

# A critical review of Lesser White-fronted Goose release projects

Tomas Aarvak, Ingar Jostein Øien & Paul Shimmings

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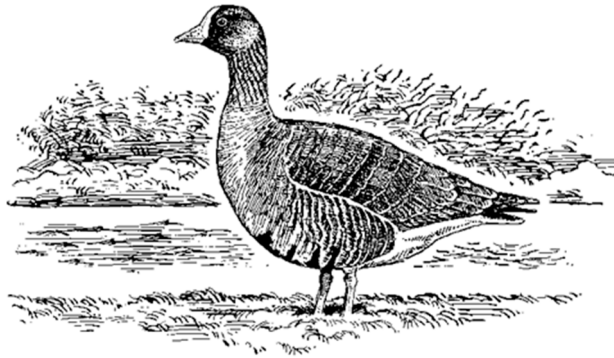


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**Tomas Aarvak, Ingar Jostein Øien & Paul Shimmings**

**BirdLife Norway 2016**

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E-mail: [nof@birdlife.no](mailto:nof@birdlife.no)

**Publication type:** Digital document (pdf) / 75 printed copies October 2016.

**Front page picture:** Lesser White-fronted Geese in the holding pen at the Valdak Marshes, Finnmark, Norway. Photo: Tomas Aarvak

**Key words:** Lesser White-fronted Goose, release project, reintroduction, translocation, illegal, genetic, distribution, population, court case, hybrid, barnacle goose, carrier species

**Recommended citation:** Aarvak, T., Øien, I.J. & Shimmings, P. 2016. A critical review of Lesser White-fronted Goose release projects. NOF-report 2016-6. 218 pp.

ISSN: 0805-4932

ISBN: 978-82-78-52140-3

## PREFACE

Conservation of species can be implemented at an international, regional or a local level. Many species are migratory, and cross political boundaries. For such migratory birds an international approach is often the best option, often supplemented by regional or local actions. Single actions in one country can have an enormous impact throughout the whole of the range of a particular population. For some species there are international flyway plans, which cover all range states for that particular species. Such is the case for the Lesser White-fronted Goose *Anser erythropus*.

The wild Fennoscandian population is the smallest of the three world populations of Lesser White-fronted Goose, all of whom have exhibited declines in numbers in recent decades. Conservation efforts directed towards the Fennoscandian population of this enigmatic goose involve many persons in an international network of people that monitor this population very closely. The amount of time and energy involved have paid dividends! The population has begun to increase thanks to conservation measures in many of the range states in which it naturally occurs. But, it is still in a perilous position, and it would take little to tip the balance in the opposite direction. Due to targeted conservation actions, from predator control in the breeding areas, through habitat protection at stopover sites on migration, to guarding by surveillance cameras and active patrolling in its winter quarters, as well as information campaigns and changes in hunting practices, then the future looks brighter today than it has for many decades for this remnant population.

However, in parallel to the intense ongoing conservation work for the Fennoscandian Lesser White-fronted Goose population, there has been a long ongoing debate regarding the value and implications of the reintroduction of the species in Sweden. The reintroduction activities have not been accepted unanimously by the international bodies working to safeguard the Lesser White-fronted Goose, and are considered to pose a real threat to the survival of the Fennoscandian population. The releases of captive-reared Lesser White-fronted Geese in Sweden have given cause for concern, not least due to our fears that birds from the reintroduced population might enter into the wild Fennoscandian population. Our fears have not been unfounded, as birds from the current release project in Sweden have been reported within the range of the wild Fennoscandian population, both during winter as well as at spring-staging sites. Released birds have also been observed within the natural range of the population in areas we hope might in future be recolonised naturally from the wild population. In addition to genetic aspects/hybridisation problems in the free-flying Swedish population, the released birds follow a human-modified flyway and utilise unnatural habitats during their life cycle. Extensive conservation efforts to safeguard the wild population across the whole of its range risk being jeopardised due to such careless and uncontrolled releases.

The aim of this current report is to present an overview of the release initiatives as well as a critical review of the



An adult pair of Lesser White-fronted Goose in the breeding area in Finnmark, Norway summer 2015. Photo: Tomas Aarvak.

effects that releases of Lesser White-fronted geese have had, or might have, upon the wild population. Work on this report commenced in 2014, four years after the start of the current releases of Lesser White-fronted Geese in Sweden, when it became evident that the release activities would carry on and escalate, even though it was well known that these actions were likely to be detrimental, rather than beneficial, to conservation of the Lesser White-fronted Goose in both Fennoscandia and along the entire flyway.

The report looks in detail at aspects of goose biology in general, at the effects and experiences of previous Lesser White-fronted Goose release projects, and the situation for both the wild Fennoscandian population and various releases (both legal and illegal). We discuss impacts that such releases have had, or are likely to have, upon the wild birds, and we have summarised currently available knowledge about release projects, and the numbers of birds involved where known, as well as assessed the viability of the released birds. This task has not been an easy one, and we have searched both published literature and greyer works for information. Thankfully, we have received much help and support in translating various articles and reports which were considered relevant to this report. The main persons involved are listed at the end of the document, but all who have forwarded information, no matter how small they may feel their contribution may have been, have been important in ensuring that the background data is as reliable as possible. We thank all who have taken the time to report their observations either directly to us or via their own national databases. We are also indebted to the innumerable people who have responded to our specific requests for further information. We are also grateful to all of the photographers whom have freely allowed us to reproduce their work in this report. It ought also to be pointed out here that not all of those whom we approached have been willing to assist in supplying information we requested towards the making of this report. We have for several years made repeated requests to The Swedish Species Information Centre (Artdatabanken) for data on the occurrence of Lesser White-fronted Geese in Sweden from the Swedish Species Observation System for birds (Artportalen). Such requests remained unanswered, until April 2016 when a refusal to supply sensitive data was received.

Despite the fact that certain institutions have been unwilling to assist us, we have persevered and found most of the necessary information through other channels. The report has been the result of countless hours of ploughing through literature, of telephone calls, correspondence with a network of observers, wildlife managers and other key persons. Production of this report has involved unsociable working hours and many cups (or rather many litres!) of coffee.

A series of ongoing disagreements regarding the captive breeding, supplementation and reintroduction of Lesser White-fronted Geese in Europe have severely hampered the implementation of conservation action for the wild populations of Lesser White-fronted Geese by repeatedly drawing away the focus of the international discussion from the urgent conservation priorities for the species. The data presented in this critical review should make it clear to everyone why we cannot accept releasing of Lesser White-fronted Geese and the negative effects of release projects upon the existing wild population in Fennoscandia. The majority of the European range states to the species as well as the wider international conservation community now consider the Swedish Lesser White-fronted Goose population to be a serious threat to the wild Fennoscandian population. It is therefore difficult to understand how these activities can still continue and be an issue for discussion that is obstructing important conservation progress of the original wild populations, including revision of the International Single Species Action Plan (ISSAP) for the species, which has now been ongoing for four years.

In Enare Sami, one of ten or more Sami languages (which belong to the Uralic language family), the species is known as “Lavláçuonja”, or “the singing goose”. We hope that by halting the further

releases of Lesser White-fronted Geese we can ensure that this enigmatic bird species continues to sing in the countries where the species naturally occurs or once occurred. The existence of the Fennoscandian population can be safeguarded by international cooperative efforts, and must not be threatened by actions that work against internationally agreed conservation priorities for the species.

By cooperating at all levels, we can together save the Lesser White-fronted Goose! We cannot accept that projects that are not part of an international flyway plan, and which may place the species in an even more perilous state than today, be allowed to continue. The Fennoscandian Lesser White-fronted Goose Conservation Project are indeed working towards a reestablishment of Lesser White-fronted Geese in the former breeding range of the species, also in Sweden. We warmly welcome Swedish colleagues to cooperation to reach this goal by following the scientifically founded and internationally agreed conservation priorities for the species in the future.

Tomas Aarvak

Ingar Jostein Øien

Paul Shimmings

Trondheim 27th October 2016



Lesser White-fronted Geese resting along the shoreline at the Valdak marshes, Finnmark, Norway, autumn 2016. Foto: Tomas Aarvak.

## EXECUTIVE SUMMARY

### Introduction

The Lesser White-fronted Goose *Anser erythropus* remains globally threatened and critically endangered within Europe, following a rapid decline during the past decades. Three original wild populations of Lesser White-fronted Geese are internationally recognised. These are the Fennoscandian population (breeding in Norway, Finland and the Kola Peninsula of NW Russia), the Western Main population (nesting in northern Russia to the west of the Taymyr Peninsula), and the Eastern Main population (nesting from the Taymyr Peninsula eastwards and wintering in China). In addition to these three wild populations a small population exists in Western Europe (henceforth called the Swedish population), which was established by releasing captive-bred birds within the former range of the Fennoscandian population in Sweden and which migrate to wintering grounds in the Netherlands using a human-mediated flyway.

International conservation activities for Lesser White-fronted Geese within the Western Palearctic follow the priorities outlined in the AEWA International Single Species Action Plan (ISSAP) adopted in 2008, the focus of which is clearly on the conservation of the original wild populations. Both this International Action Plan, as well as its predecessor adopted under the framework of the Council of Europe in 1996, express concerns regarding the potential threat posed to the existing Fennoscandian population by the free-flying Lesser White-fronted Geese released in Sweden.

The ongoing disagreements regarding the captive breeding, supplementation and reintroduction of Lesser White-fronted Geese in Europe have over the years severely hampered the implementation of conservation action for the remaining wild populations of Lesser White-fronted Geese by repeatedly drawing away the focus of the international discussion from the urgent conservation priorities for the species. Repeated attempts to revise the International Single Species Action Plan for the Lesser White-fronted Goose have, for example, effectively been halted due to these ongoing controversies. In addition, and more worryingly, the release projects themselves are increasingly considered to be directly detrimental to the conservation and future of the Fennoscandian population.

As such, and in light of the continued debate surrounding these releases of Lesser White-fronted Geese into the wild in Europe and their supposed conservation value, the Norwegian Ornithological Society (NOF/BirdLife Norway) has undertaken this critical review of both past and present release projects.

In addition to reviewing the release projects themselves, this report addresses a wide range of topics related to Lesser White-fronted Geese, such as their historical distribution and population size, as well as the current situation regarding released birds and their impact on the original wild Fennoscandian Lesser White-fronted Goose population. In doing so, the review draws upon information from a wealth of publications and internal documents, as well as from information provided by conservation experts. The review also presents conclusions and recommendations for next steps based on the information presented.



## **Releases of captive-bred Lesser White-fronted Geese in Europe**

Following the continued decline of the species throughout the Nordic range states, several release projects or experiments were implemented from the late 1980s onwards. These included the release of captive-bred birds in Finland (1987-1997), the release of captive-bred birds in Sweden in 1999 as part of a French micro-light project as well as a pilot project implemented in Norway which resulted in the release of captive-bred goslings in 2010 and 2011. These efforts were all subsequently abandoned after it was concluded that the attempts to supplement the existing population had failed (i.e. the mortality of the released birds was very high, they did not follow the wild birds etc.). Following the government imposed ban on releases in Finland, there have also been three recorded cases of illegal releases in that country.

By far the most consequential of these endeavors, the Swedish project to reintroduce Lesser White-fronted Geese by releasing captive-bred birds at a former breeding site in Swedish Lapland during 1989-1999 managed to establish a small population. The birds were released together with Barnacle Geese *Branta leucopsis* as foster parents, and the Lesser White-fronted Geese followed their foster parents to their wintering areas in the Netherlands, and subsequently returned to the area of release the following spring, thus effectively establishing a new modified migratory route to wintering grounds that were considered safer than along the traditional flyway. The population built up gradually until 2002, and thereafter fluctuated between 110-130 individuals between 2003-2011, based on winter counts conducted in the Netherlands. After 1999, the releases were stopped, following the detection of alien genes in some of the captive-breeding stock.

In 2010, the efforts to supplement the existing Swedish population by releasing more captive-bred birds were started once again, this time using wild individuals captured from the Western Main population in Russia for the captive breeding programme. Between 2010 and 2015 a total of 213 individuals have been released in the mountainous region around Arjeplog in Swedish Lapland, as well as in the public park in Hudiksvall which is used as a moulting site by some of the Swedish Lesser White-fronted Geese. Most of the released birds have been goslings, but also some yearlings (second calendar-year) have been released. Unlike the previous project in Sweden, these birds have been released without any parent geese.

In addition, a pilot project aiming to introduce an additional new migration route for Lesser White-fronted Geese by imprinting newly-hatched goslings on a micro-light aircraft was founded in 2001 by Aktion Zwerggans in Germany. The plan has been to release birds in northern Sweden and to guide them with the aircraft along the Swedish Baltic coast, through Denmark and to the Lower Rhine in Germany. The project has not yet carried out any releases, but the stakeholders involved are still active. It is unclear, however, as to why this project would want to establish a new wintering area for Lesser White-fronted Geese in Europe. It should also be noted that no independent impact assessment of the project is available.

## **Why do the past and present releases pose a threat to the remaining wild Fennoscandian population?**

Already in the mid-1980s, concerns were raised by many, including the International Council for Bird Preservation (ICBP, now BirdLife International), about the Swedish reintroduction project because of the possible negative effects of artificial rearing and human-induced change of the migration route that would put the remaining wild population under further pressure. Additionally, diverting resources from the conservation work on the wild populations towards reintroduction activities was

considered to be counterproductive. Since then, a variety of threats posed by the released birds to the Fennoscandian population - if and when birds from the two populations should meet - have been identified. These are briefly outlined below and are described in more detail throughout the review.

### *Genetics*

As mentioned above, genetic studies had revealed that some birds used in the first Swedish release project carried genetic material from other species, notably Greater White-fronted and Greylag Geese. Hybridisation between Lesser White-fronted and Greater White-fronted Geese has been recorded in captivity, but although hybridisation between these two species in the wild might be possible, there is little or no evidence to show this to be the case.

Following recommendations provided by two genetic experts, the Swedish authorities have revised their captive-breeding programme by attaining new breeding stock from the Western Main population in Russia. It was further recommended, that by introducing “pure” captive-bred birds into the free-flying population, this might dilute the existing hybrids in the Swedish population over time. There is, however, no evidence available that the Lesser White-fronted Geese released after 2010 have in fact mixed and successfully bred with the extant population. As such, it must be concluded that the genetic impurities resulting from the use of impure stock continue to exist unchanged in the Swedish population today.

### *Hybridisation*

In addition to the genetic issues mentioned above, the Swedish population includes a number of hybrids between Lesser White-fronted Geese and Barnacle Geese. The first of these stem from hybridisation between the released captive-bred offspring and their foster parents and date back to at least 1999. Hybrids between these two species continue to be recorded in the population, although efforts have been made to cull these. Despite claims to the contrary, second-generation hybrids have also been recorded in Sweden.

There are many recorded observations of the captive-bred Lesser White-fronted Geese that have been released in Sweden from 2010 onwards, associating with other goose species, and indeed with other Anatidae species, both along the human-modified migration route and in the Dutch wintering areas, as well as in other countries. Such associations increase the chances of released individuals spreading throughout the migratory routes of Anatidae in Europe (including outside the species ordinary distribution range) as well as the chance of hybridisation.

### *Changes in migratory patterns and routes*

Birds which stem from the previous release project in Sweden between 1980-1999 mainly follow the human-modified migration route to wintering sites in the Netherlands, although there are re-sightings of birds from countries outside of this flyway, for example from Norway, Estonia and Spain. Birds released in Sweden since 2010 have been recorded mainly in the Netherlands during winter. However, there are also records of these birds turning up in other countries, including Belgium, Germany, Poland, Denmark, Norway, the United Kingdom, Hungary, Lithuania, and Estonia. In addition, released birds have started wintering in Sweden with up to 21 individuals recorded in 2014-2015.

More worryingly, as of March 2016, birds released in Sweden have been recorded at sites that are also used by the wild Fennoscandian Lesser White-fronted Geese, including at the Valdak Marshes in

Norway, the Nemunas Delta in Lithuania, at Hortobágy National Park in Hungary and in Poland. That Lesser White-fronted Geese originating from Swedish releases are now observed at sites used by the Fennoscandian birds illustrates just how easy it is for Swedish birds to potentially enter into the Fennoscandian population.

In geese, young birds learn the migration route by following their parents and the family unit is extremely important for their development. Since 2010, Lesser White-fronted Geese have been released in Sweden without any parents, in the hope that they might find other conspecifics breeding in the Arjeplog mountains or at Hudiksvall and subsequently follow them to the wintering grounds. Many of these released geese have instead travelled in all irrelevant directions from the release site and have not followed the others along the human-modified migration route. In addition to increasing the risk that birds released in Sweden will thus mix with the Fennoscandian flock, releasing birds without previous parental guidance or the necessary life-skills into the wild also poses ethical questions as to the merits of the current release project.

It should also be noted that at least during some years, a high proportion of captive-bred males, and on occasion even exclusively males, have been released in Sweden. Female geese have a higher degree of nest philopatry, whereas males are the sex that disperse from the natal area. This increases the chances of dispersal to new areas, again heightening the risk of Swedish released birds entering into the Fennoscandian flock. Releasing an overabundance of males will of course lead also to an imbalance in the sex ratio of the Swedish population.

#### *Changes in habitat preferences*

Wild, natural populations of Lesser White-fronted Geese are habitat specialists, almost exclusively exploiting natural steppe and saltmarsh habitat during migration and winter, as well as short-grazed semi-natural grasslands (including grazed coastal meadows), although also at times cereal stubbles. Although this preference for natural habitats, which have diminished throughout their range, may be one of the original causes behind the long term decline of the species, it is also one of the key characteristics of the original wild Lesser White-fronted Geese.

The Swedish birds, however, have made the transition to feed on cultural habitats/farmland during winter, as well as park lawns during summer and autumn. This may lead to conflicts between geese and agriculture if this population should grow and could potentially also be one of the factors behind the lower viability of the Swedish population (see below), although no studies are available to confirm this.

#### *Behavioural changes*

A typical phenomenon attributed to birds kept and/or raised in captivity are changes associated with their behaviour. Reduced shyness is a common behavioural trait of captive birds, and released captive-bred Lesser White-fronted Geese have exhibited such a change. Reduced anti-predator behavior has also been proposed to explain the higher insensitivity of such released birds, with a loss of anti-predatory responses and escape abilities. The Lesser White-fronted Geese released in Sweden have proved to be very tame, allowing people to approach them closely, and do not react negatively to potential predators (such as dogs and cats in the park in Hudiksvall).

#### *Diseases*

Geese are subject to a number of contagious and indeed fatal diseases, and the most common ones are listed in the main body of the report. Bacterial infection from *E. coli* which resulted in the failure

of the liver and spleen was the probable cause of death of one of the birds used in the supplementation attempt in Norway in 2010, which had been received from the Swedish captive-breeding programme.

#### *Decreased viability*

All of the issues concerning the Swedish population related above contribute to the decreased viability of the individual birds and the population as a whole.

The mortality of the Swedish released population is higher than that experienced by the wild Fennoscandian population, and the return rate to the release area is lower. Additionally, the average brood size is lower for the Swedish birds compared to that of the Fennoscandian population (2.7 young per brood in Sweden, 3.3 young per brood in Norway). The proportion of broods produced in the Swedish reintroduced population is also far lower. The Swedish population produces on average 0.14 young per adult, while the corresponding figure for the Fennoscandian population is 0.47. Since the releases in Sweden were resumed in 2010, the population has crashed, and the causes of this decline remain currently unexplained. Predation by Red Fox and by White-tailed Eagle has been cited as an important mortality factor in the release area. However, an increase in predation levels cannot fully explain the decrease in population size despite the continued releases of birds since 2010.

There was, as expected, a significant positive correlation between the numbers of birds released and the population development in the years 1989-1999, based upon the population size estimated from counts during winter in the Netherlands. However, after the new releases began in 2010, there is now a significant negative correlation between release numbers and estimated population size during winter for the years 2010-2015. Possible explanations include that the newly released birds (from 2010 onwards) have an unusually high mortality (due to various reasons). This high mortality may also affect the population that was already present in the release area (for example by attracting predators into the area in search of easy prey).

## **International attempts to reach consensus**

There have been several meetings between the respective range state governments as well as key stakeholders attempting to reach an agreement on the conflicting positions with regard to the release projects, the history and details of which are included in this review. The current main points of controversy within the international discussion, in addition to the identified threats mentioned above, are listed below.

#### *The status of the Swedish population as supplemented or reintroduced*

In the Swedish Lesser White-fronted Goose National Action Plan adopted in 2011, the Swedish reintroduced population is described as a reinforcement of the existing wild Fennoscandian Lesser White-fronted Goose population (and as such should be considered part of the original Fennoscandian population), based on the claim that some wild Fennoscandian Lesser White-fronted Geese still existed in the reintroduction area when the releases started in the early 1981. An opinion provided by the Chair of the IUCN Reintroduction Specialist Group concluded that, due to the large numbers of observations the Swedish releases could be considered a reinforcement to an extant population, rather than a reintroduction. This assessment, however, did not take into account any other factors and thus the conclusion of this critical review is somewhat different, in that even if the first releases were made in Swedish Lapland whilst there were still genuinely wild birds in the area, the naturalness of this remnant population was destroyed by the introduction of birds of impure

genetic make-up and with the introduction a human-modified migration route. The Swedish population cannot be considered a part of the original wild Fennoscandian population.

#### *The previous existence of a Western flyway*

Claims have also been made by the stakeholders of the Swedish (and proposed German) release project(s) regarding the existence of a western migration route or Atlantic Flyway previously used by Lesser White-fronted Geese in order to misrepresent the fact that the migratory route currently used by the Swedish population is in fact human-induced. A review commissioned to the British Trust for Ornithology (BTO) concluded that there was little evidence that such a route existed before the Swedish releases began, and that records of Lesser White-fronted Geese in Western Europe used as an argument for the existence of such a route were of vagrants caught up with other species.

