VILKOV 2014
2015	21 600	THIS STUDY

* Only 50% of the territory was surveyed in 2014.

The low estimated numbers of some, previously abundant, game species of geese have also caused serious concern since these results may suggest the overall negative trend in their abundance.

In this connection, it seems appropriate to take immediate measures to limit both autumn and spring waterfowl hunting in two key Federal Districts in the area of our research. There is also an urgent need for further monitoring, preferably following the methods developed here on a regulr basis. Such regular standardised monitoring data should be used to underpin flexible adjustments to hunting regulations and improve measures aimed at Lesser White-fronted Goose conservation in the adjacent regions.

Hunting impact on goose population in spring and autumn (estimated by ring returns)

Data on ringing recoveries were available to help assess the impact of hunting on waterfowl. It remains impossible to provide direct quantitative data on kill rates since in the absence of any bag information from the study area.

Based on analysis of ringing recoveries provided by the Russian Bird Ringing Centre, it was concluded that the intensity of spring hunting in the study area was much higher than the intensity during autumn hunting. For example, out of 2,064 rings recoveries of shot waterfowl, 1 710 (83%) were reported after the spring hunting period, compared to only 354 (17%) in autumn. Therefore, the advere impact caused by autumn hunting on waterfowl population may be interpreted as relatively minor despite its longer duration.

Spring hunting is thought to be one of the most important limiting factors for Lesser White-fronted Geese and should be regulated. Unfortunately, we lack any data from which to calculate the proportion of Lesser White-fronted Goose shot among the total numbers of waterfowl killed during both hunting periods: we urge that this is made a key objective for further studies.

Assessment of anthropogenic impacts on waterfowl during the survey period

We assessed the distribution of anthropogenic impacts on Lesser White-fronted Goose in the study area by combining the species' distribution with observations of any signs of the presence of hunters discovered in different habitat types, including people, boats, bungalows and hides as well as Nenets outposts and herds of domestic reindeer.

In the western part of the surveyed territory, the most vulnerable staging sites for Lesser White-fronted Geese were on the western coast of the Kanin Peninsula from Konushinsaya Korga Cape to Shoina settlement; in the mouth of the Torna River, and on the western and southern coasts of Cheshskaya Bay.

In the central part of the surveyed territory the greatest impact was found in the mouth of the Indiga River, on the lakes Toravey and Urdyuzhskoye; on Bolvanskaya Bay coast and along the coastal line of Pecherskaya Bay from Cape Bolvanski Nos to Cape Konstantinovski, as well as on the Khaidypurskaya Bay coast.

In the eastern part of the surveyed territory the threats were highest for places around Kara Bay and in the environs of Ust-Kara settlement.
As for the southern part of the surveyed territory, it appeared that the anthropogenic impacts were likely of almost similar intensity over the entire territory of the Ob River floodplain.
At the same time, it was obvious that the currently existing protected areas cannot function properly for waterfowl conservation, and their number as well as the area covered by them was insufficient for Lesser White-fronted Geese protection in the period of autumn migration, both in NAD and YaNAD.
Almost all large gatherings of Lesser White-fronted Geese were situated outside the limits of the existing protected areas. Only nine rather small gatherings of Lesser White-fronted Geese were recorded within the protected areas: four of them were encountered in the Nenetski State nature reserve and Nenetski State wildlife sanctuary (NAD), three in the Yamalski wildlife sanctuary and two in the Kunovatski wildlife sanctuary (YaNAD).

The proportions of Lesser White-fronted Goose among gatherings of geese during their autumn migration period were sometimes substantial. There were a significant number of places where negative anthropogenic impacts were considered to be especially high which coincided with very high Lesser White-fronted Goose abundance, where the species cannot disperse and remain undetected amongst other geese. Such places included, for instance, the southern seaside of Cheshskaya Bay (the middle reaches of the Bolshaya Krutaya River), the southern coastal area of Bolvanskaya Bay, the coast of Pechorskaya Bay (from Cape Bolvanski Nos to Cape Konstantinovski), all coastal zones of Khaidypurskaya Bay, Kara Bay and the surroundings of Ust-Kara settlement.
In contrast, there were no such large gatherings of geese in the Dvuobie; Lesser White-fronted Geese primarily migrate there in dispersed flocks or together with Red-breasted Geese. For these reasons, all the territory of the Dvuobie should be considered as a zone where the risk of illegal kill of Lesser White-fronted Goose is increasingly high.
For these reasons, although the hunting impact on geese in autumn is significantly less than that in spring, the adverse effects of hunters and the level of disturbance caused by hunting are high anyway, so this allows us to list hunting among the important limiting factors for all geese populations in the region, and for Lesser White-fronted Geese in particular.

Fig. 9. Lesser White-fronted Geese in a hydrocarbon production area

Impact of oil production

When surveying the study area we regularly saw Lesser White-fronted Geese in flocks of Greater White-fronted Geese, Barnacle Geese and Bean Geese in areas of oil development. Neither construction activities nor the infrastructure itself appeared to exert any observable negative influence on the birds. On the contrary, many waterfowl species appear to like gathering around and within areas where oil wells are active (Fig. 9). One possible reason for this is that hunting is entirely prohibited in the immediate vicinity of such places because of associated risks, so disturbance appears very low very close to such developments, but higher about their periphery.

Reindeer breeding impact

The impact of reindeer herding on Lesser White-fronted Goose is difficult to evaluate at the current stage of research. We can only state that the numbers of domestic or domesticated reindeer is increasing in both Autonomous Districts, which may become a serious environmental problem. The number of reindeer grazing on the coastal marine marshes, the key staging sites of Lesser White-fronted Geese, is still small; however, in the future, if the population of domestic reindeer grows uncontrolled (as it currently is), these key feeding habitats of Lesser White-fronted Geese may fall under threat of degradation from overgrazing.

Conservation measures

The progressive fragmentation of the nesting habitats of Lesser White-fronted Geese and the decrease in the abundance of the species make it necessary to organize permanent monitoring of the extant Lesser White-fronted Goose populations as well as all its key habitats. The results of existing periodic monitoring have shown that Lesser White-fronted Geese migrate through the study area very extensively. As often as not they will join flocks and groups formed by different hutable species of geese, and their proportion in such gatherings can occasionally be very high. The main reason for the recently observed decrease in the number of Lesser White-fronted Goose in Russia is considered to be the high bird mortality due to hunting or poaching. The most effective measure for the conservation of the species would be the creation of several protected areas (at the local or federal level) in all the key nesting sites of the species as well as at its migratory stopover sites. A network of protected areas covering all stopover sites is needed where a significant number of Lesser White-fronted Geese have been observed during spring and autumn migration.