Claims that there have previously been regular wintering and/or staging areas in Northwestern Europe (Germany, the Netherlands and the United Kingdom) are also not supported by hard evidence. Rather, the species is considered a vagrant in these countries. This fact is also supported by fossil and archeological evidence, which reveals that Lesser White-fronted Geese were not consumed by humans in Western Europe in medieval times, even though there are many finds of other goose species being consumed then.

#### *The international status and acceptance of the Swedish population*

As has become clear during the ongoing revision process of the AEWA International Single Species Action Plan for the Lesser White-fronted Goose, the proponents of the Swedish release project and (some) of the range states hosting the Swedish population wish to increase the international recognition and acceptance of their population and thus also ensure that it receives the same conservation priority as the original wild populations. The majority of the range states which host the original wild Fennoscandian population as well as the stakeholders involved in its conservation, view the Swedish population as a severe threat to the further existence of the Fennoscandian population and wish to avoid at all costs that the two populations meet and mix in the future.

## **Conclusions and recommendations**

The main conclusions and recommendations of this critical review are as follows:

- **Releasing Lesser White-fronted Geese is not an appropriate or necessary conservation action** to address the threats still faced by the original wild Fennoscandian population at this time.
- To the contrary, **the continued releases in Sweden constitute a significant additional burden and threat to the Fennoscandian population**. As documented in detail throughout this review, the available evidence indicates that the ongoing release project is jeopardizing the continued existence of the Lesser White-fronted Goose as a wild bird breeding in Fennoscandia and as a staging and wintering species throughout its traditional migratory routes in Europe. The possible consequences of the Fennoscandian birds coming into contact with the released birds constitute a serious threat to the population and include, but are not limited to, a possible alteration in their natural behaviour, changes in the sites and habitats they use as well as genetic introgression and reduced viability. The mere potential of this threat **constitutes an unacceptable risk** and the **precautionary principle** urgently needs to be taken into account.

- **The best way to safeguard the existing original wild population of Fennoscandian Lesser White-fronted Geese** and to ensure that it attains a more favourable conservation status **is to continue and enhance the conservation regime currently in place in all areas where the original population occurs** (i.e. at the breeding, staging and wintering sites).
- It is therefore **urgently recommended that all current and planned releases of Lesser White-fronted Geese in Europe are halted immediately, in an effort to mitigate the potential negative effects on the original wild Fennoscandian population**. If the releases are stopped now, then the majority, and perhaps all, of the released Lesser White-fronted Geese in Sweden would gradually disappear as the mortality of the released birds is high and the return rate to the natal area is low (as highlighted in this review). **By stopping the releases of birds immediately, the risk of the wild population coming into contact with the released birds would be greatly reduced**, and perhaps even eliminated.
- With regard to the **pending revision of the AEWA International Single Species Action Plan** for the Conservation of the Lesser White-fronted Goose, **any proposed changes which would alter the current status or conservation priority of the Swedish population, and thereby support the continued releases of birds or even a further increase or escalation of the release activities must be avoided**. Considering the increased potential threat to the wild Fennoscandian population posed by the continued releases, it would constitute a major contradiction to sanction actions aiming to increase the Swedish population whilst simultaneously setting goals and targets for the conservation of the Fennoscandian population. A revised International Action Plan that is not clear in addressing the genetic and ecological threats posed by the Swedish population would be a direct obstacle to the international conservation of the Fennoscandian population.
- **The focus of any revised International Action Plan must clearly remain on the conservation of the original wild populations of the species.**
- The **options recommended** by the Fennoscandian Lesser White-fronted Goose project **on how to move forward with the revision of the AEWA International Single Species Action Plan** are:
  - 1) The revised Action Plan includes all populations of Lesser White-fronted Geese within the Western Palearctic, **but addresses the genetic and ecological issues posed by the Swedish population** (as well as by any other releases of Lesser White-fronted Geese) **as a potential threat** to the Fennoscandian population as outlined in the current Action Plan.
  - 2) The focus of the revised Action Plan **is limited to cover only the original, naturally occurring Lesser White-fronted Goose populations**, i.e. the Swedish population is excluded from the scope of the Plan.

A third possible option, if no consensus for either of the two scenarios above can be found, is of course to maintain the Single Species Action Plan adopted in 2008 as the internationally agreed framework for conservation action for the Lesser White-fronted Goose within the Western Palearctic.

It should also be noted, however, that although the Swedish population is included in the scope of the current Action Plan, the Swedish National Action Plan as well as the Swedish authorities and other stakeholders along the flyway do not follow the internationally agreed activities set out therein. As such, there seems to be little merit in continuing with any Plan

that includes the Swedish population as there are no guarantees that Sweden and/or the stakeholders concerned will in fact follow a new Action Plan which has not been modified specifically to meet their goals.

Following the continuous conservation efforts across the migratory routes of the original wild Fennoscandian Lesser White-fronted Goose population, we are slowly starting to see a positive trend. As the **Fennoscandian population is currently increasing at an annual rate of 15%, there is a good chance that the species may naturally recolonise some of the former breeding areas** in Sweden and Finland, which would reflect the desired scenario included in both the Norwegian and the Finnish National Action Plans for the Lesser White-fronted Goose. We would very much welcome a collaboration amongst all Fennoscandian range states to work towards this goal, eventually bringing back the original wild population to many of its former breeding areas.

Last but not least, the international conservation community must find a way to move past these ongoing disputes which have been seriously counterproductive for the conservation work for the wild populations during the past 20 years and to focus all available resources on the conservation of the remaining original wild populations.

As the increase since 2010 in the Fennoscandian population shows, it is not yet too late!

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## 1. BACKGROUND

Plans and projects for the reintroduction of the Lesser White-fronted Goose *Anser erythropus* have been the subject of intense debate for many years, and the ongoing debates have been considered detrimental to the international conservation efforts for safeguarding the original wild populations of the species. The Fennoscandian Lesser White-fronted Goose conservation project, run jointly by NOF-BirdLife Norway and WWF Finland since the early 1990s, has taken, and continues to take, a critical stand towards such (re)introduction projects for a number of reasons. These reasons are partly summarised by Lee et al. (2012) who state that: *“While translocation techniques are improving continuously and, for some species, have clearly represented the difference between survival and extinction in the short-term, translocation projects are still associated with numerous problems and consequently still have a low success rate. Problems that are significant include (1) difficulty in establishing self-sustaining captive populations, (2) poor success in release attempts, (3) high costs, (4) introgression of alien DNA, (5) pre-emption of other conservation measures, (6) disease outbreaks, and (7) maintaining administrative continuity”*.

The most frequently discussed problems regarding reintroductions of the Lesser White-fronted Goose have been related to genetic disturbance (i.e. the genetic composition of the stocks used, and planned to be used, for reintroduction) and to the modification of natural flyways by humans. There are also other reasons to take a critical stand towards the current reintroduction programmes and to be aware of the negative impacts, in particular the impact that the Swedish reintroduced population potentially could have on the original wild Fennoscandian population, if/when they come into contact. The problems related to the Swedish reintroduction project were raised at a very early stage during the process to develop an international Action Plan for the species, and the project was criticised from the very beginning. In 1998, the International Council for Bird Preservation (ICBP), the organisation which grew into the BirdLife International partnership expressed concerns about the effect of inducing another migration route by using Barnacle Geese *Branta leucopsis* as foster parents for the released Lesser White-fronted Geese (see letter from ICBP-Denmark, dated 23.12.1988, Appendix A). Most, if not all, of the concerns raised by ICBP have since proven themselves to be genuine problems, such as the concerns about what might happen regarding genetic composition issues (Ruokonen et al. 2000, 2004, 2007). Recent attempts by the Swedish Association for Hunting and Wildlife Management and the Swedish Environmental Protection Agency (SEPA) to ignore the problems and omit facts in their National Action Plan (see further discussion about this in **chapter 8.7**), as well as attempts to marginalise the scale of criticism (Liljebäck et al. 2014) do not solve any of the problems related to the Swedish reintroduced population. On the contrary, the ongoing activities in Sweden will further jeopardise not only the conservation work on the original wild populations, but will create new human-induced problems for birds breeding in Sweden and its neighbouring countries.

We understand and appreciate that many stakeholders have a genuine interest in the conservation of the Lesser White-fronted Goose. However, it is vital that any such reintroduction or release projects are critically reviewed before commencement. It is in particular vital to assess where such measures will possibly cross the line of contributing to the conservation of a species and instead become harmful. When efforts turn out to be counterproductive, and in this case both detrimental to international conservation actions and to the wild populations of the species, it is important to stop and reevaluate the strategies pursued. The means are not an excuse for reaching the goals, and sometimes there are no easy solutions to the problems. The idea to side-stepping the problem instead of doing something to resolve it, such as was the case when modifying the migration route in order to lower the adult mortality rate, is definitely not a good solution. The human mediated migration route takes the birds primarily to the Netherlands. There is a real threat that this route might also be adopted by the remaining original wild breeding birds in Fennoscandia which winter

farther south and east in Europe. If the original wild Fennoscandian Lesser White-fronted Geese that traditionally have staged in Finland, Estonia, Hungary as well as other countries, and wintered in Greece, were to mix with the Swedish population and follow the Swedish population on the human-mediated flyway to the Netherlands, thus disappearing from their natural staging and wintering sites, it would be a serious biodiversity loss for the countries that host, and have the conservation responsibility for these magnificent birds throughout much of their annual cycle. Larsson (1993) evaluated the Swedish reintroduction project which began in 1980 (von Essen 1991). He warned that there was a considerable risk that the most effective long-term conservation actions for the species were not being implemented, and that the reintroduction project would take the focus away from these actions. This is indeed what has happened, and in recent years, this has escalated to a dilemma which is difficult to resolve. Another serious and problematic issue is that the Swedish governmental authorities and stakeholders base their arguments and decisions on publications that are either flawed or erroneous. Three of these publications (Kampe-Persson 2008, Mooij & Heinicke 2008, Mooji et al. 2008) have been the focus of an independent expert review undertaken by the British Trust for Ornithology (BTO) (see **chapter 8.1**), which also scrutinised two additional papers with the same fundamental problems (Mooij 2010, Kampe-Persson 2010). These and several other publications are also scrutinised here (see for example **chapter 8.3**). Such publications have further led to an unclear understanding of what is the true nature of the breeding, migration and wintering biology of the Lesser White-fronted Goose. The claims in the publications of the stakeholders that support continued releases of captive bred Lesser White-fronted Geese, about the existence of a traditional migration route from Fennoscandia to Western Europe, and that part of the Swedish breeding population used to winter in the Netherlands and Great Britain prior to the reintroduction projects, are not supported by concrete evidence. Rather, the species has long been a rare vagrant in these two, and neighbouring countries.

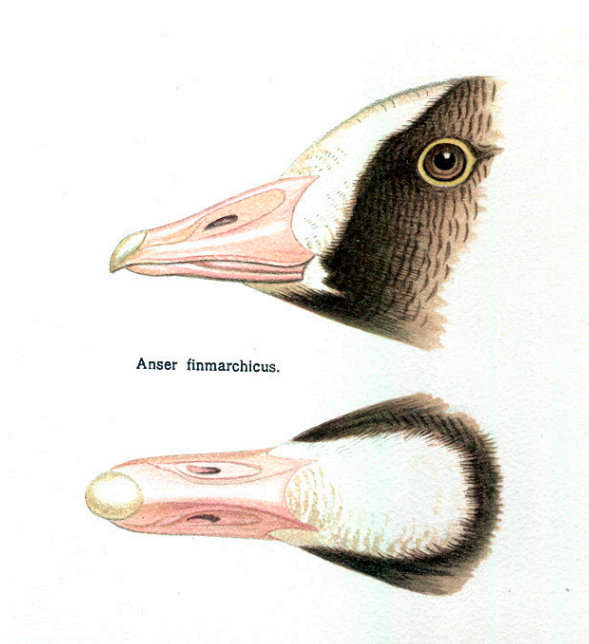
In this current report, we present details on the various release projects, as well as evidence documenting how these reintroduction projects have already, and are in future likely to (if allowed to continue), jeopardise the conservation efforts made towards safeguarding the Fennoscandian population of Lesser White-fronted Geese, and also now these activities are negatively influencing the conservation work for both the western and eastern populations of this species. Unfortunately, it is our perception that the stakeholders of continued reintroduction activities have presented biased and misleading information to support their project.

Internationally, the conservation work for the original wild populations of Lesser White-fronted Geese follow the priorities as agreed in the International Single Species Action Plan (ISSAP) for the Lesser White-fronted Goose that was first published in 1996 by the Council of Europe (Madsen 1996). An updated ISSAP was compiled by BirdLife International and adopted by the African-Eurasian Waterbird Agreement (AEWA) in 2008 (Jones et al. 2008), with an implementation period covering the years 2008-2013. The possible threats that the Swedish free-flying reintroduced population might impose to the wild Fennoscandian Lesser White-fronted Goose population were taken into account in both these action plans, although many compromises towards the Swedish population were made during the 2008 negotiation ISSAP process. The plan was based on the conclusions of the international “Workshop on Protection of Lesser White-fronted Goose” held in Lammi, Finland, from 31st March to 2nd April 2005. However, due to disagreements around the reintroduction issues the whole process stagnated. Then, after an AEWA Secretariat negotiation mission in January 2007, an agreement on how to proceed with the work was reached in November 2007, and the ISSAP was adopted by the 4th Meeting of the AEWA Parties in September 2008. A process to update this ISSAP was initiated in 2012 during the 2nd Meeting of the AEWA Lesser White-fronted Goose International Working Group, at Lake Kerkin, in Greece. Regrettably, the process has again been held up due to the strategy adopted by the Swedish Environmental Protection Agency, which now claims that the Swedish reintroduced population is a wild population that is part of the Fennoscandian population,

and demanding that it should be given the same conservation priority as the true wild populations, thereby effectively blocking progress in updating the ISSAP. As of October 2016, the AEWA ISSAP is still under revision, and two drafts have been circulated to the range states and a third draft has been circulated to the Committee for Captive Breeding, Reintroduction and Supplementation of Lesser White-fronted Geese in Fennoscandia (**chapter 6.4**). It is unfortunate that Sweden has ignored their international obligations and continued the controversial release activities, despite having adopted the ISSAP for the species, thereby ignoring the mutually agreed Action Plan and the recommended conservation actions that were adopted by the 22 principal range states for the species within the Western palearctic.

Information about the current Swedish release programme, the whereabouts of the released individuals, and information on how many birds are estimated to have survived following these releases is difficult to obtain. Although some information is available in some of the reports produced by the Swedish Lesser White-fronted Goose project (*Projekt Fjällgås*), comprehensive information about these geese is largely lacking. In order to obtain information used in this critical review report, we have relied on information from various national bird recording committees (national rarities committees), and from a network of international contacts, as well as information published on various websites. One problem with web-based information is that much of it is only publically available for a limited period of time, before either being updated or even deleted completely. For movements of Swedish Lesser White-fronted Geese recorded in Norway (colour-ringed and satellite-tagged individuals) we have had to rely on older information in the form of screen-grabs.

This critical review of Lesser White-fronted Goose reintroduction projects addresses issues pertaining to both former attempts to release Lesser White-fronted Geese in Fennoscandia, as well as the current Swedish project where first releases were made in 2010. The review addresses many topics ranging from historical distribution and population size, to past and present reintroduction projects, and to the current situation regarding the ecological and genetical problems with the existing free-flying reintroduced population in Sweden and their possible impact on the wild Fennoscandian population of Lesser White-fronted Goose. As mentioned above, the review has drawn upon information from a wealth of publications and internal documents, as well as from information from dedicated field workers.



الأوز الأغر الصغير - Arabic  
Ծվվան Սազ - Armenian  
小白额雁 - Chinese  
Νανόχηνα - Greek

The Lesser White-fronted Goose has many names, and most of them describe its diminutive size or its call. In one of the Sami languages spoken in northern Fennoscandia the name is Gálbjenjunneçuoñjis, which means “calf-nose goose”. This describes the resemblance with the white face of new-born reindeer calves. This illustration of a Lesser White-fronted Goose head is from Alpheraky (1905) at the time when the scientific name was *Anser finmarchicus*. The name comes from the northernmost region in Norway where the Lesser White-fronted Goose used to be a common breeder during summer in the mountains.

## 2. REINTRODUCTION AND TERMINOLOGY

### 2.1 Definitions

Terminology relating to translocation, reintroduction and supplementation has been used inconsistently in the past, thereby resulting in some confusion. Terms such as “exotic”, “alien” and “non-native” describe the origin of the species concerned, whereas “feral”, “introduced” and “reestablished” describe the processes by which establishment in the wild has occurred (Holmes & Simons 1996, Holmes & Stroud 1995). Translocation as a tool that has been scrutinised during the last two decades, as an ever-increasing number of translocation projects worldwide have aimed at re-establishing extinct or threatened populations. To improve conservation work, the International Union for Conservation of Nature (IUCN) developed a set of guidelines in 1998, i.e. the “IUCN guidelines for re-introductions”. In 2012, AEWA commissioned the Wildfowl and Wetlands Trust (WWT) to create a set of guidelines specially to address the issue of translocating waterbirds for the purpose of re-establishing or reinforcing a species in its historic range. The commissioned work brings additional focus on conservation introductions and risk analyses as a tool for determining whether or not a translocation should go ahead (Lee et al. 2012). These guidelines were adopted by the AEWA Meeting of the Parties (MOP5) in 2012, and all AEWA Parties are recommended to follow them.

Throughout this report, the following terms and definitions are used:

#### 2.1.1 Translocation

**Translocation** is the human-facilitated deliberate and mediated movement of wild individuals or populations from one part of their range to another.

There are several types of **translocation**: introduction, reintroduction, reinforcement/supplementation and restocking:

**Introduction** is the deliberate or accidental translocation of a species into the wild in areas where it does not occur naturally (outside its historically known range). Introduction of non-native species occurs for a variety of reasons (see below for definitions of a non-native taxon). Examples include economic gain (Sitka Spruce *Picea abies*), improvement of hunting and fishing (Canada Goose *Branta canadensis*), ornamentation of roads (*Rhododendron spp.*) or maintenance (Sweet Chestnut *Castanea sativa*). In the past, negative effects of translocation introductions of non-native species to ecosystems far outweighed the benefits of them.

**Reintroduction** is an attempt to establish a species in an area which was once part of its historical range, but from which it has been extirpated or become extinct. Re-establishment is a synonym, but implies that the reintroduction has been successful. Reintroduction is used as a wildlife management tool for the restoration of an original habitat when it has become altered of a species which has become extinct due to overcollecting, overharvesting, human persecution, or habitat deterioration.

**Reinforcement/supplementation**<sup>1</sup> is the release of an organism into an area of its native range where it still occurs in order to supplement/build up the existing population. Groome et al. 2006 in

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<sup>1</sup> The Oxford English dictionary defines **reinforcement** as “Make stronger by adding more men or material; increase the size, thickness of something so that it supports more weight” and **supplementation** as “Added later to improve or complete, e.g. a dictionary”.

Principles of Conservation Biology defines supplementation as “Addition of individuals to an existing population of conspecifics.”

**Restocking** is the translocation of an organism into the wild into an area where it is already present. Restocking is considered a conservation strategy where populations have dropped below critical levels and population recovery is questionable due to slow reproductive rates, high mortality or inbreeding. The International Union for Conservation of Nature (IUCN) recommends that restocking only occur when the causes of population decline have been removed, the area has the capacity to sustain the desired population, and individuals are of the same race as the population into which they are released but not from genetically impoverished or cloned stock.

Since there is no standardised term to describe any programme that involves the release of an organism into its historic range either for reintroduction or supplementation, Lee et al. (2010) in their feasibility study used the term “reintroduction/supplementation” for this purpose.

For further discussions around this terminology and issues, see for example IUCN (1998), IUCN/SSC (2013), Armstrong & Seddon (2008) and Lee et al. (2012).

**Conservation introductions:** the intentional movement and release of an organism outside its historic range. There are two types:

- **Assisted colonisation:** the intentional movement and release of an organism outside its historic range when protection from current or likely future threats in the historic range is deemed less feasible than at other sites.
- **Ecological replacement:** the intentional transport and release outside its historic range of an organism to perform a specific ecological function lost through extinction of other taxa.

Of the various types of translocations, the assisted colonisation and ecological replacement are the most controversial with ecological and ethical arguments underpinning the criticism of them (Ricciardi & Simberloff 2009, Sandler 2009, Williams et al. 1988). It is generally understood that historical range boundaries are associated with ecological factors that promote survival of viable populations, and therefore that locations outside historical ranges are less suitable. Identifying the necessary ecological conditions and habitats outside the historic range would be virtually impossible. Other arguments against releases outside the historic range are that assisted colonisation exacerbates the invasive species problem, and the release of threatened or endangered fauna may have unintended impacts on target systems (Davidson & Simkanin 2008, Huang 2008, Ricciardi & Simberloff 2009).

### 2.1.2 Naturalised

“**Naturalised**” is an all-encompassing term for wild self-sustaining populations of such species (“exotic”, “alien” and “non-native”), describing the outcome of the process. The term “naturalised” can be accompanied by a qualifier explaining the origin of the species concerned to produce the following categories:

- **Naturalised feral:** a domesticated species established in the wild. Note that mere keeping in captivity does not necessarily constitute domestication. The species must undergo some change in genotype, phenotype or behaviour in captivity.

- **Naturalised introduction:** established species which would not occur without introduction by man.
- **Naturalised re-establishment:** a successful re-establishment of a species in areas of former occurrence. Note that “re-established” is favoured over “reintroduced”. The latter is often used to describe species which have been re-established in an area of former natural occurrence, following extinction.
- **Naturalised establishment:** establishment of a species which occurs but does not breed naturally in a given area e.g. a vagrant, passage migrant or winter visitor. Note that these terms are meaningless without some geographical reference.

Owen et al. (2006) defined a non-native taxon as “a species, sub-species or discrete geographical population that would not occur in an area without interference by man”. This includes:

- A taxon introduced to a region where it normally only occurred outside the reproductive season.
- A taxon introduced entirely outside of its previous known range.
- A taxon imported and taken into captivity at a location outside of its normal range.
- Domesticated taxa that have established in the wild, including domestic-type strains that have arisen by hybridisation between wild and domesticated individuals.

A prerequisite of a naturalised population is that it is self-sustaining (Sol et al. 2005).

### 2.1.3 Population definitions

The following terms are used to describe natural groups of individuals in ecological studies according to Wells et al. (1995):

<b>Metapopulation</b>	A set of spatially disjunct populations, among which there is some immigration.
<b>Population</b>	A group of conspecific individuals that is demographically, genetically, or spatially disjunct from other groups of individuals.
<b>Aggregation</b>	A spatially clustered group of individuals.
<b>Deme</b>	A group of individuals more genetically similar to each other than to other individuals, usually with some degree of spatial isolation as well.
<b>Local population</b>	A group of individuals within an investigator-delimited area smaller than the geographic range of the species and often within a population (as defined above). A local population could be a disjunct population as well.
<b>Subpopulation</b>	An arbitrary spatially delimited subset of individuals from within a population (as defined above).

AEWA (2005), document MOP3.12, reviewed the practice and principles of defining waterbird populations and concluded:

*"A waterbird biogeographical population is a population of a species or a sub-species that is either geographically discrete from other populations at all times of the year, or at some times of the year only, or is a specified part of a continuous distribution so defined for the purposes of conservation management".*



#### 2.1.4 Wild versus captive

A clear distinction between captive and wild organisms does not seem to exist, despite the fact that all captive animals have a wild origin, and released captive animals sooner or later adjust to a life in the wild when released. Some discrepancy exists such as when captive bred animals are released into non-native areas and are thereby still treated as of captive origin.

The aquarium industry has a set of short-term naming conventions when wild-caught fish have been taken from the wild in order to be sold into the aquarium trade. These fish are taken directly from their natural habitat, for example lakes, rivers and seas and these wild-caught fish are referred to as F0 fish. F1 fish are captive bred offspring of wild caught fish, while F2 fish are captive bred offspring of those etc. Captive bred fish have been bred in captivity. It is, however, possible that their parents were wild caught, or that they have wild caught fish somewhere in their ancestry.

Similarly, the exotic pet industry distinguishes between wild-caught, first generation captive breed and captive breed thereafter. A typical example would be:

Captive bred: An exotic pet that comes from a breeder rather than the wild.

Captive born: An exotic pet born in captivity from wild-caught parents.

Captive hatched: An exotic pet hatched in captivity from wild-caught parents.

Captive farmed: Exotic pets raised in captivity in their country of origin.

Wild caught: An exotic pet taken from the wild.

Long term captive: An exotic pet that has been in captivity for three month or more that has been taken from the wild.

However, these naming conventions are related to the transfer of an animal from the wild to captive conditions and thereafter kept there.

According to the Oxford English Dictionary, wild is defined in the case of an animal or plant as *“living or growing in the natural environment; not domesticated or cultivated”*.

#### 2.1.5 What is an alien species?

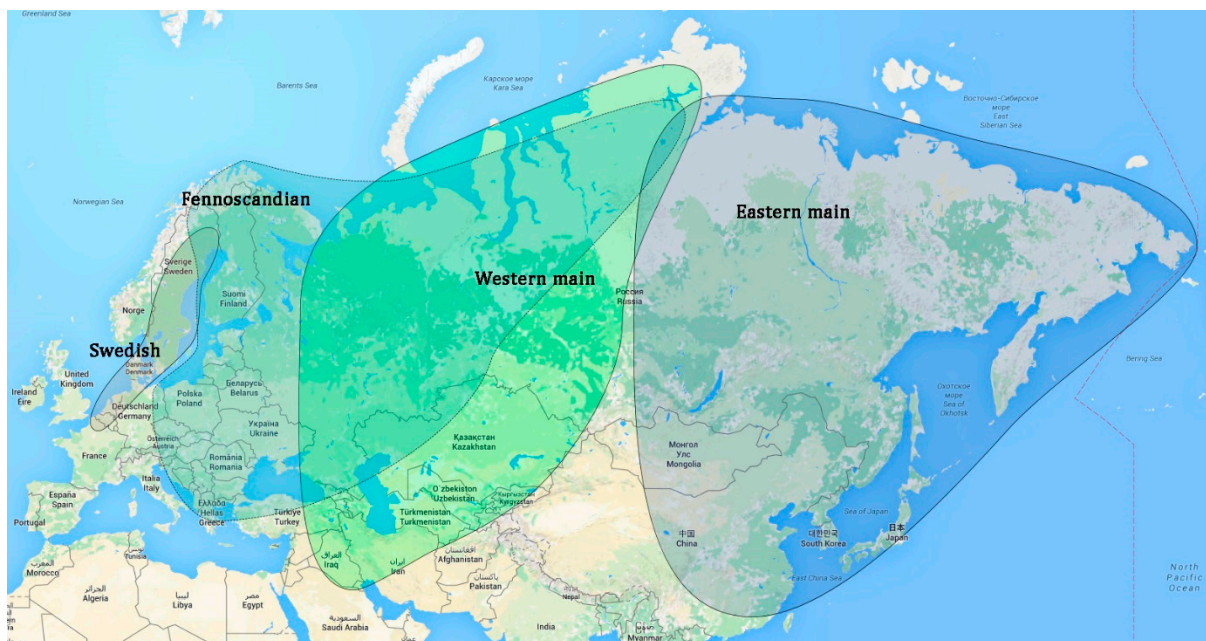
The term alien species is used in preference to the term introduced species since the term introduced is associated with deliberate actions, whereas alien is considered to be more neutral. The most problematical alien species are often termed as either invasive or invading species. A synonym to alien species is non-native species.

The definition of alien species according to the International Union for Conservation of Nature (IUCN) own definition is as follows: *“Alien species” (non-native, non-indigenous, foreign, exotic) means a species, subspecies, or lower taxon occurring outside of its natural range (past or present) and dispersal potential (i.e. outside the range it occupies naturally or could not occupy without direct or indirect introduction or care by humans) and includes any part, gametes or propagule of such species that might survive and subsequently reproduce.*

## 2.2 Delimitation of Lesser White-fronted Goose populations

Three geographic groups of wild populations of Lesser White-fronted Goose are recognised. In addition to these is the reintroduced Swedish population comprising released birds with a human-mediated migration route, but only the first three are recognised in published literature as wild/naturally occurring. The following naming and description of breeding delimitation was adopted for the current AEWA International Single Species Action Plan for the Lesser White-fronted Goose (Jones et al. 2008, **Figure 1**):

- **Fennoscandian population**, breeding in Norway, Finland and the Kola Peninsula of NW Russia.
- **Western main population**, breeding in northern Russia to the west of the Taymyr Peninsula.
- **Eastern main population**, breeding from the Taymyr Peninsula eastwards and wintering in China.
- **Swedish population**, reintroduced by the release of captive-bred birds within the former range of the Fennoscandian population in Sweden and by the establishment of a human-mediated flyway to wintering grounds in the Netherlands.



**Figure 1.** Population delimitation of the Lesser White-fronted Goose.

The naming of the three wild populations stem back in time to the late 1970s and early 1980s when research focused on birds breeding, or formerly bred, in Norway, Sweden and Finland. At the time, the term Fennoscandian was developed for the remaining small population breeding mainly in Lapland in northern Sweden, Norway and Finland (Norderhaug & Norderhaug 1980, 1982, 1984). During the 1990s, when research was conducted on the genetics of the species, it was shown that there was a clear phylogeographic structuring fitting known biogeographic and migratory divisions (Ruokonen et al. 2004). In addition to identifying the Fennoscandian population as a distinct management unit, the phylogeographic divide in the Taymyr Peninsula area led to a need for separating these two major populations breeding in Russia, with migration routes either taking them south-west to the Caucasus/Middle East or south-east to China. Informal discussions during international meetings and conferences settled with the above given names and these were subsequently published in both international (Jones et al. 2008) and National Single Species Action Plans for the species (Norwegian Directorate for Nature Management 2011).

In published literature relating to the reintroduction issue, various new naming regimes regarding the different populations have been used or proposed. For instance, Lee et al. (2011) suggested using an untraditional naming of populations: *“(i) Norwegian population: population breeding in northern Norway and wintering in Greece and possibly Turkey; thought to use traditional Lesser White-fronted Goose migratory routes. (ii) Swedish population: population breeding in Swedish Lapland and wintering in the Netherlands; uses non-traditional migratory routes. These terms are in line with the outcomes of the first meeting of the RECAP committee. The term “Fennoscandian population” is used more broadly to refer to birds breeding in Fennoscandia (Norwegian population, Swedish population, and the unknown number of birds breeding on the Kola Peninsula) or the historic population breeding widely across Fennoscandia in the early 20th century.”*

The publications produced by the stakeholders supporting continued Lesser White-fronted Goose releases also use their own naming conventions. In recent years they have presented the Swedish reintroduced population as “The southern Fennoscandian Lesser White-fronted Goose population” and described the population as one of two sub-populations of the wild Fennoscandian population. The result of this is that uninitiated managers and policy makers are confused. The internationally accepted names are based on breeding distribution of the different populations, but they might as well have been named based on their wintering distributions, for example “Greek”, “Middle East” and “South-East Asian”. The latter is in common use for the eastern most population migrating to China. For the reintroduced Swedish population, the equivalent term would then be “Dutch”. As shown later in the present report (**Chapter 3.3**), the Fennoscandian population spends 31 % of the year in Norway (breeding period) and 44 % in Greece (wintering).

The stakeholders of continued release activities have therefore increasingly argued that the Swedish population should be treated as part of the Fennoscandian population both in the revised ISSAP and in other international fora (e.g Conservation of Arctic Flora and Fauna - CAFF). However, as will be shown throughout the present report, there is no evidence that the reintroduced population in Sweden represent traces from the original wild breeding population in Sweden, and it should therefore still be treated as an entirely separate entity. This is also important in the light of the documented Swedish population’s deviation from the wild Fennoscandian population in genetic composition, migration route, behaviour and adaptation. As more research focuses on the potential negative effects of reintroduction and translocation projects as for example the ongoing studies currently carried out on the mass releases of Mallards *Anas platyrhynchos* for hunting purposes in Europe (Söderqvist et al. 2014, Söderqvist 2015, Champagnon et al. 2016), it is even more important to separate this population from the other naturally occurring ones.

Looking more closely at the exact global breeding distribution, the original wild Lesser White-fronted Goose populations breed in six more or less discrete geographical areas (see e.g Morozov & Syroechkovski 2002, **Figure 2**):

- **Fennoscandia** (northern parts) including the Kola Peninsula; 25 – 30 pairs (not including the Swedish population).
- **Tundra areas between the White Sea and the Ural Mountains** (Malozemelskaya- and Bolshezemelskaya tundras, and the Ural Mountains); 250 – 400 pairs.
- **Yamal Peninsula** (southern parts); 350 – 500 pairs.
- **Taymyr Peninsula** (southern parts); 1,000 – 1,500 pairs.
- **Putorana Mountains** (south of Taymyr Peninsula); 150 pairs.
- **North-eastern parts of Siberia** (Indigirka, Abyiskaya lowlands in Yukatlia); 1,050 – 1,850 pairs.



**Figure 2.** Global distribution of breeding areas of the Lesser White-fronted Goose.

### 3. NATURAL MIGRATION ROUTES AND POPULATION DEVELOPMENT

#### 3.1 Fennoscandian population migration routes

Ekman (1922) in his seminal work 'Djurvärdens utbredningshistoria på Skandinaviska halvön [Distributional history of animals on the Scandinavian peninsular]' wrote that (translated): "the two breeding goose species, the Bean Goose and the Lesser White-fronted Goose, have totally different migration routes. The Bean Goose migrates in large numbers across Sweden and, as is well-known, being enthusiastically hunted. The Lesser White-fronted Goose on the other hand, migrates rarely through these areas, so seldom, that it can be with great certainty be claimed that the migration passes over non-Scandinavian areas. In northern and eastern Finland, it is a common migrant both in spring and autumn. The Lesser White-fronted Goose is with certainty a north-eastern immigrant and as is with other goose species, it migrates with adult and young birds together. It is here possible to think that the birds, generation after generation, could retain their ancient migration routes (the species immigration routes). This conservative adherent to old habits could be explained in such that the routes are learned by the young through the adult's guidance".

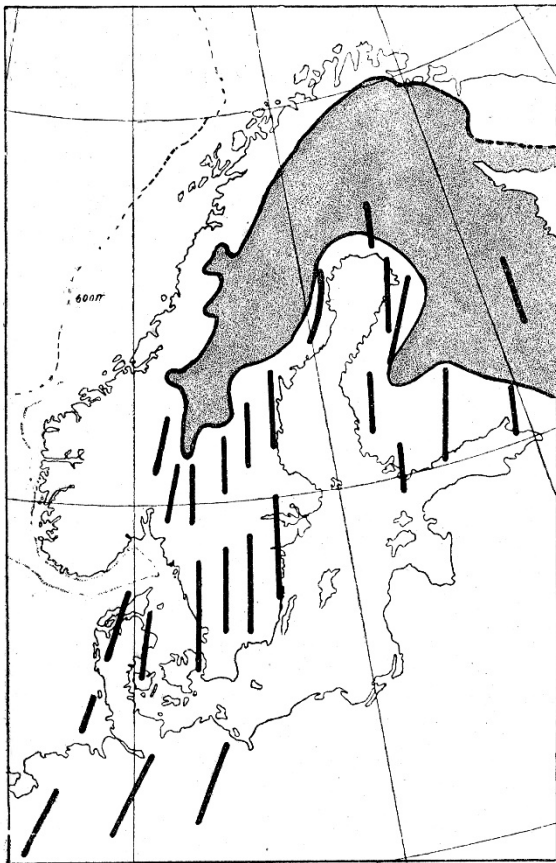


Fig. 83. Sädgåsens (*Anser fabalis*) häckningsområde (grått) och höstflyttningssvågar.

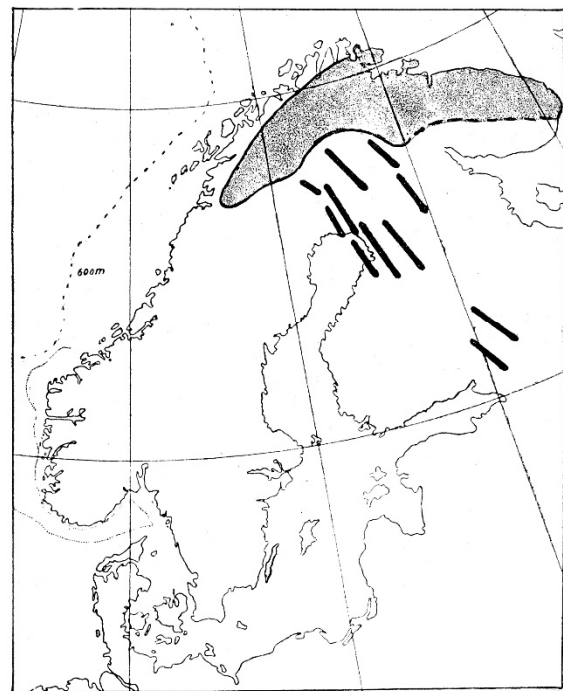


Fig. 84. Fjällgåsens (*Anser erythropus*) häckningsområde (grått; se dock underskriften till fig. 48) och höstflyttningssvågar.

**Figure 3.** Breeding areas (grey hatching) and autumn migration routes for the Bean Goose (left) and Lesser White-fronted Goose (right) in Fennoscandia according to Ekman (1922).

Similarly, Berg (1937) wrote (translated): "The Lesser White-fronted Goose is regarded immigrated from east and northeast after the last glacial period, and it migrates regularly back in autumn along the routes it arrived. Rarely has it been encountered during migration in southern Sweden."

In 1980, Norderhaug & Norderhaug published their review report on the status of the Lesser White-fronted Goose in Scandinavia. The review was undertaken with the help from numerous researchers in Finland, Sweden and Norway, as well as an extensive literature search. They concluded, in the same way as Merikallio (1920), Munsterhjelm (1913, 1916) and Hortling (1929), that the main spring migration route follows the western Finnish coast and crosses the mainland in a north-westerly direction and follows various river valleys to the breeding locations. In addition, a more easterly route through Finland was formerly important based on numerous inland observations of migrating birds. In Sweden there are direct observations of an eastward origin. Haglund (1938) wrote that the first Lesser White-fronted geese in spring arrive in the delta of the Umeå river in the last week of April. Thereafter, numbers increase and peak in mid May when 200 birds could be seen in one flock, and that they were more common than the Bean Goose. At the time it was believed to be likely that these Lesser White-fronted Geese came from Finland and over the Holmöerna islands, and this hypothesis was confirmed by observations of flocks of Lesser White-fronted Geese of 6 and 12 individuals respectively, observed migrating NNE at Holögadd on 11th and 15th May 1936.

Da det er så mange av dem og da de er trekkfugler som ellers ikke kommer oss det ringeste til nytte, har jeg aldri hatt de minste anføktelser for å drive jakt på fjellgås om våren.

[Because there are so many of them and since they are migrants and otherwise of no use to us, I have never had any scruples of hunting Lesser White-fronted Goose during spring.]

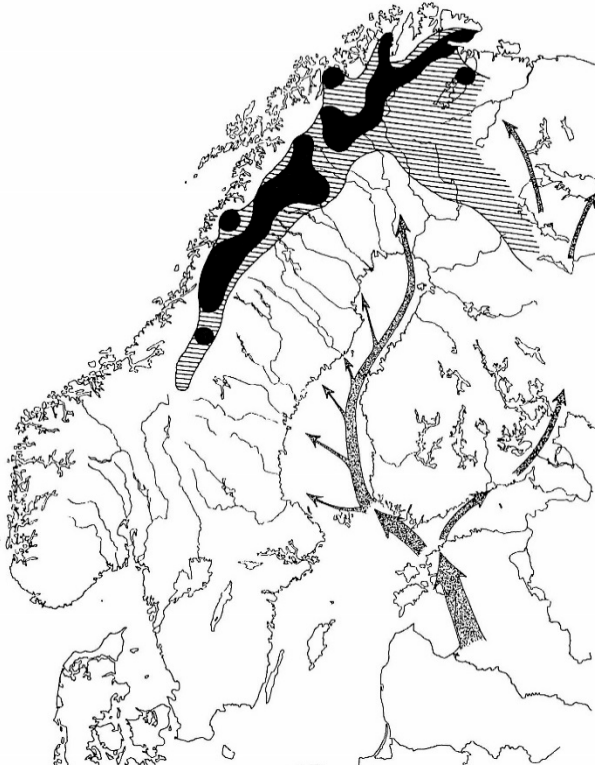
*Håkon Evjenth, 1927*

Regarding autumn migration, Norderhaug & Norderhaug (1980, 1984) wrote that *“the autumn migration seems to be following more or less the same route as in spring. Unfortunately, the number of published autumn migration records are low”*. This is not surprising knowing the migratory system as mapped by use of satellite transmitters since 1994 when the first Lesser White-fronted Goose was tagged in Finnish Lapland. In Norway, 17 wild Lesser White-fronted Geese (in the years 1995 to 2011) have been tracked (Lorentsen et al. 1998, Aarvak & Øien 2003, own unpublished data). A typical pattern is that the birds use larger areas and more variable habitats in autumn than in spring. The Valdak Marshes have been known as a spring staging (and spring hunting) area at least since the 1950s, but it was not until 1994 that the significance of the area as an autumn staging site for Lesser White-fronted Geese was realised.

In spring, the geese concentrate in the thawed salt marshes along the fjords and are therefore easy to see (and hunt), while in autumn they utilise a larger spectrum of food, of which crowberries *Empetrum nigrum* are very important, as it is also for other goose species such as the Cackling Goose *Branta hutchinsii* (Hupp et al. 2013). Crowberries are easily available almost everywhere and have, in contrast to most other berries at northerly latitudes, a steady annual yield (Wallenius 1999), and with wide distribution and good abundance the geese utilise much larger areas in autumn and are therefore also much more difficult to find. Another important factor in the reduced observation frequency in autumn is the variable amount of the population that either do not breed at all or which fail early that undertake a long-distance migration eastward, to moulting sites in Russia (Aarvak & Øien 2003). For the years 1994-2014 on average 50% of the birds seen in spring migrate during early summer to moult elsewhere, and are subsequently not seen at the Valdak Marshes in autumn. The easternmost known moulting area for Fennoscandian breeders is on the Taymyr Peninsula in Russia (Aarvak & Øien 2003, BirdLife Norway unpublished data). This area was also known previously as Rogacheva (1992) wrote: *“Much of the misinformation concerning the breeding distribution of the species can probably be attributed to the fact that the species often moults in northern tundra beyond its breeding range. Considerable concentrations of moulting Lesser White-fronted Geese were noted by V.V. Leonovich in the arctic tundra in the Tareya River Basin, 300-400 km north of the*

*nearest breeding grounds of the species (Krechmar 1966); such concentrations were also noted near Lake Taimyr at the sources of the Nizhnyaya River (Sdobnikov 1959)''.*

There are only a few recoveries of ringed Lesser White-fronted Geese from Fennoscandia before 1980, but the two recoveries that exist of birds ringed in Lapland, Sweden, suggest that the populations at the time also had a similar system with moult migration to Russia and that they were wintering in Greece or surrounding areas (Fransson & Petterson 2001). The earlier interpretation of



these two recoveries (one in winter from 7th February 1956 in Macedonia, Greece, and one in autumn on 1st September 1957 in Manych area, Stavropol, Russia, between the Caspian and Black Seas) was that the birds were on autumn migration to wintering sites in the Middle East and Asia Minor. However, present knowledge suggests that the Russian recovery might equally likely be a bird who was actually moving from moulting sites in Russia, travelling through Kazakhstan and was on its way to the winter quarters in Greece or Turkey. So, it was travelling westwards rather than eastwards as was original assumption based on the time of the year these birds were shot (Fransson & Petterson 2001). The moult migration from Fennoscandia to the Taymyr Peninsula was not known at that time (BirdLife Norway unpublished data).