At the present time, there are no protected areas in NAD for Lesser White-fronted Goose to nest. Nor are there any protected areas specifically created for Lesser White-fronted Goose conservation or to save their habitats from destruction. It is therefore important to create several protected areas at the level of Federal wildlife sanctuaries in the study region as a measure to contribute to the territorial protection of the species. These should be added by two or three specially protected areas at the level of State nature reserves or, otherwise, by expanding the areas of existing state nature reserves so that their newly created sections ensure conservation of all the major breeding groups of Lesser White-fronted Geese in their nesting areas.

The measures are especially urgent because some VIP hunting bases have been built in the Kanin Peninsula and in the environs of the Ust-Kara settlement (Fig. 10).

As soon as they are open to use, the level of disturbance will significantly increase in several key areas of Lesser White-fronted Geese, and the number killed will increase, particularly in spring, a period especially popular for hunting in the study area.

Fig. 10. Greater White-fronted Geese and Lesser White-fronted Geese at a hunting base near Ust-Kara settlement.

Development and implementation of a system of conservation measures is required to prevent geographical range shrinkage in all goose populations (including those of rare and protected species) and a decrease in their numbers. The system of already existing protection measures must be extended and improved. That can be done by modifying current conservation laws or adopting new, better ones; by making amendments to territorial protection system, both in the nesting areas and migration stopovers, and also by improving hunting regulations.
An extremely effective measure could be to ban spring hunting and strongly limit autumn hunting in all the key areas; as well as introduce effective measures against poaching in areas where the exploration and production of oil, gas and other mineral resources is taking place.

Suggestions for creation of new protected areas for Lesser White-fronted Goose protection

Suggestions for the creation of six seasonal wildlife sanctuaries (or even more strictly protected areas) in the study territory for conservation of migratory populations of Lesser White-fronted Goose in autumn are given below. These areas are illustrated by a generalized map and a series of more detailed maps for all six sectors described above (Fig. 11).

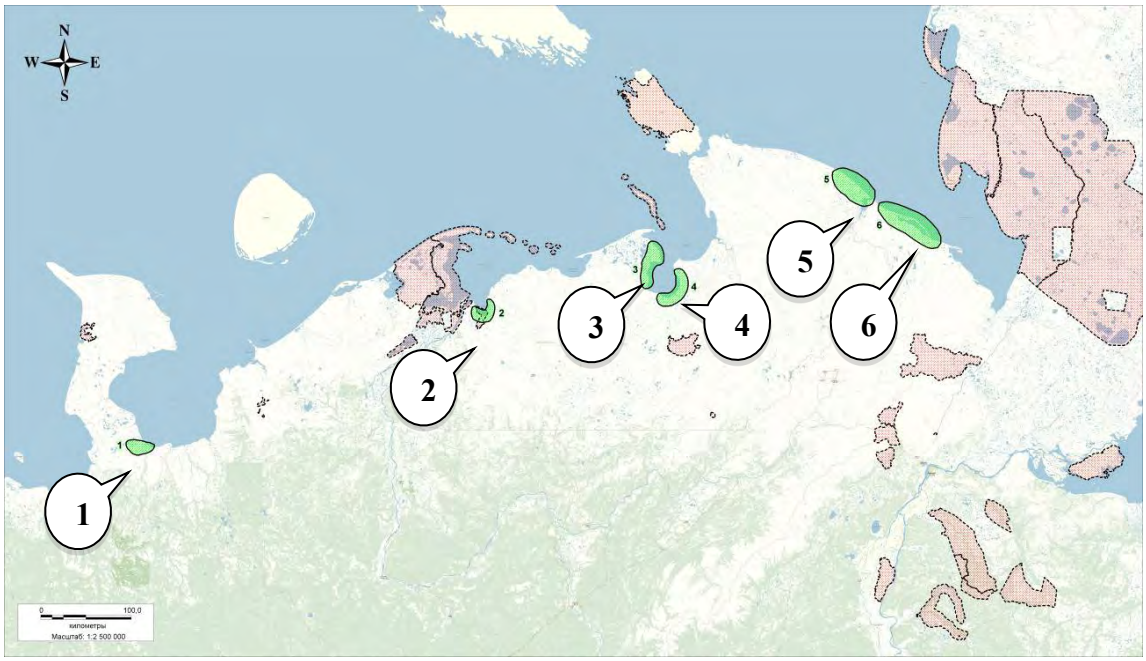

Fig. 11. Location and boundaries of six key stopover sites of Lesser White-fronted Geese where hunting waterfowl must be prohibited or strictly limited

Note: existing protected areas are filled with red; the areas where it is necessary to limit hunting for conservation of migratory Lesser White-fronted Geese (i.e. the new protected areas we have proposed) are filled with green.

Recommendations for NAD and YaNAD administration

One of the most efficient ways to protect the Lesser White-fronted Goose will be to create several hunting-free zones for waterfowl covering the key migratory stopovers in the Kanin Peninsula and on the coasts of the Strait of Pomorie, Cheshskaya Bay and Mezenskaya Bay. All the particularly important sites used by Lesser White-fronted Goose during autumn migration are located along the entire coastal line of Bolvanskaya Bay and Pechorskaya Bay from Cape Bolvanski Nos to Cape Constantinovski, plus the coast zones of the Khaypurdskaya Bay, Kara Bay and the environments of Ust-Kara settlement. We recommend creating protected areas in all the territories delineated on (ROSENFELD et al. 2015). In addition, we suggest that hunting all goose species in spring should be prohibited in the following areas (or parts therein):

1. From Arkhangelsk Province boundary in the west in a northerly direction along the Ice Ocean coast to the mouth of the Bolshaya Bugryanitsa River, then along the straight line up to the Cape Western Ludovaty Nos, along the sea coast to the mouth of the Vigas River, further along the coast of Cheshskaya Bay to the mouth of the Snopa River, then southwest to Vigas settlement and back westwards to Arkhangelsk Province boundary (key zones 1–4 on Fig.11);
2. In the mouth of the Indiga River and over the entire territory of Cape Svyatoi Nos (key zone 5 on Fig. 11);
3. On the lake Toravey and in the mouth of the Welt River (key zone 6 on Fig. 11)
4. In a one-kilometer wide zone along the costs of Khaypudyrskaya, Pakhancheskaya and Bolvanskaya bays;
5. In a one-kilometer wide zone along the cost of Kara Bay;
6. In a one-kilometer wide zone along the cost of Pechorskaya Bay;
7. In the Dvuobie within the boundaries described in Part 3 in ROSENFELD et al. (2015).