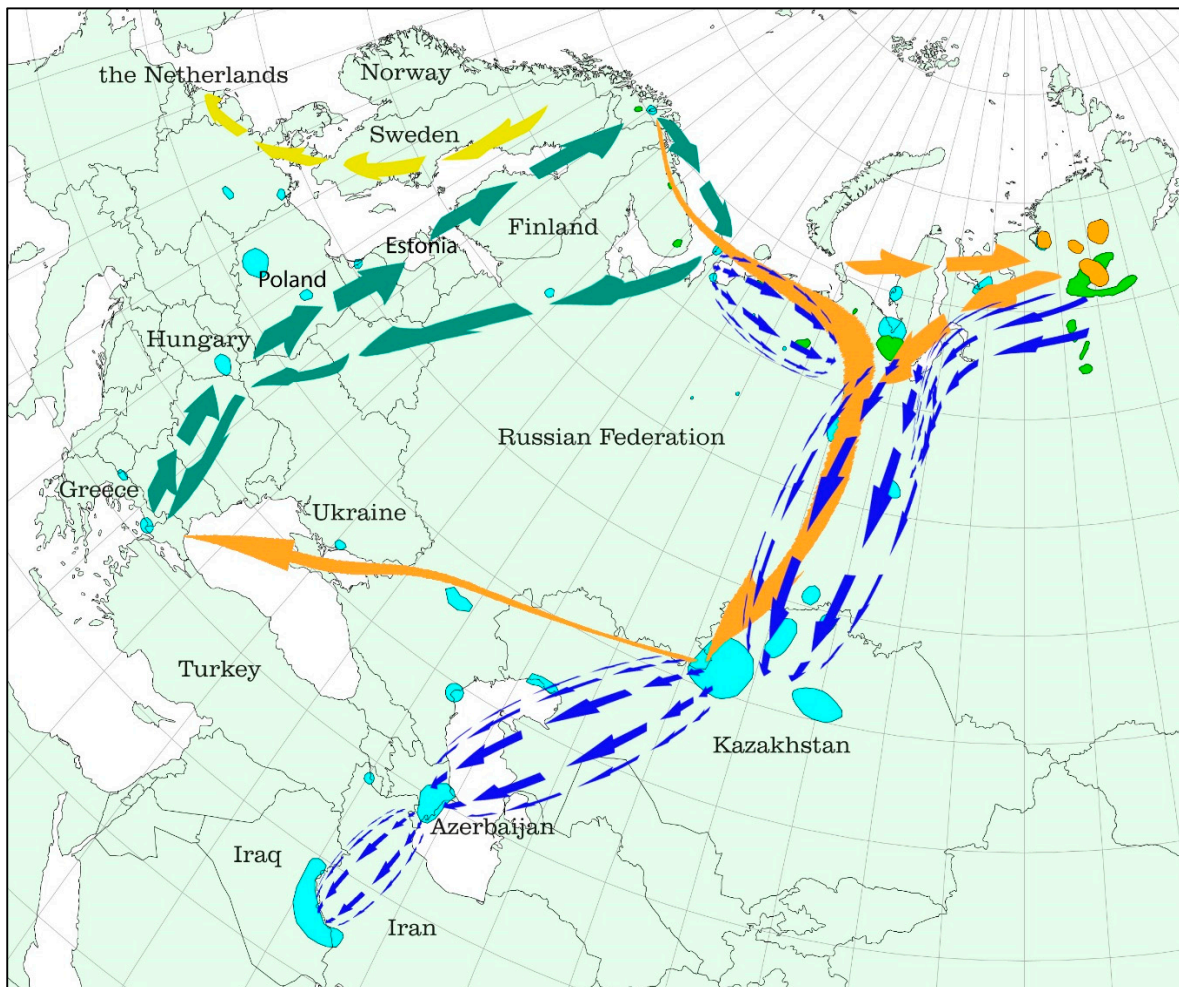
**Figure 4.** Spring migration route of the Lesser White-fronted Goose (arrows). After Norderhaug & Norderhaug 1984. Past distribution is shown with horizontal hatching and present (early 1980s) as black shading.

By use of satellite transmitters and colour-rings on Lesser White-fronted Geese from the Fennoscandian population since 1994, basic knowledge about the elaborate migratory system has been gathered (Lorentsen et al. 1998, Aarvak & Øien 2003, Morozov & Aarvak 2004, BirdLife Norway unpublished data).

In autumn, after completing the moult, successful breeding pairs return to the same staging area as used pre-breeding in spring. There, at the Valdak Marshes in Finnmark County, Norway, about 80% of the population gathers each year (Aarvak et al. 2009). They spend about three weeks at Valdak before migrating eastwards to the Kanin Peninsula, north-west Russia, in early September. From there the main migration route divides into two, of which the main route is towards the south-west, to staging areas north of the Onega and Ladoga lakes in Russia, then to Eastern Germany/Western Poland, then Hortobágy in Hungary and further to Northern Greece before eventually ending up in the wintering area at the Evros Delta on the border area of Greece and Turkey (Lorentsen et al. 1998, Aarvak & Øien 2003, **Figure 5**). The other migration route, leads south-eastwards from the Kanin Peninsula, crossing the Ural Mountains to staging sites in the lower Ob River Valley (Lorentsen et al. 1998), and further south to the Kostanay Region in northern Kazakhstan (Karvonen & Markkola 1997, Aarvak & Øien 2003). Non-breeders and failed breeders follow a similar migration route southward

from the northern Ob-valley after having left the breeding areas in Norway in late June and migrated eastwards to moulting sites in northern Russia (some of them as far east as the Taymyr Peninsula). From Kazakhstan, the Fennoscandian birds turn south-west crossing north of the Caspian and Black seas before also ending up in north-eastern Greece. The Ob valley route south to Kazakhstan, is also followed by the Russian Western main population, though these continue further south to wintering grounds in Azerbaijan, Iran and Iraq (Morozov & Aarvak 2004).

As mentioned above, the sub-adults, failed- and non-breeders undertake a long distance moult migration in mid-June, eastwards from the breeding areas to moulting sites, which stretch from the Kanin Peninsula, Kolgujev Island, and all the way to the Taymyr Peninsula in Russia (Aarvak & Øien 2003), and these birds end up in the same wintering areas in Greece and Turkey as successful breeders and their offspring (BirdLife Norway unpublished data, **Figure 5**). This difference in migration routes between breeders and non-breeders is important since the mortality rate on the eastern routes is much higher due to exposure to excessive hunting pressure and illegal killing.



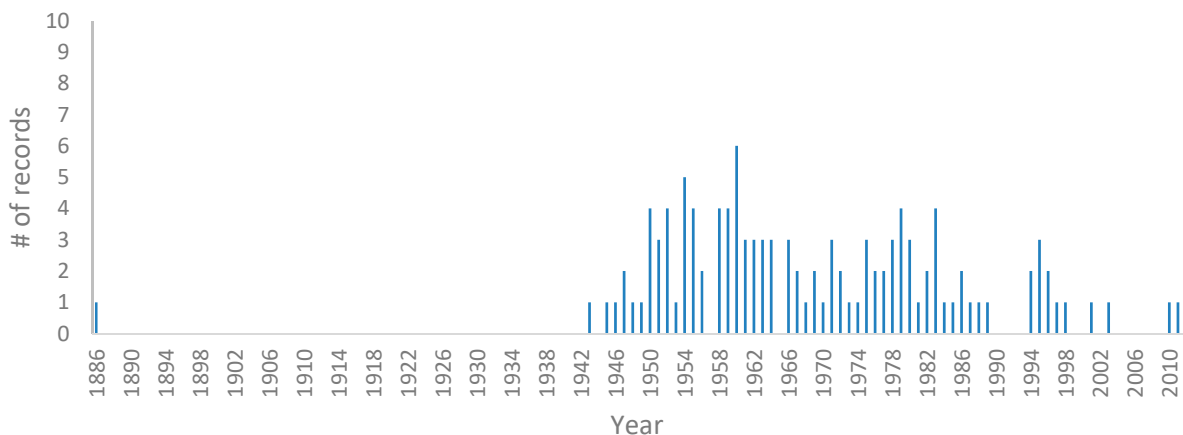
**Figure 5.** Migration system for the Lesser White-fronted Goose in the Western Palearctic. Light blue shading = important staging sites and wintering sites, dark green = breeding areas, orange = moulting sites. Fennoscandian population: Green arrows = migration route for successful breeders, orange arrows = moult migration route. Swedish reintroduced population: yellow arrows show the main route southwards. Russian Western main population: blue arrows show main routes southwards (after Lorentsen et al. 1998, Aarvak & Øien 2003, Morozov & Aarvak 2004, BirdLife Norway unpublished data).



### 3.2 Possible existence of a western migration route, an “Atlantic flyway”

Even at the time when the Lesser White-fronted Geese in the Fennoscandian population were numerous and where several accounts describe the Lesser White-fronted Goose as being a common breeder in the uplands (von Wright 1873, Collett 1921, Ekman 1922, Ryd 2007, Munsterhjelm 1913), and when 80 000-120 000 of them were seen during migration in Hungary (Sterbetz 1982), there were no records of significant flocks of Lesser White-fronted Geese in the Netherlands and Great Britain, which is contrary to the claim by the reintroduction stakeholders (Kampe-Persson 2008, Mooij et al. 2008, Mooij 2010, Kampe-Persson 2010). Following concerns about the three aforementioned publications being biased, an independent review by Marchant & Musgrove (2011) was commissioned by AEW (see section 8.1), which concluded that “*all records in western Denmark, western Germany, Spain and other west European countries can be accounted for by vagrancy and by escapes*”.

The Netherlands and Great Britain have never been part of a regular wintering area for any wild breeding population of Lesser White-fronted Goose. On the contrary, all historical, as well as new ornithological accounts, from these countries describe the species as a rare vagrant (van den Berg & Bosman 1999, Brill 1970, Owen et al. 1986, Parkin & Knox 2010). If any of these countries were formerly part of the normal wintering area of a Lesser White-fronted Goose population, we would at least expect regular occurrence of family-sized groups or small flocks. Of the 130 records in Great Britain, there are 98 records from before 1980, of which only eight consist of two individuals and there is only one record of more than two birds (six individuals seen at Slimbridge, England in March 1956). The remainder of records (91%) are of single birds. The fact that the majority of records are of single individuals cannot constitute evidence of regular wintering, and these records do not *per se* indicate the presence of a population (single individuals cannot breed without a partner). Additionally, data from the British Trust for Ornithology (BTO) in recent years conforms to this pattern of vagrancy, with very few single bird observations believed to be of wild origin. The majority of observations during the last couple of decades involve birds of feral / captive origin (see Parkin & Knox 2010).



**Figure 6.** Annual numbers of accepted records of wild Lesser White-fronted Geese held by the British Birds Rarities Committee 1886-2011 (data from BBRC).

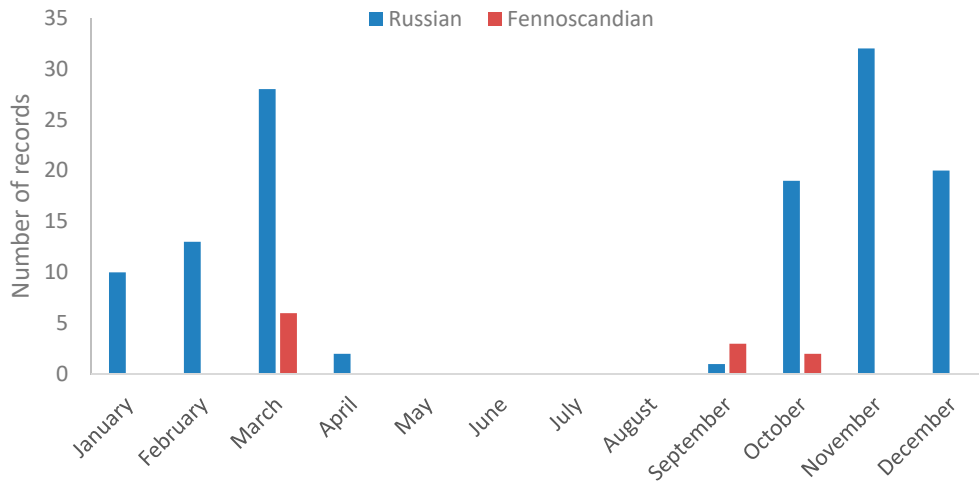
Similarly, in the Netherlands, there are no observations of flocks as large as an average goose family of 5 birds (an adult pair plus an average brood during winter of 3 goslings, Lee et al. 2010) before 1980. The species was regarded as rather rare in the Netherlands in the 19th Century, and in the period 1900-1968 there were only 41 records (van den Berg & Bosman 1999). These were in total 16

individuals (14 collected and 2 observed in the field) in the period 1908-1949, and 25 individuals (10 collected or trapped and 15 observed in the field) in the period 1950-1968, all from the period September to March. Since 1969, the species was recorded almost every winter, with increasing numbers especially since 1980 when the Swedish reintroduction project modified the migration route of the released birds to use wintering areas in the Netherlands. Since then it became impossible to distinguish between these introduced birds from Sweden and vagrants from Russia, and the Dutch rarity committee (CDNA) decided not to consider or record the species from 1st January 1990 onwards. Koffijberg et al. (2005) showed how numbers reported in the Netherlands matched up to 99% of the estimated size of the Swedish reintroduced population in the preceding autumn, while more recent data (years 2009-2015, Koffijberg & van der Winden 2013, Kees Koffijberg pers. comm.) shows that an average of 97.2% (range 88.9%-120%) of the numbers in Sweden in autumn are found in the Netherlands during winter. The discrepancy probably arises from a smaller number of ferals and/or vagrant birds of Russian origin following the migration of Greater White-fronted Geese. The latter is a typical pattern observed in Hungary and described in more detail below.

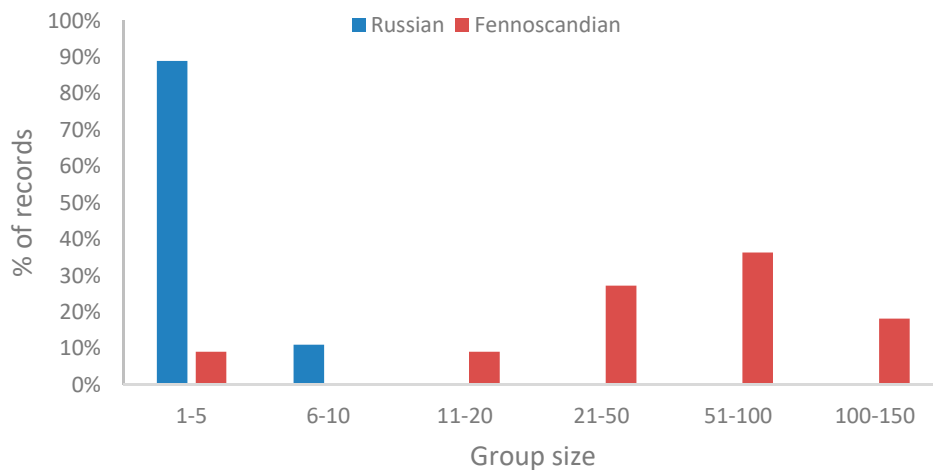
The claim that the Netherlands has been a traditional wintering area for parts of the wild Fennoscandian Lesser White-fronted Goose population originally breeding in Sweden is incorrect. In the 1930s, flocks of approx. 150 Lesser White-fronted Geese could be seen in Ångermanland, Västerbotten and Norrbotten in Sweden. In the 1950s, flocks of 50 Lesser White-fronted Geese could still be seen in Sweden in Västerbotten and Norrbotten (SOF 1990). There were no observations of large (or even small) flocks in the Netherlands in the 1930s and 1950s, despite this being one of the smaller countries in the world with a dense human population, a rich ornithological history and a high number of active birdwatchers. Brill (1970) categorised the species as an irregular visitor to the Netherlands, and it was similarly classified as a scarce winter visitor by van den Berg & Bosman (1999). It is worth mentioning that in former times the Friesian goose catchers, using nets, caught live geese, and that the common species were killed and sold to poulterers, and the rare ones like the Lesser White-fronted Goose (known as 'goudeachje' =golden-eye) were sold to waterfowl collections (<http://www.science.uva.nl/ZMA/index.htm>, downloaded 15.01.2015). Furthermore, the almost total absence of skins of the species in the zoological collections in the Netherlands clearly indicates that a regular wintering population of Lesser White-fronted Geese was non-existent. Also one of the founders of the reintroduction project in the late 1970s in Sweden, von Essen (1982) wrote: *"In spite of the fact that the natural migration route of the Anser erythropus from Scandinavia goes in a southeastern direction we have decided to try the Branta leucopsis as foster-parents."* Clearly, the founders of the first reintroduction attempts in Sweden were aware that Lesser White-fronted Geese traditionally flew in another direction than to Western Europe.

To set the small number of records of vagrant Lesser White-fronted Geese in perspective: the Fennoscandian population utilises the Hortobágy area in Hungary exclusively during spring and autumn migration (as confirmed by annual resightings of colour-rings), but in addition vagrant Lesser White-fronted Geese originating from the Western main population in Russia are recorded at many sites in the company of Greater White-fronted Geese (see observation data at <http://piskulka.net>). In 2015, 168 observations / records of Lesser White-fronted Geese were reported in Hungary. Of these, 74% were of Russian origin (125 records) and 6.5% of Fennoscandian origin (11 records). Altogether 31 records could not be classified with certainty. The average group sizes were 2.7 (118 records) and 58.7 individuals for Russian and Fennoscandian birds respectively. The average for birds of Russian origin is overestimated as many of the records are given as sums of individuals that are found within the large flocks of Greater White-fronted Geese that reach up to 20,000 individuals. The Fennoscandian birds pass through quickly during spring and autumn migration, while birds of Russian origin stay throughout winter. Out of the 125 records of birds of Russian origin, 68% (85 records) were found within much larger flocks of other species. The main carrier species was Greater White-

fronted Geese with 97.5% of the records. Lesser White-fronted Geese were found within flocks of other species of goose flocks only twice, once with Red-breasted Geese and once with Greylag Geese.



**Figure 7.** Monthly distribution of records of Lesser White-fronted Geese in Hungary in 2015, with 11 and 125 records of Fennoscandian and Russian origin respectively. The origin is determined based on colour ringed individuals as well as the carrier species they accompany (data from <http://piskulka.net>).

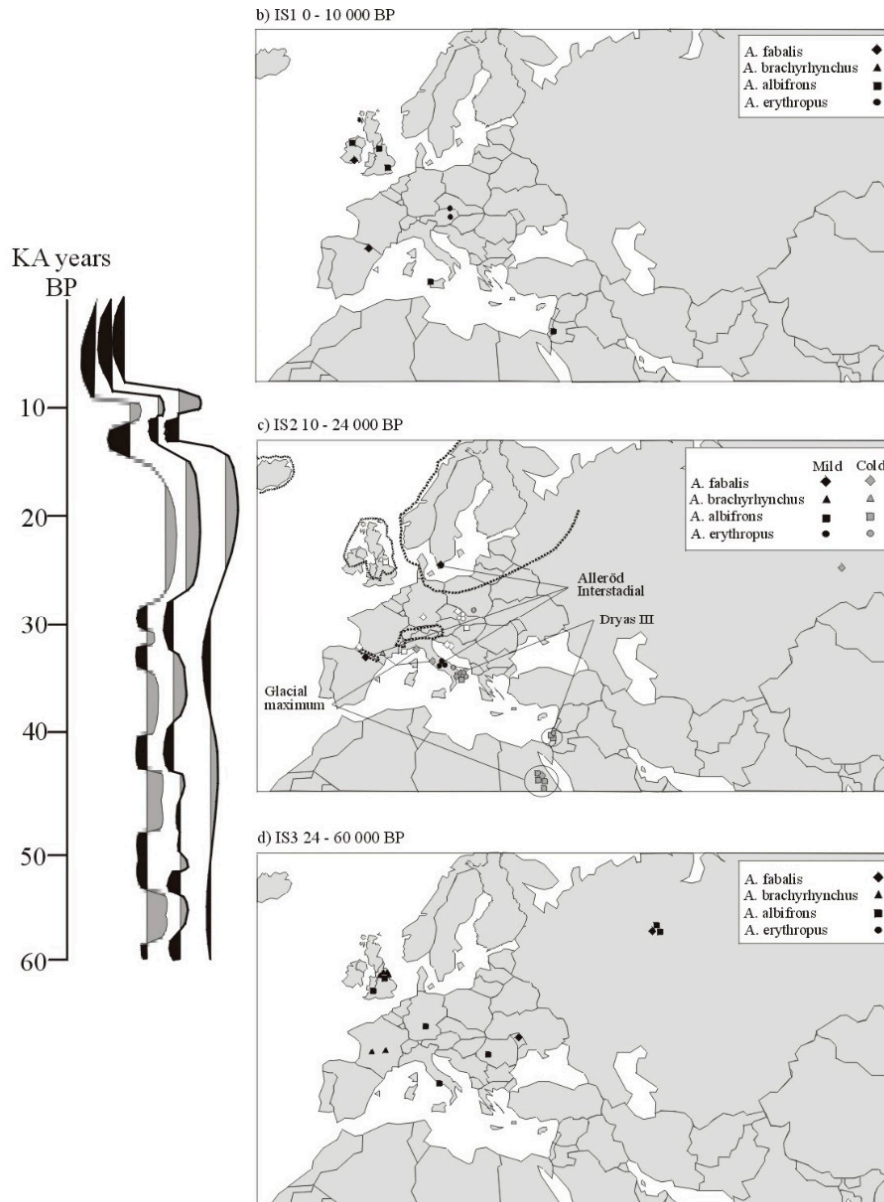


**Figure 8.** Distribution of group size of Lesser White-fronted Geese of Russian origin (blue bars, n=118) and Fennoscandian origin (red bars, n=11) observed in Hungary in 2015 (data from <http://piskulka.net>).



**Figure 9.** All observations of Lesser White-fronted Goose in Hungary in 2015. Winter observations are shown in light blue, while autumn observations are shown in red. The Hortobagy area is marked with stippled circle (data from <http://piskulka.net>).

In the review of articles claiming the existence of a traditional migration route to Western Europe, Marchant & Musgrove (2011) concluded that *“There is little evidence that such a migration route existed before the Swedish project began, although it might have done so, dying out before European ornithology had developed sufficiently to record it”*. This is an understandable reservation from the authors considering the material they scrutinised. This reservation has, however, been interpreted by the stakeholders of continued releases as it is as likely that there has been an original migration route from Fennoscandia to western Europe rather than the opposite. Yet the reservation by the authors can in fact be refuted, as fossil records reveal no finds of Lesser White-fronted Goose in Western Europe. On the contrary, all known existing fossil records of Lesser White-fronted Geese are from the Mediterranean (Italy and Egypt) as well as central Europe, a pattern fitting the species’ current distribution. Based on the work of Tyrberg (1998), Ruokonen (2001) analysed the records of a total of 91 fossils of Lesser White-fronted Goose, Greater White-fronted Goose, Bean Goose and Pink-footed Goose during the last two stages of the late Pleistocene (IS3 60,000 – 24,000 BP and IS2 20,000-10,000 BP) and first isotope stage of Holocene (10,000 BP-present). Tyrberg concluded that the Pink-footed Goose is only found in Western Europe with the exception of one fossil location found in Italy during Dryas III, the last cold period before the onset of Holocene, which was harsh, especially in western Europe. Comparatively, Lesser White-fronted Goose fossils are not found in Western Europe, which is in agreement with their present day distribution in Europe during the non-breeding season (Ruokonen 2001).



**Figure 10.** Fossil records of Lesser White-fronted Goose, Greater White-fronted Goose, Pink-footed Goose and Bean Goose from approx. 10,000 -24,000 BP based on 76 records (after Ruokonen 2001).

Research into more recent history does not provide any evidence of a western distribution as exemplified by the work of Albarella & Thomas (2002), who reviewed the use and consumption of wild birds in medieval England. A survey of the occurrence of wild birds from 153 sites of Anglo-Saxon origin found evidence of domestic Greylag Geese from 10 sites in the 6th-early 11th centuries, and regularly thereafter up to the 16th-17th centuries (early post-medieval). Wild Greylag Geese and Barnacle Geese were also common, while Pink-footed Goose, Greater White-fronted Goose and Brent Goose were found at one site each. There are no records of Lesser White-fronted Goose. In 1991-1993 large scale excavations were carried out in Friesland in the Netherlands (Zeiler 2014). The artificial dwelling mound, situated in a former tidal salt marsh area, contained 3,429 bird remains from the Roman period (AD 175-300/500) up to the Ottonian period (850-900/950) in the early Middle Ages. Here the most common species were Greylag Goose (n=60) and Brent Goose (n=20), while Greater White-fronted Goose (n=2) and Bean Goose (n=4) were found in smaller numbers.

### 3.3 Fennoscandian population development

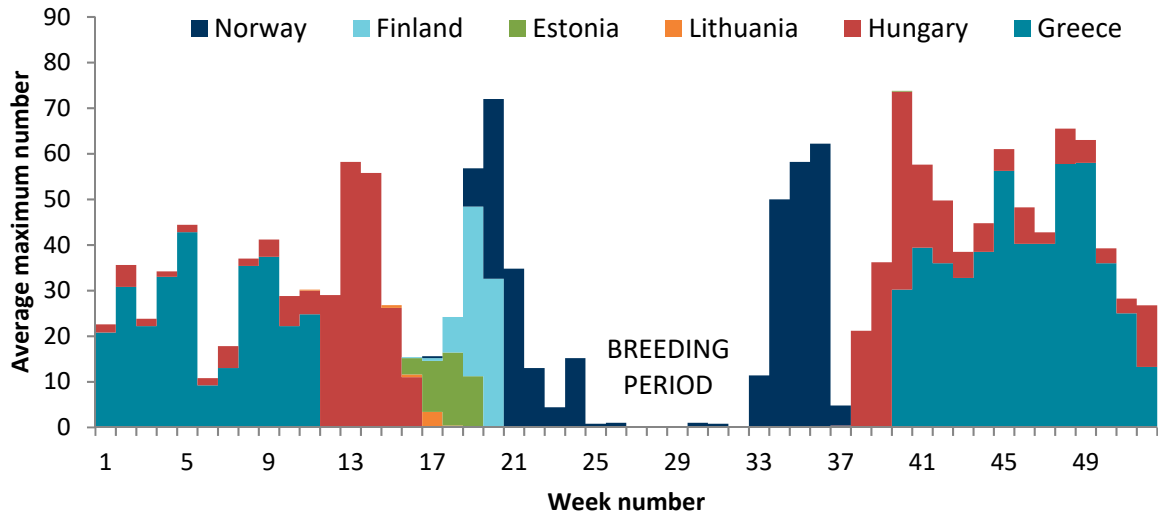
The Fennoscandian Lesser White-fronted Goose population has been monitored in detail in Norway since 1990 and in Finland since 1985, where all birds have been identified individually based upon their unique black belly-markings (Øien et al. 1996). For identification between years and migration and survival analyses, 68 individuals have been colour-ringed in Norway since 1995. In addition, a few birds have been ringed in Finnish Lapland. The Fennoscandian population has been the focus of five EU-LIFE conservation projects since 1997, of which the latest is due to finish during 2016-2017. Besides these, national research and monitoring projects have been running for several decades in Norway, Finland, Estonia, Hungary and Greece and, through their collaboration in the current EU-LIFE project from 2011 (LIFE10 NAT/GR/000638), an extensive network of field workers have been set up in the Western Palearctic, covering more than 17 countries within the distribution range of the Fennoscandian population. The collaborative work has led to a good understanding of the population dynamics and the factors affecting trends in numbers, mortality and reproduction.

Observations of Lesser White-fronted Geese from the Fennoscandian population are now continuously added to the databases of <http://piskulka.net> in addition to the many national bird observation databases. The observation coverage for the Fennoscandian population throughout the year is good, and the periods of the year when their whereabouts are unknown are well documented.

Maximum weekly numbers throughout the year for the six most important countries for the Fennoscandian population in the years 2011-2015 (**Figure 11**) shows that they disappear for a short period during midwinter, then again when migrating northwards from Hortobágy in Hungary in spring. To understand the data, it is important to be aware that during spring migration northwards the goose flocks split up into smaller groups or pairs, so the maximum weekly numbers drop since they travel more independently in this period.

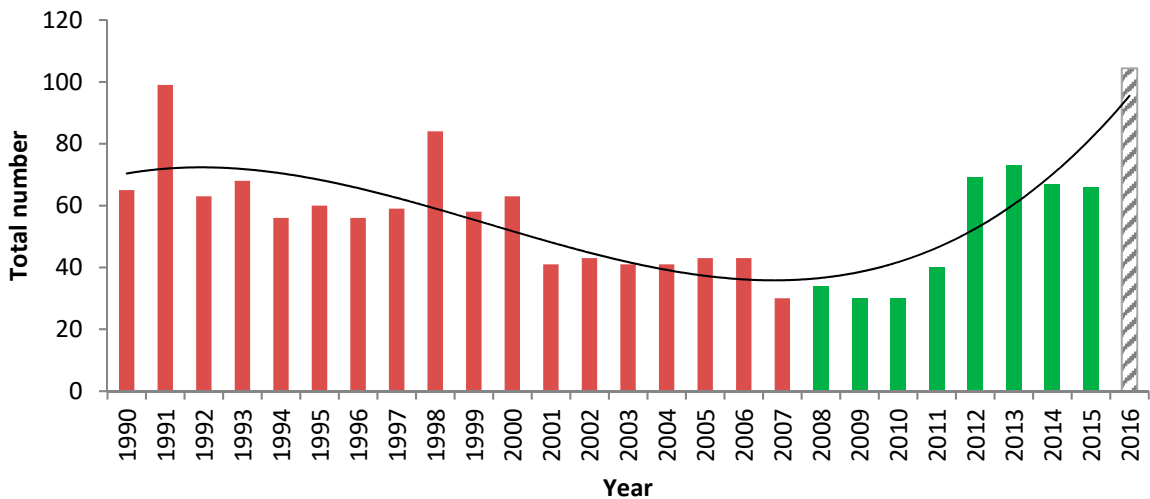
Based on an average maximum weekly numbers for the years 2011-2015, the Lesser White-fronted Geese stay in Norway for 30.9 % of the year (breeding season) and 43.6 % of the year in Greece (wintering). Corresponding percentages during migration periods (staging) are Finland 5.5 %, Estonia 5.5 % and Hungary 14.5 %.

During summer, approximately 75% of the pairs breed in a core breeding area, but in order to reduce disturbance they are not the target to any specific research after the early breeding survey in early June is finished (these data are not presented here). In autumn, the birds again show strong flocking behaviour and migrate in one or two large groups, and this is well reflected in the maximum weekly numbers recorded. After the last observation date in northern Norway, they migrate to western Russia where there are no field observers, but they probably stay at the known staging site on the Kanin Peninsula until they again show up in Hungary 1-2 weeks after they left Norway. From Hungary all the birds migrate to Lake Kerkini in Greece where they usually stay until the New Year. Afterwards, they move a short distance to the Evros Delta. Here parts of the flock can leave for several weeks for a hitherto unknown area, dubbed the “mystery site”. Count coverage is more limited in the Evros Delta because of more difficult access and poor visibility for some of the preferred feeding habitats.



**Figure 11.** Average weekly maximum number of Lesser White-fronted Geese throughout the annual cycle in the years 2011-2015. Data from <http://piskulka.net>.

The best long-term monitoring data is from the spring and autumn staging site in the Porsangen Fjord (which includes the Valdak Marshes) in Finnmark, Norway, where on average 80% of the population is present during spring staging (Aarvak et al. 2009). Here, the population was decreasing by 4.5% annually until 2010, after when it started recovering with an annual increase of more than 14% per year.



**Figure 12.** Total numbers of Lesser White-fronted Geese during spring staging in Porsangen Fjord, Finnmark Norway during the years 1990-2015. A preliminary estimate of 104 individuals for 2016 is added (video analyses for spring 2016 still pending).

As the population dynamics of the original wild Fennoscandian Lesser White-fronted Goose population are not the focus of the present report we will not present specific details on mortality, production and the factors regulating them, but note that culling of Red Foxes in the core breeding area in Norway (started in 2008, with effective implementation from 2009) is a key to the changing

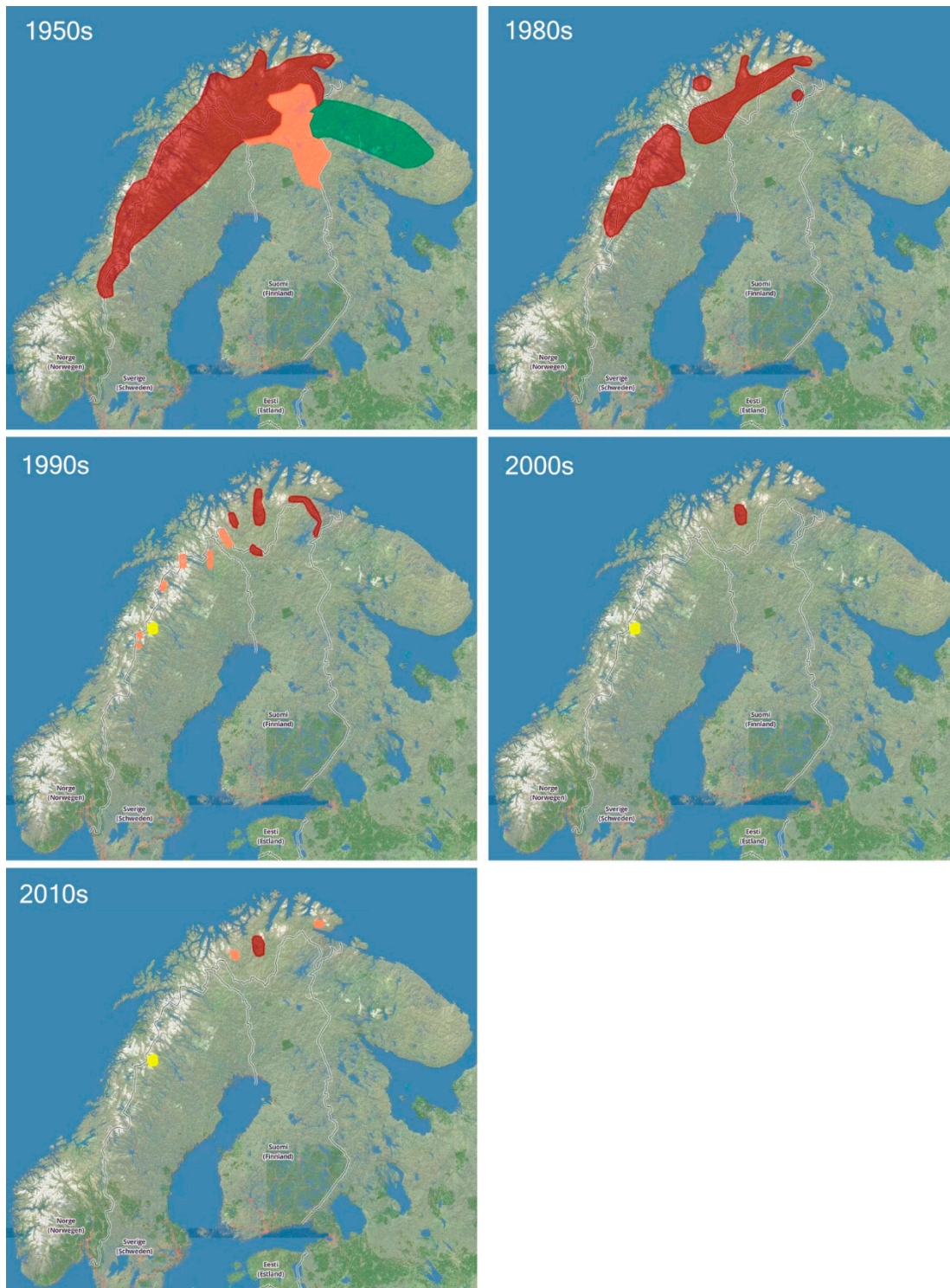
trend in population development. The purpose of the culling is to counteract loss of egg clutches but most importantly to delay possible loss of clutches or broods to avoid the adult birds undertaking the long moult migration to Russia where they are exposed to heavy hunting pressure during the summer. Later, during the autumn migration along the eastern route through Russia, Kazakhstan and Ukraine, they are subjected to an even higher hunting pressure despite being totally protected. Because of the underlying reasons for the culling, we do not expect that a similar culling activity of Red Foxes in the release breeding area of the Swedish population will have a similar large positive effect, since it is the adult mortality on migration that is being affected and not the survival and production within the breeding areas per se. To further understand the mechanisms and effects of climate changes to the future survival of the Fennoscandian population, BirdLife Norway joined in 2016 the Norwegian research program “Sustainable management of renewable resources in a changing environment: an integrated approach across ecosystems” (SUSTAIN). This is in order to analyse and model the effects of climate change and culling of Red Foxes in the breeding areas on the population development of the Fennoscandian Lesser White-fronted Goose. Our research data will be incorporated into one of six case studies. The SUSTAIN project involves three of the strongest scientific groups within ecology and evolution in Norway who join efforts to study the combined impacts of environmental change and harvesting across marine, freshwater and terrestrial ecosystems. The research groups are the Centre for Ecological and Evolutionary Synthesis (CEES), Dept. of Biosciences, University of Oslo (UiO), Centre for Biodiversity Dynamics, Norwegian University of Science and Technology (NTNU) in Trondheim, and the Department of Arctic and Marine Biology, University of Tromsø, (UiT).



In 2014, the Fennoscandian population size in late spring/early summer was estimated at 70-90 individuals, of which 15-20 were breeding pairs (BirdLife Norway unpublished data), a slight increase from the estimate of 60-80 individuals given by Fox et al. (2010). The population is predicted to be significantly larger in 2016 as an effect of the good production in 2015 (**Figure 12**). In mid-February 2016, at least 144 birds were wintering in Greece (<http://piskulka.net>) and in early May, 104 individuals were observed at staging sites near Oulu, Finland. This is the highest spring count in Finland since 1964! During spring staging i late May 2016 in The Porsangen Fjord, 28 potential breeding pairs were identified.

Since the 19<sup>th</sup> Century, when the Fennoscandian Lesser White-fronted Goose population was at its peak with a gross estimate of at least 10,000 individuals, the numbers have fallen drastically during the 1940s and 1950s, and the decline continued and brought the population to the brink of extinction in early 2000s (**Figure 13**). This was accompanied by a severe decrease and fragmentation of the breeding areas, and the Fennoscandian population was occupying less than 1% of its former range in early 2000s. Following the positive change in numbers during the last 5-6 years, Lesser White-fronted Geese have started to reoccupy several of the former breeding areas in the counties of Finnmark and Troms in Norway and possibly also areas in northern Finland close to the border with Finnmark (BirdLife Norway unpublished data).





**Figure 13.** Changes in breeding distribution of Lesser White-fronted Geese in Fennoscandia from the 1950s until 2015 (red = regular breeding, green= probable breeding area, orange = sporadic breeding, yellow = Swedish population reintroduction area). In 2016 an additional recolonised area was located in Finnmark County, Norway.

## 3.4 Migratory behaviour

### 3.4.1 Cultural/social learning versus inherent (genetical) knowledge

Migratory behaviour can be genetically or culturally determined. In cultural transmission, the young learn by following their parents, or other group member's behaviour. Consequently, species with this system are expected to have a social lifestyle, long life spans, and (in higher vertebrates) extended parental care. Classic examples include schooling fish species such as herring (cf. Huse et al. 2002), geese, swans, and mammals such as antelopes, Wildebeest *Connochaetes* sp., and Sperm Whales *Physeter macrocephalus*. For Sperm Whales, cultural inheritance has been shown to drive fitness asymmetries where it influences both clan membership and foraging strategies, with differential feeding success among clans (Whitehead & Rendell 2004).

Genetically determined migration is typically associated with threshold photoperiods or preferred directions, and involves species where there are no parents accompanying the young, peers or elders, due to short lifespan, high mortality, or separation of age classes or generations. Genetic transmission is typical in passerine bird species (Berthold et al. 1992, Alerstam 1990), all insect migrants and sea turtles (cf. Fuxjager et al. 2014). The knowledge that swans, geese and cranes learn the migration routes and which sites to use by accompanying their parents (culturally determined) has been used to re-establish populations in areas from which former populations had been eliminated. Ellis et al. (2003) describes 15 experiments from 1993 to 2002 where they used ultra-light or micro-light aircraft to accompany species such as Canada Goose *Branta canadensis*, Sandhill Crane *Grus canadensis* and Trumpeter Swan *Cygnus buccinator* in the United States. The Swedish reintroduction project that used Barnacle Geese as foster parents to manipulate the migration route to a safer wintering area (von Essen 1991) has become a classical textbook example of how effective this cultural learning is for young geese (Milner-Gulland et al. 2011, Cabot 2009). The fact that geese learn the routes from their parents has probably been known for a long time (cf. Ekman 1922), and this is not surprising considering how long geese have been used for various purposes by man (Kear 1990, Shrubbs 2013). In the Light-bellied Brent Goose *Branta bernicla hrota*, it was shown a kin structure where most offspring chose staging and wintering sites in adulthood that were identical or very near to those of their parents, but with no evidence of genetic differentiation (Harrison et al. 2010). This represents a mechanism whereby behaviour learned from parents could generate reproductive isolation through allopatry (Harrison et al. 2010).

Experiments by Chernetsov et al. (2003) proved that young White Storks *Ciconia ciconia* who undertake their first autumn migration without the aid of parents or other adults do not know where to travel, and that they do not possess a genetically inherited compass telling them in which direction to go. The study used satellite transmitters to follow the migratory orientation of juvenile White Storks from the population in the Kaliningrad Region (Russia) during their first autumn migration. Two series of experiments were performed. The first involved several groups of first-year storks raised in an aviary, kept there until all free-living conspecifics had left the area, and then released. These birds had to select their migratory route on the basis of the inherited directional information they possessed, without any chance of being guided by experienced conspecifics. The second experiment used several groups of juveniles displaced from the Kaliningrad Region to the Volga area and to Western Siberia. Both areas lie outside the breeding range of the White Stork, so the displaced birds also had to rely on their innate migratory programme. Results from the differently designed experiments did not match, nor did they match with the results of earlier experiments on the delayed departure of juvenile White Storks. The authors suggest that naïve White Storks (and perhaps other soaring migrants) rely on social interactions when selecting their autumn migratory route to a much greater extent than do passerine long-distance migrants (Chernetsov et al. 2003).