List of high priority measures to improve hunting regulations and enhance *Anseriformes* conservation

1.1. Create a Bolshezemelski State nature reserve as a first-priority measure to protect large nesting groups of the Lesser White-fronted Goose. The reserve should include the following parts:
- – the valley of the middle reaches of the More-Yu River;
- – the basin of the upper and middle reaches of the Khe-Yakha River, a eastside tributary of the Korotaikha River;
- – the valley and adjacent tundras in the upper reaches of the Bolshaya Rogovaya River

1.2. The reserve boundaries within all three above-mentioned parts should be kept in accordance with the initial project of Bolshezemelski reserve as it was proposed in 1994.

1.3. To protect moulting gatherings of Lesser White-fronted Goose, all known key moulting sites should be included in the territory of Yamalski Peninsular regional wildlife sanctuary.

1.4. Hunting-free zones for autumn period should be allocated in the Dvuobie along the boundaries of all the hunting-free zones proposed for spring period (see Part 3 in ROSENFELD et al. (2015) for details).

2.1. It is essential to develop special regulations for hunting waterfowl in spring.

2.2. New terms of spring hunting should be set to prevent extermination of the nesting waterfowl populations; namely, the closing date for the spring hunting season should be changed to 1 June.

2.3. An analytical study of existing information should then be carried out to determine the beginning dates of nesting periods for all waterfowl species found in the region, as well as how the dates depend on weather conditions and other factors.

2.4. Then, based on the above information, the opening and closing dates for waterfowl hunting period in spring should be adjusted more precisely for each region.

3. It is also important to set the opening day of autumn hunting period not earlier than 1 September. In the tundra zone, it is advisable to open the autumn hunting between mid-September and late October, within the period of mass migration of Bean Geese and Greater White-fronted Geese, in order to give better chances for rare goose species (especially for Lesser White-fronted Goose) to disperse among the waterfowl flocks after joining the mass groups of goose game species.

4. Hunting quotas during both hunting periods should be set for a day, not for a trip.

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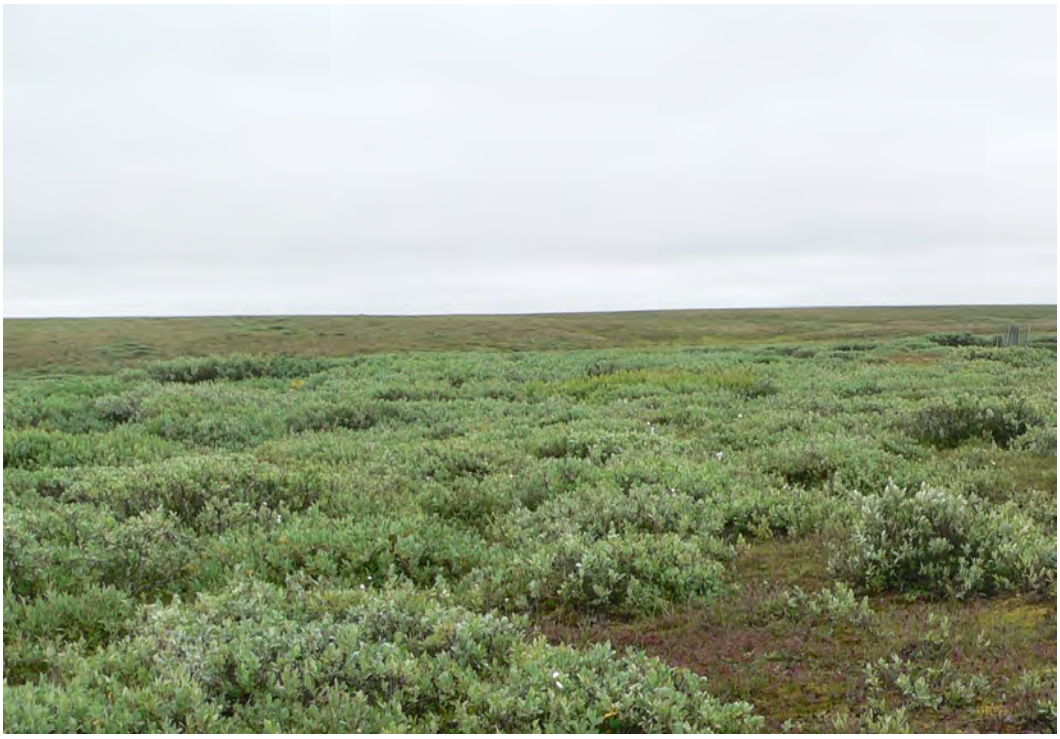
Conclusions

The current study has revealed the feasibility of Lesser White-fronted Geese aerial monitoring in vast and remote areas of the Russian Extreme North. Using this approach:

1. we obtained new and reliable data on the numbers and the distribution between different biotopes of Lesser White-fronted Goose during their autumn migration within a major part of the range occupied by the western population of the species;
2. a number of key sites were discovered during the period of autumnal hyperphagia and the following migration;
3. we could develop advanced practical measures for Lesser White-fronted Goose conservation in the study area;
4. appropriate suggestions were put forward for policy makers concerning the protection of all the key stopover sites of Lesser White-fronted Geese identified in both Autonomous Districts. The suggestions include, among other items, proposals for stricter limitation of hunting in the study area, as well as some necessary changes in hunting regulations.