Similarly, Mueller et al. (2013) found evidence of long-term social learning, but no effect of genetic relatedness on migratory performance in Whooping Cranes *Grus americana*.

For other species such as Herring Gulls *Larus argentatus* and Lesser Black-backed Gulls *L. fuscus* it has been shown through cross-fostering experiments that genetic influences override social ones in determining whether to migrate or not. Young migratory Lesser Black-backed Gulls became imprinted and fostered by resident Herring Gulls and vice versa (Harris 1970). Both species behaved as their species normally do, and did not pick up the migratory, or lack of, migratory behaviour of their foster parents. In addition, another important lesson from these experiments was the effect of imprinting (Harris 1970): *“Despite wide ecological and behavioural overlaps, interbreeding between L. argentatus and L. fuscus is exceedingly rare. However, as a result of cross-fostering experiments, 31 and 40 mixed pairs were found on Skokholm in 1968 and 1969 respectively. Although some of the birds involved were unringed it is probable that all the adults in mixed pairs had been cross-fostered. Other cross-fostered birds were found mated with their own species and it appears that the sex of the imprinted birds was important. Female gulls will usually only mate with males of their own species, or in the case of the cross-fostered birds, with males of their foster species. Males will mate with either species. Evidence is given that suggests that the colour of the mantle and wings is important in species recognition at long range, and the colour of eye-ring and join of the mandibles for recognition at short range. The role of voice is uncertain but general behaviour is probably unimportant.”*

### 3.4.2 Imprinting and adoption

Individual birds immediately become associated upon the species they first become associated with, and this behaviour is known as imprinting (Spalding 1872). Many studies, such as the classical behavioural experiments performed by ethologists such as Konrad Lorenz (1903-1989), have taken advantage of the bonding process immediately after birds hatch out of the egg, where young become imprinted on the first living being they see, regardless as to whether or not this is their own parent(s), or indeed their own species. As an example, Lorenz’s captive Greylag Geese became imprinted upon their human foster parents.

Choudhury et al. (1993) carried out studies on a wild population of Barnacle Geese breeding in the Svalbard archipelago to determine the frequency and timing of adoption within the same species. This revealed that adoption was most likely to occur in the early development stages of goslings, shortly after hatching, although adoption was also recorded in geese at later stages when goslings were up to 12 weeks old. Adoption shortly after hatching probably occurs whilst parents and offspring are still unfamiliar and are not yet able to recognise one another, but this did not explain adoptions at later stages.

In a study of a Barnacle Goose population in the Baltic, Larsson et al. (1995) found that there appeared to be little benefit in adopting young. In adult birds, there were no significant differences in either body mass, adult survival or reproductive success in subsequent seasons. Post-fledgling survival in young geese was not significantly different in birds that were adopted as opposed to birds in families with or without adopted goslings. A study on adoption in Snow Geese *Chen caerulescens* found that an adopted gosling was as likely to survive to fledging as the other (original) members of the brood (Williams 1994). Nilsson & Kampe-Persson (2003) found, however, that there were significant advantages in adopting geese, with goslings in larger families of Greylag Geese having improved survival and were more likely to reach recruitment age (which is three years after fledging in Greylag Geese) than goslings reared in smaller families. Furthermore, goslings in families had a distinct advantage over lone goslings in gaining access to better quality foods, and that they are attacked proportionately less often and for shorter periods than lone goslings. They were also able to

feed undisturbed for longer periods, thus being in better body condition and have increased fitness and survival (Black & Owen 1984, 1989a, 1989b). There are also likely to be benefits to the host family in the form of an extra group member to help look out for predators, and larger broods appear to have faster growth rates compared to smaller broods (Cooch et al. 1991, Black & Owen 1987).

The above examples suggest that there are advantages in being adopted, and that goslings that have become separated from their parents are unlikely to survive without becoming adopted. There are undoubtedly advantages for a lost gosling to join another family, not least because parental protection is likely to play a significant role in offspring survival (Black & Owen 1987). Adoption is more likely at an early age in life (up to about two weeks of age) but there are examples where adoption has occurred at later stages in life (see reference to Choudhury et al. 1993).

An obvious prerequisite for adoption is that there are other families of geese in the area so that adoption may be possible. In the case of the released population of Lesser White-fronted Geese in Sweden, their production of young has been low (amongst other reasons due to high predation rates on adult birds) and the chances of young that are released actually becoming adopted are very small as there are very few pairs with broods of goslings. In this respect, releases of young raised in captivity into the Swedish mountains are unlikely to result in birds becoming adopted by adult birds from the Swedish Lesser White-fronted Goose population. As a result, these goslings cannot be expected to follow the same route as the other geese (which themselves follow a human-induced and unnatural migration route, see elsewhere in this report).

### **3.4.3 Family and social life**

Geese are social animals and interact both with members of their own family as well as other conspecifics. Young geese remain within the family unit until they are chased by their parents or leave on their own accord. The length of time that geese remain in the family varies but is normally for several months, at least until prior to the next breeding season. In some species, however, young birds may continue to associate with their parents for several seasons (e.g. Warren et al. 1993). Raveling et al. (2000) found that prolonged parental care was beneficial to Canada Geese, resulting both in better survival as well as having better reproductive success in their first year of breeding than for young birds that were not in family associations. Black & Owen (1987) showed that young in families had enhanced social status. Lack (1968) showed that survival and subsequent reproductive success was enhanced in birds within a family structure.

Young geese are known to learn which food plants that are most profitable from their parents, and indulge in food-sharing (Black & Owen 1989a, Turcotte & Bédard 1989). Food-sharing bouts may occur up until the young are ten months old. However, the frequency of such bouts decline as goslings become older (Black & Owen 1989a).

In the case of the Lesser White-fronted Geese released in Sweden without any parents or foster parents (i.e. birds released in the current programme from 2010 onwards) then these feed in habitats that are very unlike that of the wild Fennoscandian birds (see **chapter 5.6.2**). These birds feed in agricultural habitats and in park grasslands, whereas the wild Fennoscandian Lesser White-fronted Goose population feed on coastal marshes and steppe-like habitats. A shift towards agricultural and other man made habitats may lead to a conflict between geese and human interests, if the population were to increase. The problem would be exasperated if the birds released in Sweden breed successfully (which they do) and thereby teach their offspring to feed in the same habitats as the parent birds.

## 4. HISTORY OF CAPTIVE BREEDING AND RELEASES OF LESSER WHITE-FRONTED GOOSE IN EUROPE

Captivation and domestication of geese has a long tradition. The Egyptian Goose *Alopochen aegyptiacus* was caught, kept in captivity and possibly domesticated in Egypt in the 3rd millennium BC. The common domestic goose, nowadays found across the world, derives from the Greylag Goose *Anser anser*, probably of the *rubrirostris* subspecies (Albarella 2005). Several time-lines for the domestication processes have been suggested, though the general consensus is that the European domestic goose was domesticated approximately 3,000-5,000 years ago, most likely in the vicinity of the eastern Mediterranean region (Heikkinen et al. 2015, Bruford et al. 2003). The Chinese domesticated geese are derived from another species, the Swan Goose *Anser cygnoides* (Bruford et al. 2003). Well-documented records of domestic geese date back to the first half of the 8th century, as in Homer's "Odyssey". By Roman times, goose husbandry had become well established. Geese were, however, not only used for food, but were also kept for religious purposes and for pleasure as was evident in the 1st century BC (Albarella 2005). In mediaeval England during wartime, goose feathers for fletching arrows were in great demand. In February 1417, six feathers from every goose in 20 southern counties were ordered sent to the Tower (in London) by 14th March, and, on 1st December 1418, sheriffs were ordered to supply 1,190,000 goose feathers by Michaelmas. Such orders were issued annually to replace stocks (Hardy 1992 referred in Shrubbs 2013).

As detailed above, having geese in captivity has a long history. Although we have not made a specific extensive search of literature for records of Lesser White-fronted Geese held in captivity, we know they have been held in captivity at least since the mid-1850s. Irby (1861) mentions seeing Lesser White-fronted Geese in the Zoological Gardens, Regent's Park in London, England sometime after 1859. He was familiar with the species after having previously shot two birds in India. Finn (1909, 1915) describes how four wild-caught birds were obtained from a Calcutta bazaar in 1898 and sent to the Calcutta Zoo, India. Horsbrugh (1910) describes a hybrid Lesser White-fronted Goose x Brent Goose in the waterfowl collection of Stephen's Green in Dublin, Ireland, and Quintin (1919) describes the probable first captive breeding of Lesser White-fronted Goose in Britain in 1918. Quintin acquired his three adult birds in July 1914. At Slimbridge on the Severn estuary (England), they acquired their first Lesser White-fronted Goose in 1946 (The Severn Wildfowl Trust 1948). The Severn Wildfowl Trust, later became the Wildfowl Trust, and again changed its name to the current one of The Wildfowl and Wetlands Trust (WWT). At that time, the Lesser White-fronted Goose was considered an extreme rarity in Britain with only three records of single birds prior to 1946 (British Birds Rarities Committee (BBRC), Davies & Scott 1946).

The total number of captive Lesser White-fronted Geese currently registered worldwide with the International Species Information System (ISIS 2013) as of October 2013 was 272 individuals in 46 collections, with 37 of these collections being in Europe (with a total of 233 individuals). These numbers are likely to represent much less than half of the true number of captive Lesser White-fronted Geese, as many private breeders and other collections are not registered with ISIS. In Sweden both "Nordens Ark" (65 individuals) and The Skåne Zoo Foundation (Stiftelsen Skånes Djurpark) (1 individual) were registered, while similarly in Finland, Ahtari Zoo, Helsinki Zoo and Ranua Wildlife Park were registered with 3, 4 and 2 individuals respectively in 2013. Clearly, most of the stakeholders of continued releases of Lesser White-fronted Geese in Fennoscandia that keep Lesser White-fronted Goose stocks do not have their breeding stocks registered with the International organisation for zoos, aquariums and related conservation organisations.

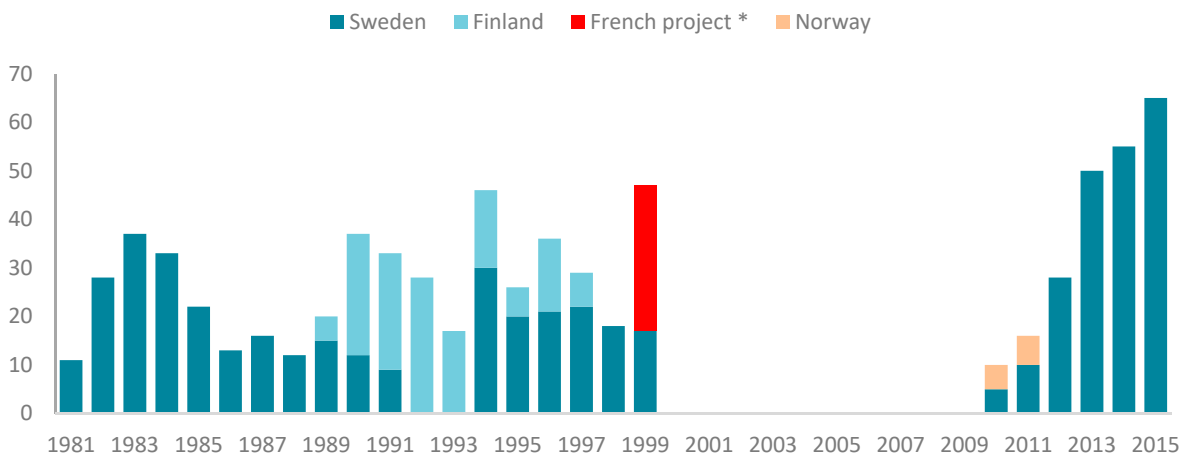
Significant captive breeding stocks of Lesser White-fronted Goose were built up in Sweden and Finland to supply the reintroduction/supplementation programs that released birds in Fennoscandia between 1981 and 1999. These breeding stocks were mainly housed at the Öster-Malma Hunting and

Wildlife Management School in Nyköping, Sweden; the “Nordens Ark Foundation” in Western Sweden; a private farm on the isle of Hailuoto on the west coast of Finland; and Hämeenkoski Farm in southern Finland.

While a small proportion of the birds (seven individuals) which founded the Öster-Malma breeding stock were wild-caught in Fennoscandia and therefore of known wild origin, the majority of birds introduced into these breeding stocks were from existing captive collections of unknown wild origin and with a long history of captive-breeding (Tegelström et al. 2001).

After a temporary halt of releases in Sweden after 1999 following the detection of alien genes in the original captive stock, a new captive stock was established at the zoo of the foundation known as “Nordens Ark”, Sweden in cooperation with the Swedish Association for Hunting and Wildlife Management (Svenska Jägareförbundet) and they also rebuilt the captive stock at Öster Malma. These stocks were founded by using wild-caught birds from the Western Main population. Juvenile Lesser White-fronted Geese were captured on the Russian tundra and moved to Moscow Zoo where they underwent a veterinary examination before being sent to “Nordens Ark”. A total of 59 Russian Lesser White-fronted Geese were imported into Sweden between 2006 and 2013 (Liljebäck et al. 2013).

By 2015, a total of 740 captive-bred Lesser White-fronted Geese have been released in Fennoscandia through official release programs. This comes in addition to an unknown, but perhaps substantial, number of illegally released and escaped Lesser White-fronted Geese from a number of sources throughout Europe.



**Figure 14.** Number of released captive-bred Lesser White-fronted Geese in Fennoscandia in the period 1981-2015. In addition, there is an unknown number of illegally released and escaped Lesser White-fronted Geese throughout Europe. \*=raised in Belgium, released in Central Sweden.

## 4.1 Reintroduction in Sweden using Barnacle Goose foster parents (1981-1999)

A project was initiated in 1976 for a release programme for Lesser White-fronted Geese in Sweden. The project group consisted of Bertil Haglund, Eric Fabricius, Finn Sandberg and Lambart von Essen, and the latter was chosen as project leader.

The release site in Norrbotten County was selected as being where Swanberg (1936, 1946) found that the Lesser White-fronted Goose was a common breeder in the 1930s and 1940s. According to locals, only some few single birds had been seen in recent years. Later it was reported that a single brood with four goslings had been seen by a Dutch ornithologist in 1979 in the northern part of the area (von Essen 1993a, 1996b).

The first releases into the wild took place in 1981 (von Essen 1986, 1993a, 1996b). The breeding stock was built up during 1977-1979 mainly with birds and eggs originating from wildfowl collections in the Netherlands, England and West Germany (von Essen 1982). During the period 1981 to 1999, 348 captive-bred Lesser White-fronted Geese were released in Swedish Lapland, mainly in the Svaipa area, Arjeplog municipality in Norrbotten County, although in 1994, 30 of them were released at “another site”. Most of these latter geese disappeared (von Essen 1999c).

Barnacle Geese were used as foster parents to alter the migration route of the geese to supposed safer and better wintering areas in the Netherlands (von Essen 1986, 1999c). The method was based on the knowledge that geese are imprinted on the location where they learn to fly and that they learn the routes by following their parents. The project team were obviously aware that goslings are imprinted on the birds which rear them (von Essen 1999c, Fabricius 1983), and thus the released Lesser White-fronted Geese would follow their foster parents to wintering grounds in the Netherlands. The birds used this artificially established migration route, which avoided countries with unsustainably high hunting pressure. A total of 66 young fledged from breeding attempts in the release area between 1981 and 1999 (Tegelström et al. 2001). The number of fledglings reared between 1999 and 2007 ranged from 13 to 20 annually, with a total for the eight-year period of 136 fledglings from 51 broods (Tegelström et al. 2001). See **chapter 5** for a detailed description of the population development and the possible negative effects of the project.

The exact origin of birds used in this first introduction project are poorly documented or indeed lacking, although Tegelström et al. (2001) writes that seven of the individuals which founded the Öster-Malma breeding stock were wild-caught. The details and catching data on these seven wild-caught individuals have not been traced in any publications currently known to us, but as they were caught after protection in Sweden in 1964, records of this must exist at least in the archives of the Environmental Authorities.

In 1991, blood samples were collected from 23 Lesser White-fronted Geese in Öster Malma for analyses of relationships between individuals (Tegelström & von Essen 1996). However, these birds originated from at least five different sources / farms as follows: Uvnäs-Eriksberg, Sweden (7 of the sampled individuals), Boda, Sweden (5 individuals), Öster-Malma, Sweden (2 individuals), unknown source in Germany (1 individual) and from Slimbridge, England (5 individuals). The same authors also note that all of the birds from sources in Sweden might have originated from a Dutch wildfowl farm. Additionally, following import to Sweden, individuals have been moved between groups/farms (Tegelström & von Essen 1996). In 1993, the number of captive breeding pairs was further increased with imports of birds from several farms, although the numbers of geese involved are unknown. These birds came from “Nordens Ark” in Sweden, from Rängs Farm in Sweden, and from an unknown source in Denmark.

The releases were halted after 1999 when a study of the genetics of the Finnish captive stock showed that four out of the 15 individuals sampled carried mitochondrial DNA (mtDNA) typical for Greater White-fronted Goose *Anser a. albifrons* (Ruokonen et al. 2000). Among the 15 individuals studied, three had originated directly from Öster-Malma in Sweden, and one of the Öster-Malma individuals had the mtDNA characteristic for the Greater White-fronted Goose (Tegelström et al. 2001, Ruokonen et al. 2000, Andersson et al. 2004).

A more thorough study involving a total of 128 captive Lesser White-fronted Geese held in Swedish farms, 91 wild Greater White-fronted Geese sampled in the Netherlands, Sweden, Ireland, Bulgaria, Kazakhstan and Russia, and 110 wild Lesser White-fronted Geese, showed that a total of 17 individuals (16%) of the captive Lesser White-fronted Geese had mtDNA typical for the Greater White-fronted Goose, while four (3%) of the captive birds (originating from a Belgian farm) were found to carry a mtDNA haplotype related to the Greylag Goose *A. anser* (Ruokonen et al. 2007). None of the wild Lesser White-fronted Geese or Greater White-fronted Geese were found to carry a mtDNA haplotype typical for the other species nor mtDNA halotypes typical for Greylag Goose. The two species were monophyletic with respect to mtDNA (Ruokonen et al. 2007).



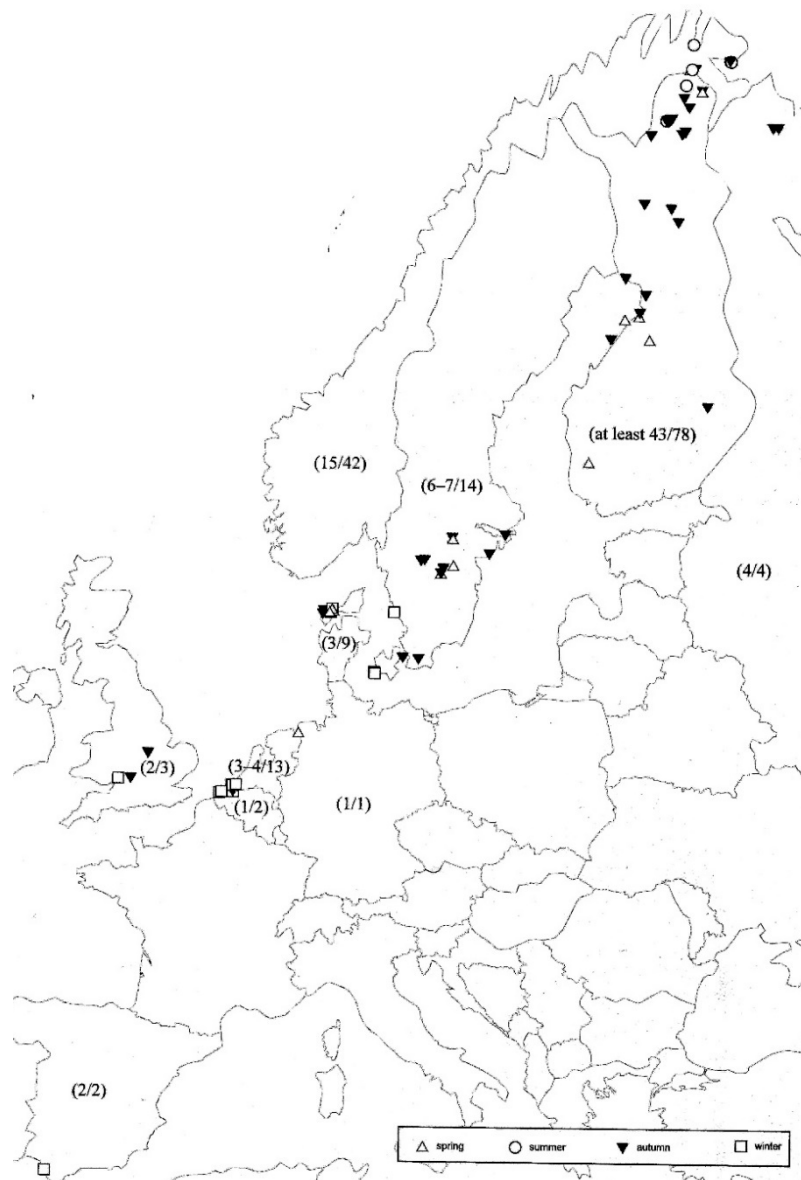
A Lesser White-fronted Goose (front and side views) with colour-ring combination as used by the Swedish reintroduction project in the 1981-1999 releases. Illustration by Jari Kostet.