The results of our extensive aerial surveys made over a large area show that this method is much more effective and less expensive in searching for key places for staging waterfowl species than marking a few bird individuals with satellite transmitters. New key sites identified using transmitters will require an additional field survey to confirm their status; whereas, during aerial surveys we immediately gathered a large amount of actual data about the abundance of birds, the habitat they used and its condition, their conservation status, as well as the hunting pressure on the populations. Therefore, aerial surveys provide much more reliable instantaneous information about the key habitats of the species in their breeding areas and about the main zones used during their autumn migration. Furthermore, we believe that it is aerial surveys that should be applied in future for further studies aimed at Lesser White-fronted Goose research and monitoring all over the territory of Russia. This will allow researchers to react in an operational way to all the changes and threats occurring to the populations of this endangered species.

Acknowledgements

The maps and descriptions of hunting-free zones for the waterfowl were prepared by I. Pospelov. We are much obliged to the staff of the Department of Natural Resources Management of YaNAD V. Yachmenyov, V. Borisyuk and S. Schnaider for their help in distributing questionnaires among hunters in the District, as well as V. Basova and M. Ivanov for their help in the primary processing of the query results.

A field survey encompassing such a vast area would be impossible without organizational and logistics assistance that we received from many our colleagues. We are very thankful personally to D. Zamyatin, P. Kondratenko, A. Kashin, O. Makarova, S. Uvarov, V. Vyucheiskij, M. Sobolev, E. Levandovski, U. Logvinov, N. Zubri, B. Filippov, I. Bolotov, V. Spitsyn, M. Gavrilo and I. Ryabikov.

We also received immense support from the regional public organization 'Wings of the Arctic' at the Federation of Light and Ultralight Aviation of Yamalo-Nenetski Autonomous District; as well as from the crew of boat station at Priobye settlement, from V. Stepin, the leaseholder of the Ust-Yuribey trade outpost, and his staff.

Our special thanks to T. Konstantinova for reporting the results of our project in the mass media.

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Obituary: Hugh Boyd 12 May 1925 – 3 July 2016

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It is impossible in hindsight to describe the magnitude of the contribution that Hugh Boyd made to the world of waterbird conservation in his lifetime. This is partly because he was such an innovative pioneer in his field and was basically there at the very inception of his discipline. As such, Hugh contributed enormously to the very foundations of everything we take so very much for granted today with regard to waterbird research, monitoring, conservation, management and site safeguard. It is therefore with great sadness and a major sense of loss that we mark his passing.

Following his wartime service in the Royal Navy and education at Bristol University, Hugh's passion for birds landed him his first "proper job" as warden of Lundy Bird Observatory in 1948. As a young man, he had already spent considerable amounts of time cycling around his native Bristol area to visit the city's outlying reservoirs and the Somerset Levels where he was particularly fascinated by waterbirds, producing his first publication (in *British Birds*) on Coot *Fulica atra* in 1947, followed by two others in *Ibis* on the same species in 1948 and 1950. His extraordinary accomplishments, talents and enthusiasm attracted the far-sighted attention of Peter Scott (subsequently Sir Peter Scott) at the fledgling Severn Wildfowl Trust (now the Wildfowl & Wetlands Trust) who promptly appointed him the first ever resident research biologist at Slimbridge. Who could have foreseen what an inspired appointment this would turn out to be?

Hugh was quick to see that in post-war Britain and Europe, goose populations were not faring particularly well and set about establishing the fundamental basics of flyway definition and the monitoring of the population abundance of ducks, geese and swans which form the foundation of what we know and do today. Working with Peter initially on the Icelandic Greylag and Pink-footed Goose populations, Hugh and the Trust orchestrated networks of volunteers to simultaneously count geese at all their known wintering resorts and to search for unknown concentrations, long before the contemporary term "citizen science" was ever coined. In this way, they started to generate annual estimates of flyway population size to determine status and trends.

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However, they quickly realized that without estimates of annual reproductive success and survival, it was difficult to describe the environmental factors driving the demographic causes of changes in population size. This led to pioneering work to capture and metal ring large numbers of Pink-footed Geese on the moulting areas in Þjorsárver in central Iceland and subsequently, to the introduction of rocket netting of Greylags and Pinkfeet on the wintering grounds in Britain, to generate ringing recoveries and hence provide survival estimates for goose populations. Patient field determination of autumn age ratios amongst goose flocks provided the profit side of the accounts to balance mortality losses, culminating in his classic *Journal of Animal Ecology* paper in 1956. Thanks to these pioneering ideas, we can now look back on 66 years of such data for the Pinkfeet, making it hard to recognize just how ground-breaking the development of this type of integrated population monitoring was to the discipline of zoology at that time.

Hugh Boyd (left) and Geoffrey Matthews preparing a rocket-net in the first half of the 1950s (photo by E.D.H. Johnson)

Hugh was also deeply interested in the individual behaviour of birds and how this contributed to their lifetime fitness. The pioneering use of hides or blinds at Slimbridge enabled Hugh to get "up close and personal" for the first time ever to observe the behaviour of wintering White-fronted Geese there. From these observations, Hugh was able to show how offspring benefitted from their membership of family groups, especially because when groups of geese indulged in aggressive clashes, the biggest family groups always won dominance over the best food resources and families of any size evidently won over lone pairs. His landmark publication on the subject in 1953 in the journal *Behaviour* continues to be quoted to the present day.

Never content with his accumulating knowledge, Hugh was fascinated by all aspects of waterbird ecology and, amongst many subjects, published extensively on age ratios and brood sizes, the effects of summer weather conditions on reproductive success (an obsession developed long before the effects of climate change on waterbirds was an issue) and population dynamics of all waterbirds (especially with regard to hunting of huntable species and its effects on population change). He also helped to introduce many novel techniques to gather new data, such as using duck wings from hunters to assess annual age ratios and undertaking surveys from aircraft as a means of counting waterbirds in areas hard to cover by counting on the ground (e.g. the Greenland breeding Barnacle Goose population that mostly winters on remote offshore islands off the coast of Ireland and Scotland). Hugh was also responsible for introducing rocket-netting to the ornithological wader community, and was pivotal in inflating the annual catches of a few hundred shorebirds using mist nets on the Wash to several thousand using his methods. In doing so, he started to apply the techniques he had perfected with ducks and geese to wader populations, publishing the first ever estimates of reproductive success and annual survival for many of the common *Charadrii* species in *Ibis* which, for some species, remain the only estimates to the present.

Hugh Boyd (left) in May 2005 with Malcolm Ogilvie (centre) and Roy King (right) (photo by A.D.Fox).