## 4.2 Restocking in Finland (1987-1997)

In winter 1985-1986, a captive breeding stock was established on the isle of Hailuoto on the western coast of Finland, and since 1989 also at Hämeenkoski in southern Finland (Markkola et al. 1999). The first four adults came from Öster-Malma in Sweden, while another 11 birds came from a private farm in Sweden (which later became Eriksberg Viltpark). Several further imports were made of birds originating from captive populations in the UK, the Netherlands, Germany, Denmark and Belgium. Between 1989 and 1997, 143 captive-bred Lesser White-fronted Geese were released in Finnish Lapland, but high mortality rates were detected and no known breeding attempts were made by the released birds (Tolvanen & Markkola 1997, Markkola et al. 1999).

This restocking project did not aim to modify the migration routes of the Lesser White-fronted Goose as was the case with releases in Sweden. With no guidance from adults, the birds mainly flew south along the coast, and it was thought that they followed Bean Geese on migration to winter in western Europe, rather than to follow routes used by wild Lesser White-fronted Geese. Released Lesser White-fronted Geese have been observed in October and winter in southern Sweden, Denmark, the Netherlands, Belgium, Great Britain and even in Spain (Markkola et al. 1999). One of the main problems experienced by this restocking attempt, in addition to the birds following the wrong migration route, was high mortality that was attributed to behaviour. The birds were much too tame and many of them were consequently killed in a variety of manners. During the first winter, mortality rate was as high as 70-80%. The released birds were observed in yards, and one individual landed in a kennel and was killed by dogs. The releases were abandoned in 1998 after an international conference on conservation of Lesser White-fronted Goose in Helsinki in 1998 concluded that the release project did not work as anticipated. However, Lesser White-fronted Geese have continued to be bred in captivity in Finland since then.



**Figure 15.** Spatial distribution of resightings and recoveries of released Lesser White-fronted Geese from the Finnish restocking project in 1989-1997. The numbers show the totals of different individuals / number of observations in each country (after Markkola et al. 1999).

## Atten nye agronomer

Fungerende rektor Berit Martinsen (bildet) ved Finnmark Landbrukskole i Tana kan i disse dager ønske atten etablerte jordbrukere, femten kvinner og tre menn, lykke til med sin agronomutdanning ved skolen.



De atten gjennomgår en desentralisert agronomutdanning. I løpet av en periode på to år vil de fullføre kurset. Skolens lærere skal stå for undervisningen. Elevene har tredagers samlinger i Tana hver måned. Mellom samlingene i Tana vil det bli holdt lokale fagsamlinger rundt i fylket.

Martinsen kan fortelle at det har vært stor interesse for kurset. Skolen håper dette er en utvikling som går i retning av å tilføre det etablerte jordbruket nødvendig fagkompetanse.

Fylkeslandbrukskontorets prosjekt «Særlige tiltak for jordbruket i Finnmark» har tatt initiativ til kurset.

## Brevvenn i Ghana?

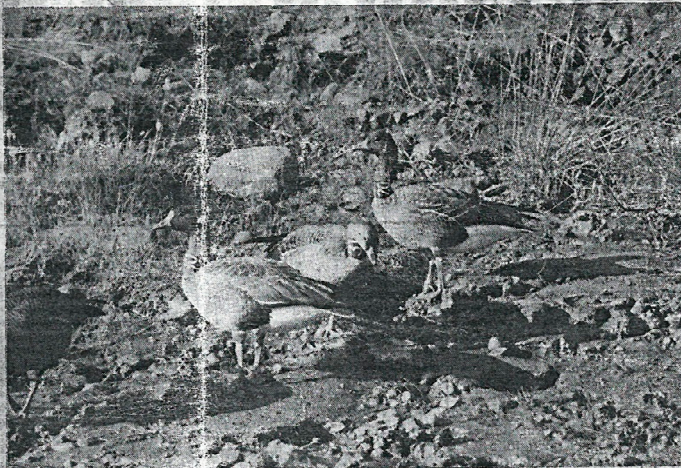
Finnmarken har fått et nytt høflig brev fra Ghana. Det kommer også fra Takoradi i den vestlige delen av landet. Denne gangen er det Clement på 21 år som ønsker seg en brevvenn. Om det er finnmarkingene som nå har blitt så populære i Ghana, vet vi ikke, men brevene finner

i alle fall veien helt fram til oss i Vadsø. Riktignok med en heller sparsom adressering.

Clement studerer og skal bli sivilingeniør. Han liker å reise, å lese og å lage mat. De som vil, kan skrive til Clement på engelsk. Hans adresse er:

Clement Segborwoiso  
Takoradi Polytechnic  
P.O. Box 256  
Takoradi  
Western Region-Ghana

## Halvville eller halvtamme gjess



Om dette er halvtamme villgjess eller halvville tamgjess, skal vi ikke svørge på. Vi skal heller ikke begi oss på å bedømme hvilken gjessart det dreier seg om. Det vi med sikkerhet kan si at det er staselege fugler og at de er ringmerket et eller annet sted i Finland.

Det er Harald Johnsen fra Båteng som har tatt bilder av fuglene. Han kom på fire, fem

meters hold før gjessene hev seg på vingene. Hver av fuglene hadde nummerert «halsbånd» og ring i døy ene foten. Fugleksparter blant våre lesere kan sikkert gi oss og andre fugleinteresserte opplysninger om hvilken gjessart disse fuglene tilhører. Nebbet hos disse fuglene er etter fargefoto rødgrønt. Kan det være grågås, eller kanskje sædgås – eller ingen av delene.

**Figure 16.** Several Lesser White-fronted Geese from the Finnish restocking project showed up in Båteng, Finnmark, Norway, and the observation was published in the regional newspaper “Finnmarken” on 26th September 1990. They were unusual tame and this is illustrated by the first sentence: “If these are half-wild or half-tame we can’t swear to it”. The observer came on a distance of 4-5 meters before they flew off.

### 4.3 Pilot project on reintroduction by use of ultra-light aircraft in Sweden (1999)

In 1999, 30 Lesser White-fronted Geese of mostly Belgian captive origin were transported from France to central Sweden. The goslings were hatched and imprinted upon two humans (Christian Moulllec and his wife Paola) in France. The Moulllecs then travelled with the goslings and two ultra-light aircraft to Öster-Malma in Sweden in the beginning of July (von Essen 1999b). There, the geese learned to fly with the ultra-light aircraft. On 1st September they flew stepwise along the Baltic Sea coast south to a nature reserve along the River Rhine in Germany. The French project wanted to release the birds in Swedish Lapland, but the leaders of the Swedish reintroduction project opposed this, since they were worried it would disturb their own project that had shown some small improvements at the time (von Essen 1999b). Only 12 of these 30 birds returned to Öster-Malma, where they were recaptured and entered into the farming stock (Andersson 2001), so the majority remained free-flying. Some of them were subsequently observed in southern Sweden (Andersson 2001) and coastal areas of Finland (occasionally also in Denmark and Germany) mainly together with Barnacle Geese. No breeding by these birds has been reported. A television film crew from *Media Video Compagnie* followed the project and made a film for French television.

#### 4.4 Illegal releases of broods in Finland with Barnacle Goose foster parents

In summer 2004, three Lesser White-fronted Goose goslings were released together with their Barnacle Goose foster parents in northern Finland, despite the moratorium on releases in Finland. The male was satellite-tagged (Jones et al. 2008). One of the young Lesser White-fronted Geese was observed among Barnacle Geese in the Netherlands in December 2004, though not in the company of its foster parents, nor with reintroduced Swedish birds. The illegal release was filed but in a subsequent district court trial in 2005 those responsible for the releases were not sentenced, because it was concluded that the “scale of the activity” was so small, i.e. the risk of establishing an alien population was considered to be negligible.

Similar to the 2004 release, one brood of Lesser White-fronted Goose goslings was released in northern Finland in summer 2009 along with Barnacle Goose foster parents. The whereabouts of these birds are unknown. The 2009 release was, as in 2004, taken to the district court. The court concluded that the captive Lesser White-fronted Goose stock is regarded, as is also the case for Barnacle Goose in Finnish Lapland, as an alien species, and the perpetrator of the release was fined on the grounds of a nature conservation violation.

A third release took place in 2013. A family consisting of Barnacle and Lesser White-fronted Geese were apparently illegally released, as such a group was observed on the lake by Näkkälä village, Enontekiö municipality, Finland, in August 2013 (Tuomo Ollila, Metsähallitus pers. comm.).

There are also observations of hybrid Barnacle Goose x Lesser White-fronted Goose in South-western Finland (BirdLife Suomi-Finland 2016), but it is not known if these originate from the Swedish reintroduction project or from the Finnish releases.

The details of the three court cases are given in **chapter 4.13**.

#### 4.5 Pilot project on supplementation in Norway (2010-2011)

In Norway, a pilot project was initiated in 2008 to see if supplementation of the wild population could help it to recover from a critically low level. A feasibility study (Lee et al. 2010) was commissioned to Wildfowl & Wetlands Trust (WWT), and a preparatory workshop was held in Trondheim, Norway between WWT, the Norwegian Directorate for Nature Management (currently the Norwegian Environment Agency), NOF-BirdLife Norway and the AEWA Secretariat in May 2009. The feasibility analysis was extensive, and made recommendations for which key issues and risks should be factored into the decision making. If a decision were to be made to implement a supplementation programme, the programme should aim to release birds with utmost urgency while the existing part of Fennoscandian Lesser White-fronted Goose population breeding in Norway was large enough to support a supplementation, and any supplementation should be conducted in conjunction with wider conservation measures. A set of short-term steps were identified. In addition, the feasibility study identified several short-term steps if a decision should be made not to implement a supplementation programme.

During the autumns 2010 and 2011, a total of 11 goslings were released at the Valdak Marshes in the Porsangen Fjord same period as wild successful breeding birds were staging in the area. The released birds came from the zoo “Nordens Ark” in Sweden, where they had built up a new stock of Lesser White-fronted Geese originating from the breeding areas in the Polar Urals in Russia (see **chapter 4.6**). The release site was chosen in the hope that the released goslings would join the wild flock and follow them on the migration to the wintering areas in Greece. All goslings were fitted with black

neck-bands with individual codes. Two of the four goslings in 2010 were released with satellite transmitters. One gosling had a 30-gram ARGOS/GPS solar-powered transmitter mounted as a backpack, while the other had a 5-gram Argos transmitter mounted on the neck-band. In 2011, five of the six goslings were released with 5-gram Argos transmitters attached to the neck-band (Øien & Aarvak 2010, Aarvak & Øien 2011). The expectancy of any of the birds returning was low as all the goslings were believed to be males, and in geese in general it is the male that is the dispersing sex. The captive breeding stock at “Nordens Ark” struggled with a highly skewed sex ratio with an overwhelming number of males produced. Of the six goslings in the brood sent with parents to Finnmark in 2011, only one gosling was sexed as female and the Swedish “Project Fjällgås” demanded its return. It was subsequently returned together with the mother only, as the accompanying adult male died suddenly in the holding pen (see **chapter 4.12** on spread of diseases). After releases from the pen both in 2010 and in 2011, the young were observed at the marshes daily, sometimes alone, sometimes in association with Greylag Geese, and on a few occasions together with the wild Lesser White-fronted Goose staging in the area.



Four juvenile Lesser White-fronted Geese together with two adult birds, in the holding pen at Valdak Marshes in 2010. The birds have just arrived and are not yet processed for release with neck-bands. Photo: Tomas Aarvak

**Table 1.** Details of the Lesser White-fronted Geese with black neck-bands (white characters) released in Porsanger, Norway in 2010 and 2011. All birds released were fledged goslings (i.e. 1st calendar-year birds).

Ring nb.	Status	Neck band	Date release	Sex	Date biometry	Wing max	Head+bill	Weight	PTT id.	Resighted abroad?
CA21163	Released Porsanger	A06	26.08.2010	M	21.08	356	82.3	1300	43913	
CA21164	Released Porsanger	A16	26.08.2010	F*	21.08	365	83.6	1440		
CA21165	Released Porsanger	A17	26.08.2010	M	21.08	368	84.0	1460		
CA21166	Released Porsanger	A18	26.08.2010	M	21.08	373	87.7	1330	43884	yes
CA21167	<i>Returned Nordens Ark</i>	<i>(A20)</i>		F	21.08	357	81.8	1260		
CA21175	Released Porsanger	A19	22.08.2011	M	11.08	337	82.6	1030	60761	
CA21176	Released Porsanger	A21	22.08.2011	M	11.08	361	86.0	1160	60762	yes
CA21177	Released Porsanger	A22	22.08.2011	M	11.08	333	77.6	1030	60768	
CA21178	Released Porsanger	A23	22.08.2011	M	11.08	337	78.9	1060	60772	
CA21179	Released Porsanger	A24	22.08.2011	M	11.08	346	86.3	1100	60773	
CA21180	Released Porsanger	A25	22.08.2011	M	11.08	358	84.5	1160		yes

\* this individual was at first sexed as male.

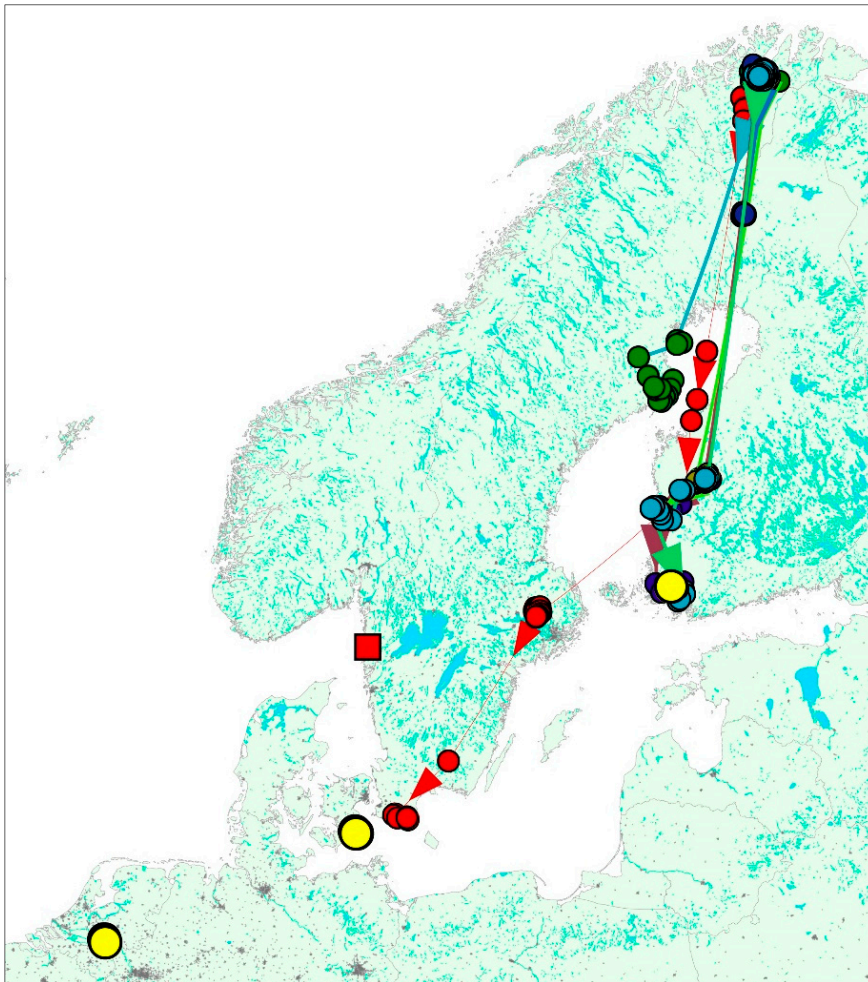
Only one of the released birds (black neck-band A16) returned to the release site in the Porsangen Fjord the following year, but it was despatched on 23rd May 2012 by the Norwegian State Nature Inspectorate since it did not follow the wild Fennoscandian Lesser White-fronted Geese, but rather wintered in the Netherlands and Belgium. The choice of this route was undesirable, as the individual could come into contact with birds from the Swedish release project, or with feral birds and bring individuals or groups with an altered genetic make-up into the wild Fennoscandian population. Additionally, amongst many arguments for and against, it was considered extremely important not to destroy the natural migration route of wild Lesser White-fronted Geese that migrate through Russia, Hungary etc., to the wintering areas in Greece. This is important for the species, and also for the nature conservation in Hungary and Greece, as these countries could risk losing the species within their national borders.

Of the 11 birds released, two individuals generated many resightings (A21 & A25), especially in the Netherlands (see **Figure 19**, **Figure 20**).

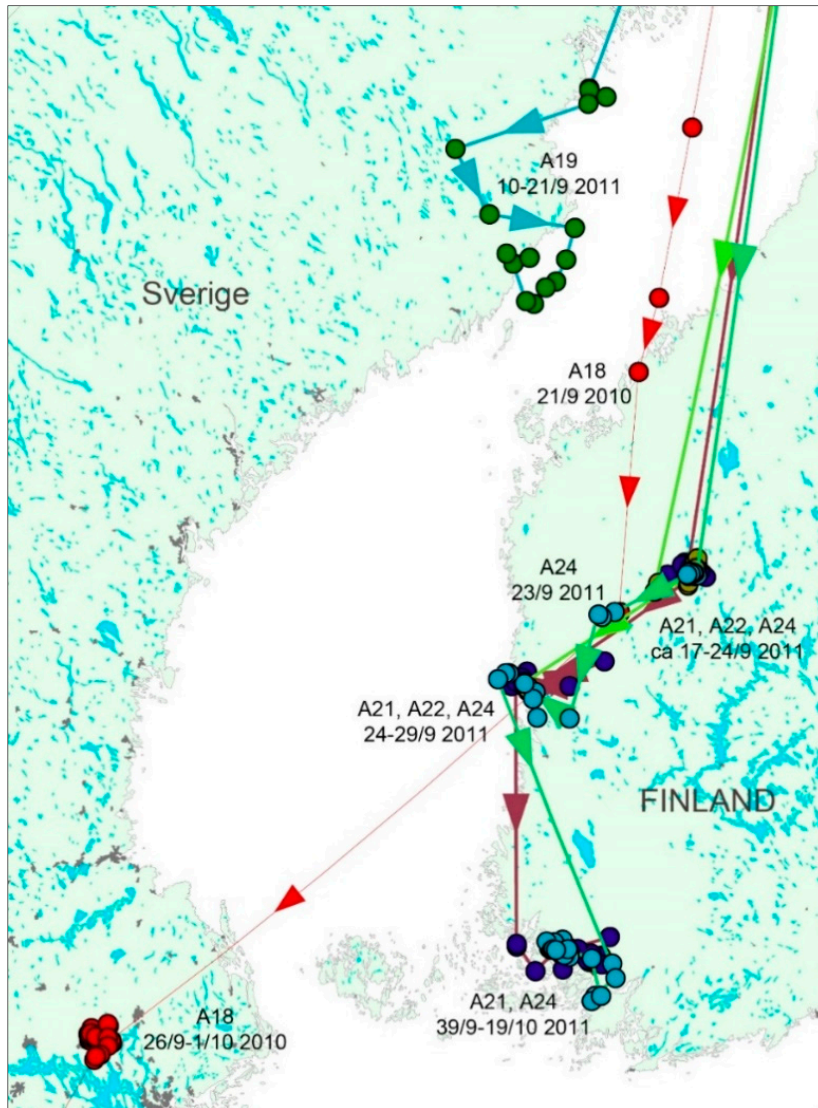
The releases in Norway were abandoned in 2012 when it was concluded that thereleased Lesser White-fronted Geese did not follow the natural migration routes, but presumably followed Greylag Geese from the Porsangen Fjord to Belgium and the Netherlands. Greylag Geese from northern Norway, especially from central and eastern Finnmark, migrate through the Bothnian Bay southwards along the Baltic Sea, crossing southern Sweden before ending up wintering in the Netherlands. The Lesser White-fronted Geese equipped with satellite transmitters and neck-bands followed either the east coast of Sweden (n=1) or the west coast of Finland (n=5). In Finland, one of the individuals was recorded staging in a city park together with Barnacle Geese. Some continued further to Spain (Arne Follestad pers. comm.). Although the carrier species in this case was not confirmed, an explanation could be that they just follow any of all the many geese migrating south to winter in the most important areas in the Netherlands. The number of geese in the Netherlands peaks at 1.8 million geese during winter and this amounts to approximately 50% of all wintering geese in Europe (Koffijberg et al. 2010, Fox et al. 2010). Based on resightings in the Netherlands of neck-banded Lesser White-fronted Geese from the Finnish and Norwegian releases, Koffijberg & van Winden (2013) wrote in the summary about migration of Lesser White-fronted Goose: *“this confirms that birds from several sites in Northern Fennoscandia might migrate to the Netherlands in winter”*. This statement is incorrect if it is related to wild breeding birds and not farmed ones. However, they

correctly conclude in the discussion: “On the other hand, none of the earlier colour-ringed individuals, or satellite-tracked birds from Norway (native breeding birds) was ever observed in the Netherlands. Thus, the difference in dispersal might just be a result of the origin of the birds”. Migration studies by use of satellite transmitters and resightings of colour-ringed birds from the wild breeding birds in northern Norway and Finland clearly show that they have never wintered nor migrated through Western Europe, but rather that they utilise sites in Eastern Europe on the way to the wintering areas in Greece (see **chapter 3.1** and **3.2**). This is not surprising given the species preference for steppe and puzta habitats, which do not exist in Western Europe.