In 1964, Hugh moved from Slimbridge to take up a secondment with the Nature Conservancy in Edinburgh, but later was head-hunted by the Canadian Wildlife Service in 1967 to head up their research activities in the Eastern Region. Hugh took to this new challenge with gusto, starting massive shorebird, passerine and common bird monitoring programmes on top of a challenging suite of waterbird projects. In 1975, his considerable abilities led to his promotion to Director of Migratory Birds at CWS headquarters, where he was to work until his retirement in 1981, having served as Senior Policy Advisor, Senior Scientist and Acting Director of CWS Ontario Region in the meantime.

Although impressive, these mere titles tell little of Hugh Boyd's real influence across the North American continent, because as well as being a driving force for the effective monitoring, research and conservation of the continent's waterbirds and developing a functional network of protected areas, he also helped lay the foundations for the North American Waterbird Management Plan and Western Hemisphere Shorebird Reserve Network which enshrine waterbird and shorebird management in the Americas to the present day. Typical of his modest nature, Hugh also played a major background role in finding solutions to the superabundance of the Lesser Snow Goose in the early days.
Any ordinary mortal might be expected to slow down in retirement, but not Hugh! All his professional life, he set great store by scientific writing. In his view, research was effectively non-existent if not fully documented and made available in readable form. He was a tough but supportive and accomplished editor, and as well as finding time to publishing more than 180 scientific publications, three books and innumerable reports himself, he was an avid editor for journals and for many of the CWS report series, a task that only accelerated with his retirement. He was still publishing in internationally refereed journals in 2012.

In retirement, Hugh also threw himself into shorebird research in the Arctic in Foxe Basin and was happily clambering in and out of helicopters to do aerial goose surveys of Queen Maud Gulf Migratory Bird Sanctuary in the 1990s. He travelled from Canada to quite a chilly conference venue in rural Poland just to attend the first ever meeting of the fledgling Goose Specialist Group in 1995. From his early Þjorsárver adventures, one of his great enduring loves was for Iceland and he was never happier than working in that country, especially revisiting Pink-footed Geese which he had first found in the 1980s nesting areas in the Icelandic southern lowlands to which they had spread with their increasing population size. For his 80th birthday he found himself again in Reykjavik, still carrying out fieldwork, happily celebrating the occasion with a huge party of friends and Icelandic ornithologists.

For a man who helped invent and develop waterbird research, monitoring, conservation and management on one continent and made a considerable contribution to its evolution on another, Hugh Boyd could be forgiven for the very occasional moment of self-satisfaction. If this ever was the case, it was impossible to detect. Hugh Boyd was one of the kindest, gentlest, most humble and above all modest men you could ever wish to meet. He was also great fun, with a wonderful sense of humour and an absolute pleasure and inspiration to accompany into the field. Courteous and thoughtful, considerate, generous to a fault and always encouraging, Hugh was great mentor, despite always maintaining that he never really had any "real" students. Nevertheless, his influence on the lives of so many established avian ecologists is legend, starting with his assistant at Slimbridge, Malcolm Ogilvie, but continuing with the likes of Guy Morrison, Tony Gaston, Austin Reed, Nicola Crockford, Jesper Madsen and Theunis Piersma to name but a very few. I first met him opportunistically on a visit to Slimbridge in 1978 when he happened to be back in the UK on a visit. Despite our outward appearance as an unprepossessing, scraggly band of poorly briefed undergraduates trying to canvas support from the Wildfowl Trust for a madcap expedition to Greenland to study White-fronted Geese, Hugh immediately took us seriously, gave us enormous advice and encouragement and on our departure, discretely handed us a personal cheque for hundreds of pounds towards our cause. Such a generous gesture was a watershed moment for us and the project went ahead, I only hope we repaid a little of the debt with what was subsequently achieved.

For his extraordinary accomplishments and a lifetime's contribution to wetland birds, their flyways and habitats and effective conservation, Hugh received many awards, most notably the Peter Scott Medal (from WWT) and the Doris Huestis Speirs Award (from the Society of Canadian Ornithologists), while his international achievements for Canada were recognized by his appointment as a Member of the Order of Canada. His selfless dedication and support to so many of us is already very sorely missed, but can be as nothing compared to the loss to his wife Gillian, his three sons, and their families, to whom we extend our sympathies.

Obituary: Luc Hoffmann 23 January 1923 – 21 July 2016

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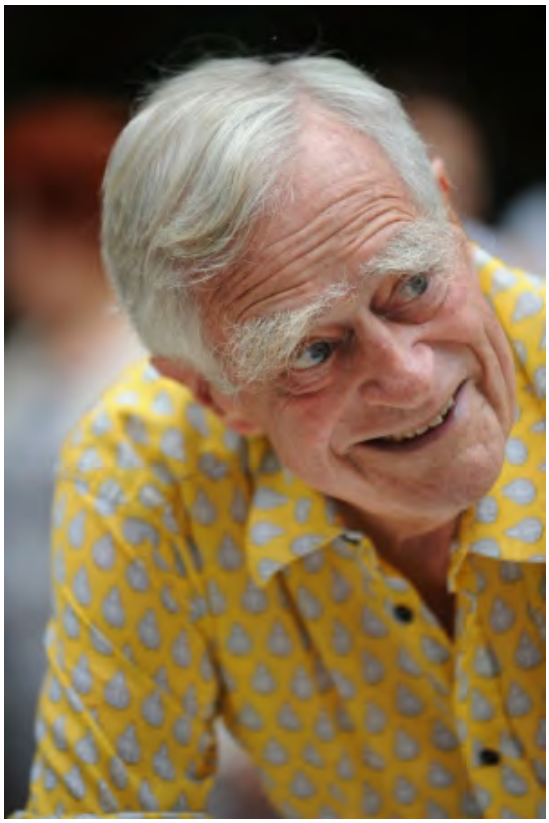

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As a former employee of WWF and former delegate of the Ramsar Convention as well a delegate of Wetlands International I met Luc Hoffmann more often and always was impressed. The co-founder of WWF, one of the fathers of the Ramsar Convention and Wetlands International was a very humble and gentle person, always interested in what others did and told, always ready to help, especially to help young researchers. When he entred a room, he was there, with his characteristic bushy eyebrows, his gentle smile, his natural authority and his outstanding knowledge about wetlands, waterbirds, ecology. Most of the time he was silent, listened, but when he spoke it made sense and advanced the discussion. He was a good listener, a patient teacher, an inspiring mentor and a very practical man.

Dr. Hans Lukas ("Luc") Hoffmann was born in Basel in 1923, as the second son of the businessman Emanuel Hoffmann and the sculptor Maja Hoffmann-Stehlin and grandson of Fritz Hoffmann-La Roche, the founder of the F. Hoffmann-La Roche Ltd. pharmaceutical company. His family is the majority shareholder in the company, but in spite of his wealth, Luc Hoffmann was an uncomplicated, pleasant "normal" person.

From his early youth he was interested in nature and published his first scientific paper about waders in the surroundings of his hometown Basel as a schoolboy in 1941. In the same year he started his biological study at the University of Basel. After an intermezzo in the Swiss army during the second worldwar he resumed his scientific work and completed his biological studies with a PhD thesis about the different color patterns of the chicks of the Common Tern *Sterna hirundo* in the Camargue in 1953.
During his studies Luc Hoffmann fell in love with the Camarque and its birdlife and bought the Tour du Valat estate there in 1947, on which he founded the "Station de recherche biologique de la Tour du Valat" in 1954. This was his first step into his lifetime engagement in the protection of nature and wildlife, with a special focus on wetlands and waterbirds. Under Luc Hoffmann's stimulating attendance and support the Tour du Valat developed until today to a worldwide leading research institute for the conservation of wetlands, with a clear focus on Mediterranean wetlands. Generations of ecologists from countries all over the world have been involved in the research programs of the Tour du Valat and were trained for the conservation of wetlands and waterbirds in their native countries. Many well-known conservationists obtained crucial training and experience under the lead of the Tour du Valat's scientists.
In the 1950's Luc Hoffmann did not only marry his wife Daria Razumovsky (1925-2002) and founded a family, but besides his job as a board member of Roche he became increasingly engaged in a number of international nature conservation organisations, like IUCN (World Conservation Union) founded in 1946 and IWRB (International Waterbird and Wetlands Research Bureau, nowadays Wetlands International) established in 1954. Between 1962 and 1969 he was the honorary director of IWRB that also for this period moved its headquarters from the Museum of Natural History in London to the Tour du Valat and between 1966 and 1969 he was the Vice-President of IUCN. In 1961 he was one of the co-founders of WWF (World Wildlife Fund, nowadays World Wide Fund for Nature) and between 1955 and 1964 he was one of the motors of the so-called "MAR project" of IUCN, IWRB and ICBP, an initiative to collect data and generate public awareness for the importance of wetlands and the need to protect them.

Luc Hoffmann in 1971 in Iran, on the occasion of the signature of the Ramsar Convention (photo Tour du Valat).

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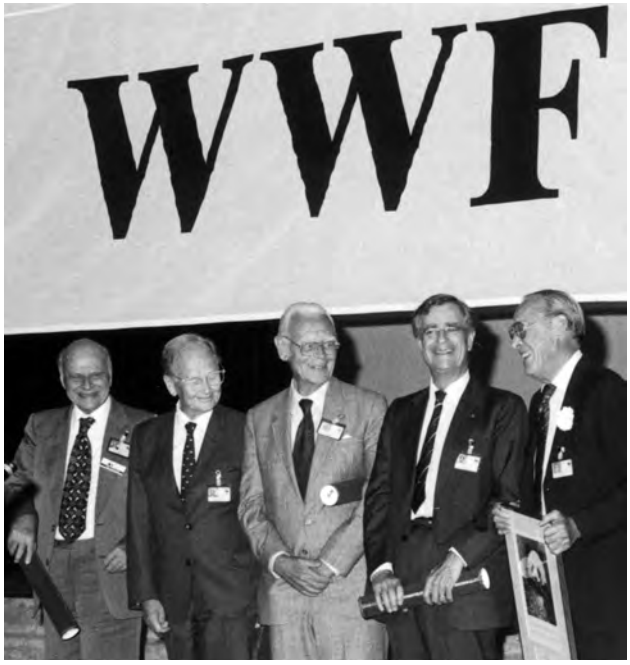

Luc Hoffmann (second man from the right) with i.a. HRM Prins Bernhard of the Netherlands, Sir Peter Scott and Guy Mountfort (foto WWF)

After a number of international conferences about the conservation of waterbirds, organised by IWRB (St. Andrews 1964, Noordwijk aan Zee 1966 and Leningrad 1968) under the lead of Luc Hoffmann the MAR project culminated during the "International Conference on the Conservation of Wetlands and Waterfowl" in the Iranian town of Ramsar in 1971 in the signing of the "Convention on the Conservation of Wetlands of International Importance especially as Waterfowl Habitat", better known as "Ramsar Convention". This Convention was the first international agreement that launched the "wise use" concept, which was also adopted in the Bern Convention of 1979 and, in a slightly weaker version called "sustainable use" or "sustainable development", also in later agreements like the Convention on Biological Diversity (CBD) of 1992.

Besides his beneficial influence on a number of international organisations and agreements Luc Hoffmann played a key role in the protection and long-term management of several important wetlands in Europe (Camargue in France, Cota Doñana in Spain, Neusiedler See at the border between Austria and Hungary, Hortobágy in Hungary, Prespa in the tri-border area of Greece, Albania and Macedonia) and in Africa (Banc d'Arguin in Mauritania, Bijagos Islands in Guinea Bissau).

Besides these large-scale achievements in favour of wetlands and waterbirds in general, the duck community also owe him a special thank for the work he did and led with his team on various *Anas* and *Aythya* species in the Camargue: while the Tour du Valat is particularly famous for its research and monitoring of flamingo and heron populations, ducks were among the main focuses of the station when it was created. The Tour du Valat crew alone ringed over 80,000 ducks between 1950 and 1975 on the Tour du Valat estate only, more than in most European countries over the same period! Luc Hoffmann also had a special interest for lead-poisoning issues, with many of these ducks being x-rayed at ringing. He was among the early scientists to recognize the devastating effects of lead shot ingestion by these birds, and even attempted some original experiments to reduce lead ingestion rate, through the spreading of gravel onto the sediment of waterbodies to reduce incidental ingestion by the ducks. The publications by him and the Tour du Valat scientists on the subject played an important role in the later ban of lead ammunition for shooting over wetlands in France.

During the 1980's Claudia Feh studied the semi-free living horses of the Camargue and subsequently became engaged with the protection and breeding of Przewalski's horse. Luc Hoffman supported her as well as the establishment and the activities of the association TAKH for the reintroduction of the Przewalski's horse in Mongolia.

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In 1994, he established the MAVA Foundation as an expression of his personal commitment to biodiversity. Subsequently also his children engaged in the foundation that was named after the initials of his four children. The foundation plans to become a key player of the conservation of global biodiversity.

Luc Hoffmann's death leaves the waterbird and wetland community with deep feelings of sadness and a gap that will be hard to fill, but at the same time we should feel a deep gratitude for the fact that we knew him and for the heritage he left us.

Outstanding Ornithologist of the past: Sergej Alexandrowitsch Buturlin (1872–1938)

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Sergey Aleksandrovich Buturlin (Russian: Серге́й Александрович Бутурлин); 22 September 1872 in Montreux, Switzerland – 22 January 1938 in Moscow was a Russian ornithologist. His father — Alexander Sergeyevich Buturlin, who was a scientist by profession, had a profound impact on his son and was his "first and best teacher of nature and life".

Already as a student of the Simbirsk (nowadays Uljanowsk) Gymnasium the young Sergey started to study the fauna of the Central Volga region and collected all kinds of zoological materials.

After he finished school Buturlin started studying law in St. Petersburg, where he graduated in 1895. But his interest in zoology was so strong that he spent most of his time traveling through Russia, collecting specimens of species of the local fauna and describing them.

After his studies in the Volga area, he visited the Baltic region and in the following years he participated in a number of expeditions, especially to the northern part of Russia.

Between 1900 and 1903 he travelled through the Arkhangelsk Province as well as to Kolguyev Island and Novaya Zemlya and in 1905 took part in a major expedition to Kolyma River. In 1909, he visited the Altay Mountains and in 1925, the Chukchi Peninsula.

During his travels Sergey A. Buturlin collected tens of thousands of animal skins, especially birds. In 1924 he gave a huge collection of bird skins to the Zoological Museum of the Lomonosov State University in Moscow, of which a considerable part was lost during the Russian revolution. A part of these skins belonged to species that were described for the first time by Buturlin.

Sergey Buturlin was a multisided man; although a lawyer by profession he holds an outstanding position among the Russian scientists as a brilliant field naturalist and an excellent hunter. He made important contributions to many areas of natural sciences: game management, medicine, ornithology, organizer of numerous expeditions, collector of natural-historical collections, author of several monographs and reviews as well as hundreds of scientific and hunting articles. He described more than 200 new bird species and was a pioneer of game management as well as of species diversity in Russia. One of the (sub)species described by Sergey Aleksandrovich Buturlin is the Tundra Bean Goose *Anser fabalis rossicus* Buturlin,1933.

Tundra Bean Goose *Anser fabalis rossicus* (Buturlin, 1933) (after Alphéraky 1904)

New Publications 2015 - 2016

ADAM, M., M. PODHRÁZSKY & P. MUSIL (2016): Effect of start of hunting season on behaviour of Greylag geese *Anser anser*. – Ardea 104: 63-68.

CHOI, C.-Y., K.-S. LEE, N.D. POYARKOV, J.-Y. PARK, H. LEE, J.Y. TAKEKAWA, L.M. SMITH, C.R. ELY, W. XIN, L. CAO, A.D. FOX, O. GOROSHKO, N. BATBAYAR, D.J. PROSSER & X. XIAO (2016): Low survival rates of threatened Swan Geese (*Anser cygnoides*) estimated from neck-collar resighting and telemetry. – Waterbirds 39: 277-286.

CHOI, C.-Y., J.Y. TAKEKAWA, D.J. PROSSER, L.M. SMITH, C.R. ELY, A.D. FOX, L. CAO, X. WANG, N. BATBAYAR, T. NATSAGDORJ & X. XIAO. (2016): Chewing Lice (Phthiraptera) of Swan Geese (*Anser cygnoides*): New Host-Parasite Associations. – Korean Journal of Parasitology 54: 685-691

CLAUSEN, K.K. & J. MADSEN (2016): Philopatry in a changing world: response of pink-footed geese Anser brachyrhynchus to the loss of a key autumn staging area due to restoration of Filsø Lake, Denmark. – J. Ornithol. 157: 229–237.

ERNBERG SIMONSEN, C., J. MADSEN, I.M. TOMBRE & J. NABE-NIELSEN (2016): Is it worthwhile scaring geese to alleviate damage to crops? – An experimental study. –Journal of Applied Ecology 53: 916-924.

FOX, A.D. & J. KAHLERT (2015): Moulting Greylag Geese *Anser anser* on Saltholm, Denmark do not cease feeding midday in response to diurnal oscillation in food quality. – Wildfowl 65: 19-30.

FOX, A.D., J.O. LEAFLOOR, T.J.S. BALSBY, K.M. DICKSON, M.A. JOHNSON & C.A. NICOLAI (2016): Non-breeding Cackling, Ross's and Snow Geese on Baffin Island show no loss of body mass during wing moult. – Ibis 158: 876–880.

FOX, A.D., K.A. HOBSON, A. DE JONG, K.J. KARDYNAL, G. KOEHLER & T. HEINICKE (2017): Moulting-wintering site connectivity for Taiga Bean Geese *Anser fabalis fabalis* revealed by feather stable isotope analysis. – Ibis 159: 66-75.

GARCIA-ALVAREZ, A., C.H.A. VAN LEEUWEN, C.J. LUQUE, A. HUSSNER, A. VELEZ-MARTIN, A. PEREZ-VAZQUEZ, A.J. GREEN & E.M. CASTELLANOS (2015): Internal transport of alien and native plants by geese and ducks: an experimental study. – Freshwater Biology 60, 1316–1329.

GUERENA, K.B., P.M. CASTELLI, T.C. NICHOLS & C.K. WILLIAMS (2016): Factors influencing nest survival in resident Canada geese. – Journal of Wildlife Management 80: 1022-1030.

GUNDERSEN, O. M., K. K. CLAUSEN, J. MADSEN (2016): Weight dynamics of migratory geese during stopover on autumn migration: possible effects of previous breeding season. In review, – Ibis. pp 13.

HARTER, T.S., M. REICHERT, C. J. BRAUNER & W. K. MILSOM (2016): Validation of the i-STAT and HemoCue systems for the analysis of blood parameters in the bar-headed goose, *Anser indicus*. – Conserv Physiol (2015) 3 (1): cov021, doi: 10.1093/conphys/cov021.

JAHANTIGH, M. & M. ZAMANI-AHMADMAHMUDI (2016): Hematology and serum biochemistry values in greylag geese (*Anser anser*) in Southeast Iran. – Comp Clin Pathol 25: 671. doi:10.1007/s00580-016-2273-6.

JENSEN, G.H., J. MADSEN & I.M. TOMBRE (2016): Hunting migratory geese: is there an optimal practice? – Wildlife Biology 22: 194-203.

JIA, Q., K. KOYAMA, C.-Y. CHOI, H.-J. KIM, L. CAO, D. GAO, G. LIU & A.D. FOX (2016): Population estimates and geographical distributions of swans and geese in East Asia based on counts during the non-breeding season. – Bird Conserv. Int. 26: 397-417.

KHAN, A., A. GUJAR & N. BATBAYAR (2016): Ring Recovery of Mongolian tagged Bar-headed goose *Anser indicus* (Latham,1790) (Anseriforms: Anatidae) from Kumbhargaon, Maharashtra, India. – Ela Journal of Forestry and Wildlife 5:137-140

KLEVEN, O., R.T. KROGLUND & J.E. ØSTNES (2016): Isolation characterization and multiplex PCR development of Bean Goose (*Anser fabalis*) microsatellite loci. – J. Ornithol. 157: 641-646.

KÖLZSCH, A., G.J.D.M. MÜSKENS, H. KRUCKENBERG, P. GLAZOV, R. WEINZIERL, B.A. NOLET & M. WIKELSKI (2016): Towards a new understanding of migration timing: slower spring than autumn migration in geese reflects different decision rules for stopover use and departure. – Oikos 2016, Doi: 10.1111/oik.03121

KRISTOFFERSEN, H.L. (2016): Autumn staging behaviour in Pink-footed Geese; a similar contribution among sexes in parental care. – BIO-3950 Master thesis in Biology, Northern populations and Ecosystems May 2016.

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MADSEN, J., F. COTTAAR, O. AMSTRUP, T. ASFERG, M. BAK, J. BAKKEN & C. VERSCHEURE (2015): Svalbard Pink-footed Goose. Population Status Report 2014-15. – Danish Centre for Environment and Energy. Retrieved from http://dce.au.dk/en.

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WEEGMAN, M.D., FOX, A.D., S. BEARHOP, G.M. HILTON, A.J. WALSH, I. CLEASBY & D.J. HODGSON (2015): No evidence for sex bias during winter inter-site movement in an Arctic-nesting goose population. – Ibis 157: 401-405.

WEEGMAN, M.D., S. BEARHOP, G.M. HILTON, A.J. WALSH, & FOX, A.D. (2016): Conditions during adulthood affect cohort-specific reproductive success in an Arctic nesting goose population. – PeerJ 4:e2044

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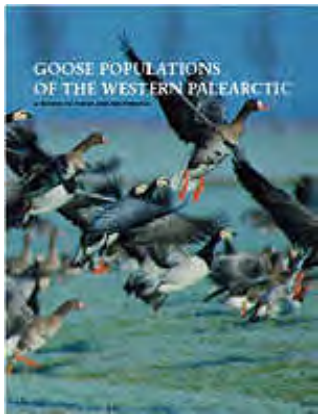
WORK, T.M., J. DAGENAIS, R. RAMEYER & R. BREEDEN (2015): Mortality patterns in endangered Hawaiian Geese (Nene; *Branta sandvicensis*). – Journal of Wildlife Diseases 51:688-695. doi: http://dx.doi.org/10.7589/2014-11-256.

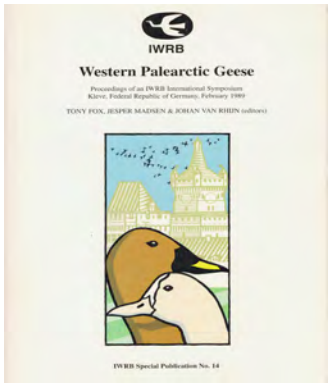
ZHAO, M., L. CAO, M. KLAASSEN, Y. ZHANG & FOX, A.D. (2015): Avoiding competition? Site use, diet and foraging behaviours in two similarly sized geese wintering in China. – Ardea 103: 27-38.



Literature

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

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



Proceedings Goose Meeting 1989 (Kleve, Germany)
Interested? Please contact:
johan.mooij@t-online.de

Proceedings Goose 2007 (Xanten, Germany)
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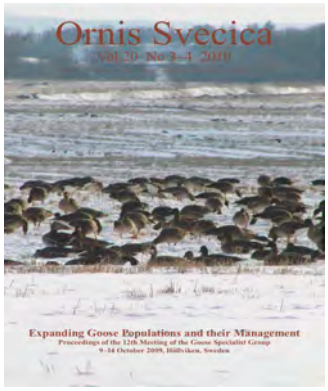

Proceedings Goose 2009 (Höllviken, Sweden)
Interested? Please contact:
leif.nilsson@zooekol.lu.se

Proceedings of the 14th meeting of the Goose Specialist Group

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

Proceedings of the 15th meeting of the Goose Specialist Group

The proceedings of the 15th meeting of the Goose Specialist Group held in Arcachon, France in January 2013 have appeared as a special edition of the journal **Wildfowl.**
By sending an email to wildfowl@wwt.org.uk a printed copy of this Special Issue (nr.3) can be ordered at the cost of £17 plus an additional £3.50 for credit card transactions.
It also can be downloaded for free at:
http://wildfowl.wwt.org.uk/index.php/wildfowl/issue/view/285

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Call for help:

As discussed during the Höllviken meeting we invite all goose researchers to send their publications to our data bank of geese literature. Not only international but also local publications (including those in languages other than English) are most welcome.
Please send your publications, preferably as a pdf file, to Fred Cottaar - fred.cottaar@tiscali.nl.

Instructions to authors

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

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