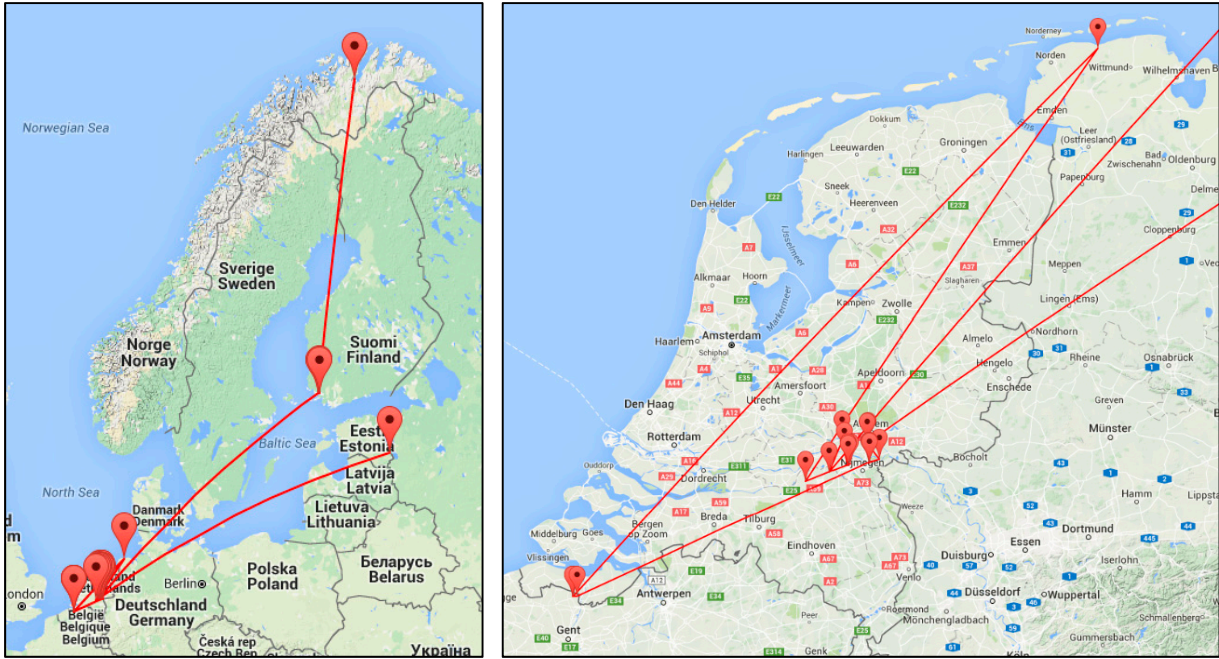
The negative lessons learned from these two release projects in Finland and in Norway have regrettably not been taken into account in Sweden. Neither has the fact that published sources from the early 1980s stated that goslings learn where to migrate from their parents (von Essen 1982). Advice from the early 1980s has clearly been ignored. Without the guidance by parents we can only speculate as to what determines the choices made by geese when the summer ends and it is time for the migration to the wintering areas.



**Figure 17.** Migration routes of the captive bred Lesser White-fronted Geese that were released with satellite transmitters in the Porsangen Fjord area, Norway, in 2010 and 2011. The red dots represent the individual released in the autumn 2010. Other colours represent different individuals released in the autumn 2011. The autumn observation on Ruissalo, SW Finland, in October 2010, and in Denmark and in the Netherlands during the winter 2011-2012 are indicated by yellow dots. The location of the zoo at “Nordens Ark” where the released birds were reared is indicated by a red square.



**Figure 18.** Migration and local movements in the Gulf of Bothnia by captive bred Lesser White-fronted Geese that were released with satellite transmitters in the Porsangen Fjord area, Norway, in 2010 and 2011. The red dots represent the individual released in autumn 2010 (neck-band A18). Other colours represent different individuals released in the autumn 2011 (neck-bands A19, A21, A22, A23 and A24).



**Figure 19.** Resightings of Lesser White-fronted Goose with neckband A21 (n=23 records, data from <http://geese.org> and <http://ringmerking.no>). The red lines merely connect the sequence of observations and do not indicate the migration route. This bird seemed to have joined Russian Greater White-fronted Geese as it was regularly seen within larger flocks of these during winter. The bird had a 5 gram satellite transmitter attached to the neck-band, but this transmitter was lost after 68 days. The goose was last seen 9th May 2013 in Estonia.



**Figure 20.** Resightings of Lesser White-fronted Goose with neckband A25 (n=29 records, data from <http://geese.org> and <http://ringmerking.no>). The red lines connect the sequence of observations and do not indicate the migration route. It was seen with A21 in a flock of Barnacle Geese during the first autumn migration. During winter, it has been seen together with Greylag Geese, but also more recently together with Greater White-fronted Geese. It is believed to follow Greater White-fronted Geese during migration to summer in Russia.



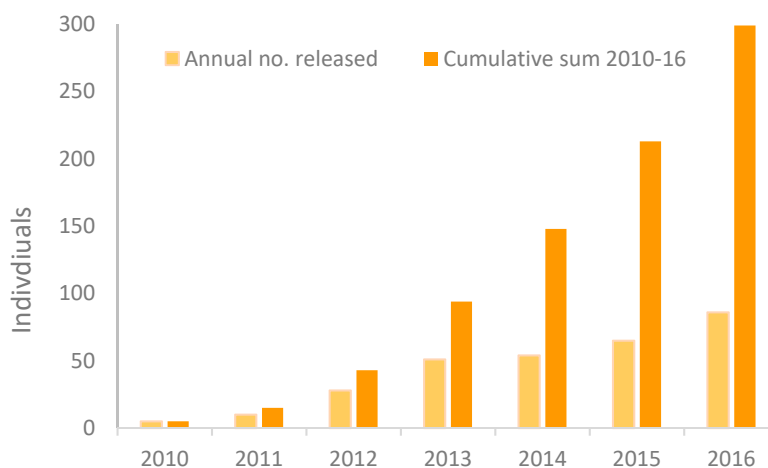
## 4.6 Current release project in Sweden (2010-present)

The current release project in Sweden is run by *Projekt Fjällgås*, which is a collaboration between the Swedish Association for Hunting and Wildlife Management (Svenska Jägerförbundet) and the zoo foundation “Nordens Ark”.

After genetic studies in 1999 revealed that individuals in the captive breeding stock used for the Finnish and Swedish release projects were carrying DNA of other goose species, notably Greater White-fronted Goose and Greylag Goose, and pending additional genetic studies, a moratorium on the release of the birds was introduced in Sweden. The genetic findings initiated an intensive debate about the value of the present captive-bred stock and the possible consequences of the existence of an unknown number of released birds carrying Greater White-fronted Goose genes in Sweden. Negotiations were initiated with Russian scientists and authorities in late 2003, aimed at transferring young wild Lesser White-fronted Geese caught in northern Russia west of the Ural Mountains to Sweden. *Projekt Fjällgås*/SEPA subsequently established a cooperation with the Russian Goose, Swan and Duck Study Group and with Moscow Zoo. The first eight young birds were captured in 2005 in the Polar Urals, transferred to Moscow Zoo, and then imported to Sweden.

Since 2010, *Projekt Fjällgås* have released Lesser White-fronted Geese reared in captivity into the mountainous region around Arjeplog in Swedish Lapland (Andersson & Holmqvist 2011, Liljebäck et al. 2012, 2013, 2014). The numbers released have varied, and have ranged between 5 and 86 individuals annually. Since 2013, birds have also been released in the local park in the town of Hudiksvall, 550 km to the south of the release sites in the mountains. The town of Hudiksvall is situated on the east coast of Sweden, at 61°N. The habitat in and around Hudiksvall is very different to the mountain sites, and the birds are released within a public park with grass lawns. Hudiksvall is used as both a staging and a moulting site for a variable number of individuals from the Swedish reintroduced Lesser White-fronted Goose population. In total, 299 Lesser White-fronted Geese have been released in Sweden in the period 2010-2016 (**Figure 21**).

Unlike the releases undertaken in 1981-1999 in Sweden where they used Barnacle Geese as foster parents and where the goslings and adults stayed together from the summer, over the winter and until the next spring when the Barnacle Geese would return to their breeding site at Öster-Malma, the current project has released goslings or one-year old geese without parents. We only have access to detailed age distribution data for the years 2010-2012 and 2014, and the proportion has been 69% goslings and 31% yearlings.



**Figure 21.** Annual numbers of Lesser White-fronted Geese released in Sweden in the period 2010-2016 (light orange columns) and the cumulative number of birds released in the same period (dark orange columns).

## 4.7 Imprinting on micro-light aircraft – Operation Lesser Whitefront, Germany (2001-present)

This pilot project is based on modifying the migration route of Lesser White-fronted Geese by imprinting newly-hatched goslings on a micro-light aircraft and training them to follow the aircraft on the ground, on water and in the air.

This project was founded in 2001 with the aim to contribute to saving the declining population of Lesser White-fronted Goose in Fennoscandia. The main action is to imprint Lesser White-fronted Geese upon micro-light aircraft and lead the birds from northern Sweden (Lapland/Västerbotten) along the Swedish Baltic coast, through Denmark, to the Lower Rhine area in Germany. The target area for the reintroduction is Vindelfjällen nature reserve in Västerbotten, and was chosen because of its optimal location in relation to the re-introduction area used by *Projekt Fjällgås*. According to the project *“It is likely that birds introduced by this pilot project sooner or later will mix with birds already migration between Sweden and the Netherlands. As all birds used in this project will be genetically checked, a dilution of unwanted genes already existing in Sweden could take place”* (Scholze 2005). From Vindelfjällen the geese will be led by micro-light aircraft to the Umeälven delta, and then southwards. Due to the restricted range of the micro-light aircraft, the geese will learn staging sites situated 200-225 km apart all the way to the Danish border. From Denmark to the Bislicher Insel in Germany mainly sites in crop fields and grasslands will be used. The project plans to avoid areas protected by national conservation legislation as stop-overs in Sweden and Denmark, but not so in Germany where the project states that relevant authorities are ready to give special permission for landing in such areas with the geese (Scholze 2005).

The project has, as of October 2016, not been able to fly with any geese, though permission from the Swedish Environmental Protection Agency (SEPA) was granted as early as 2005 (letter Dnr 402-3587-05 Nv) with permission to use a maximum of 25 geese per year. The permission was given despite many critical statements from different authorities and organisations, both within Sweden (Länsstyrelsen i Norrbotten, Länsstyrelsen i Västernorrlands län, Länsstyrelsen i Örebro län, Sveriges Ornitologiska Förening, Svenska Naturskyddsföreningen & Norrbottens Ornitologiska Förening) and from abroad. The permission was re-issued in 2010 following only a limited inquiry in Sweden by telephone beforehand (Dnr 429-2910-10 Nv). The first postponement of the project came due to the outbreak of avian influenza in a number of European countries in winter 2005-2006. A further delay arose due to the already proven problems with the genetic make-up of the captive breeding stocks of Lesser White-fronted Geese and the free-flying reintroduced population in Sweden. Based on the results of a negotiation mission of the AEWA secretariat and the subsequent appointment of the Lesser White-fronted Goose RECAP Committee (Committee for captive breeding, re-introduction and supplementation of Lesser White-fronted Geese in Fennoscandia) in 2007, the German Ministry of Environment, Nature Conservation and Nuclear Safety (BMU) requested Aktion Zwerggans and the Allianz Umweltstiftung (the foreseen main financial supporter of the project) to postpone the first flight of the pilot project. The request was made for a three-year postponement until there would be enough offspring of western Russian origin available in the new Swedish captive breeding stock, which would remedy the genetic problems encountered.

The partners of this project include amongst others Aktion Zwerggans (*Operation Lesser White-front*), the German Aero Club, the Biological Station in the District of Wesel (BSKW), Institute of Biodiversity – Network e.V., Zoological Garden Cottbus, the Friends of the Lesser White-Fronted Goose (a Finnish organisation which runs the breeding farm at Hämeenkoski) and Lyksele Zoo (in Sweden).

As is the case with other release projects, this project is also prone to a number of potentially negative effects:

- It is unclear why a new wintering area should be established.
- There is no environmental/ecological impact assessment of the establishment of a new migration route.
- There is no impact assessment of mixing two populations with different migration routes.
- Establishing a new migration route is not in line with modern conservation biology since it avoids problems instead of solving them, and the ecological effects are unknown.
- It diverts the conservation efforts away from the original wild populations.

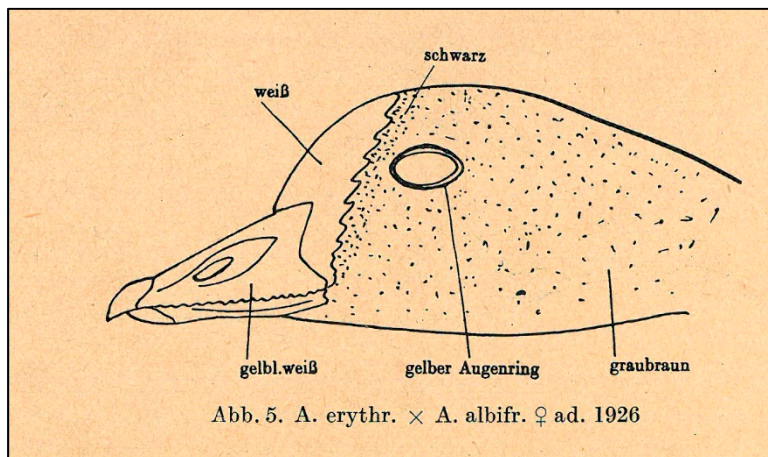
Using micro-light aircraft creates a migration route with many new stopover sites with distances of approximately 200-225 km apart, which is fundamentally different to the migration strategy of wild Lesser White-fronted Geese where stopover sites are situated 800-1,300 km apart (Aarvak & Øien 2003, Morozov & Aarvak 2004). This also creates another serious issue for which environmental authorities, especially within the European Union (EU) have to deal with, as they are obliged to establish protected areas where significant numbers of this highly threatened species occur (see also **chapter 4.13** on the Dutch State of Council ruling). A flight with micro-light aircraft from Vindelfjällen to the south tip of Sweden is approximately 1,400 km, and would involve a minimum of seven stopover sites. The project has mapped the route from Umeå to Denmark and has identified 30 locations along the route which could be used for stop-over and emergency landings.

Another risk is the possibility of Lesser White-fronted Geese (or any other goose species for that matter) which are habituated towards micro- or ultra-light aircraft, then there is that serious risk at they will not respond as other geese by fleeing from aircraft. Rather, such individuals may even be attracted to aircraft, thereby creating a serious aviation hazard. Geese are large-bodied birds, and they can do considerable damage to aeroplanes. The project “Operation Lesser White-front”, is modifying their own aircraft with propeller cages to avoid injuries to the imprinted geese (Scholze 2005).

#### 4.8 Hybridisation between *A. erythropus* and *A. albifrons* in zoos

Nagy (1950) used four hybrids specimens of Lesser White-front x Greater White-fronted Geese (*Anser erythropus* x *A. albifrons*) from a local zoo to describe how wild hybrids would look (**Figure 22**). His intention was to help observers to distinguish between various species and races on the one hand, and various hybrids on the other hand. The hybrids were raised at the Blücherhof estate in Mecklenburg, Germany, and were later available as skins in the Museum Alexander Koenig (=König) in Bonn (provided by Director Dr. von Jordans and Assistant Dr. Mannheims). By 2015 only two of the four *A. erythropus* x *A. albifrons* specimens seen by Nagy were still present in the collection, of which the two individuals described by Nagy (1950) on pages 260-261 (male, 20th October 1912) and on page 262 (female, 13th March 1915). However, there is an additional hybrid from Blücherhof that was apparently not studied by Nagy. Hence, in total the museum now has three adult/subadult specimens of hybrid origin (bred in captivity at Blücherhof) plus two hybrid pulli specimens (Dr. Till Töpfer, Curator, pers. comm.).

This shows that hybridisation between these two species occurred in captivity long before the onset of the reintroduction project in Sweden. It therefore provides more support for the later analysis which showed a captive origin of the introgression problem in the Finnish and Swedish captive stocks (Tegelström et al. 2001, Ruokonen et al. 2000, 2007), and then evidently also for the Swedish free-flying reintroduced population which stems from captive-bred birds.



**Figure 22.** Illustration of the head of a captive-bred hybrid *A. erythropus* x *A. albifrons* from Museum Alexander Koenig. After Nagy (1950).

#### 4.9 Hybridisation between Lesser White-fronted Goose and Greater White-fronted Goose in the wild

Hybridisation of Lesser White-fronted Goose with other goose species is expected to occur in the wild, but is mainly found in Western Europe in relation to breeding/release projects and in pairs with alien species such as Cackling Goose *Branta hutchinsii* and Canada Goose outside the normal breeding range/habitats. Geese that have been bred in captivity are also more prone to hybridise than their wild conspecifics (Randler 2000). As far as we can tell from published accounts, there are to date no records of proven hybrid offspring between Greater White-fronted Goose and Lesser White-fronted Goose, although aberrant and likely hybrids are regularly seen in Western Europe. There is one report from England of “A male Lesser White-fronted Goose mated to a Siberian White-fronted Goose with two young, the young not distinguishable from those of Siberian White-fronts, were seen at Slimbridge Gloucestershire 6-7 March 1956” (Scott & Boyd 1956, Kampe-Persson & Lerner 2007). However, this is not on the list of accepted records by the British Birds Rarities

Committee. Based upon the location of the observation in Britain, they could well be from any of the many stocks of locally bred birds from waterfowl collections as there is no tradition of pinioning geese (or other wildfowl) when the species is registered as naturally occurring in the country. Pinioning is normally only used on non-native wildfowl (Wildfowl & Wetlands Trust 2016).

McCarthy (2006) lists a number of hybrid combinations with the Lesser White-fronted Goose, but all of these either refer to hybridisation in a farm/zoo environment, or are of suspected/likely hybrids based on intermediate phenotypic expression as for instance the apparent hybrid reported by Shackleton (1956) in England in 1956.

In a detailed study on hybrid geese in Sweden, Kampe-Persson & Lerner (2007) describe records of hybridisation of Lesser White-fronted Goose with Canada Goose, Cackling Goose, Barnacle Goose and Greater White-fronted Goose. In addition, there is also a record of a first-generation hybrid between a male Cackling Goose x Lesser White-fronted Goose hybrid attempting to breed together with a female Barnacle Goose, but no eggs hatched. Also, a male hybrid Barnacle Goose x Lesser White-fronted Goose bred unsuccessfully with a Canada Goose as none of six eggs hatched (Kampe-Persson & Lerner 2007). However, in 2010 a female hybrid Barnacle Goose x Lesser White-fronted Goose bred successfully with a male Barnacle Goose (see **chapter 5.6.3**). The hybridisation with Cackling Goose is thought to originate from the breeding of geese at Eriksberg (Nilsson 1983). The large number of hybrids with Barnacle Goose stem from the reintroduction and use of Barnacle Geese as foster parents.

Kampe-Persson & Lerner (2007) list all available records of possible hybrids between Lesser White-fronted Goose x Greater White-fronted Goose in Sweden up until 2007. This includes one hybrid pair in 1991, two individuals in 2005, three individuals in 2006, one in 2001 and a new individual in 2004. In addition, two possible Lesser White-fronted Goose x Greater White-fronted Goose hybrids were reported in 2006. None of these are possible to validate in the Swedish Reporting System as this hybrid combination is even not listed under valid taxa that can be reported (possible hybrid taxa that can be selected in the Swedish Reporting System are *Anser erythropus* x *Anser canagica* and *Anser erythropus* x *Branta leucopsis*). Of the purported hybrids, only two are published in ornithological journals with photographic documentation, and based upon identification characters both seem to be intermediate and candidates for being classified as “likely hybrids” (cf. Lerner 2005).

The article by Nijman et al. (2010) is discussed in detail elsewhere in this report (**chapter 8.3**), but here we would mention that the conclusion in that article of an estimated hybridisation rate of 4% is unrealistic, and this ought to have alarmed the authors that something with their analyses was not correct. A species with such a high rate of hybridisation would not be accepted as an own independent species.

It is noteworthy that the majority of such hybrid combinations occur within regions in Europe where zoos, breeding farms, wildfowl collections and aviaries are common, and one might even speculate if the long domestication history with man is an important factor in the high hybridisation rates found in waterfowl in particular. Recent research into the genetics of Greylag Geese for instance shows both past and ongoing hybridisation between wild Greylag Geese and domestic geese in multiple locations (Heikkinen et al. 2015).

During many field seasons in North-western Kazakhstan where hundreds of thousands Greater White-fronted Geese and more than ten thousand Lesser White-fronted Geese are staging annually during autumn migration, not a single mixed pair have been observed, nor any hybrid offspring despite intensive sampling. In 1997, 15,000 geese were identified to species, while 1,734 Lesser White-fronted Geese were accurately aged (Tolvanen & Pynnönen 1997). In 1998, 11,000 individuals

were identified to species, while 691 Lesser White-fronted Geese and 588 Greater White-fronted Geese were aged (Tolvanen et al. 1999a). In 1999, 46,740 geese were identified by random sampling, with 274 Lesser White-fronted Geese and 14,130 Greater White-fronted Geese accurately aged. As part of the methodology of estimating production, both full broods as well as age samples have been obtained in large numbers to allow for species and year discrimination analyses. Any samples where identification has not been 100% accurate have been dismissed, so only birds seen well have been included. For full details of methodology see Tolvanen et al. (1999b).

In addition, through the EU LIFE+ Nature project “Safeguarding the Lesser White-fronted Goose Fennoscandian population in key wintering and staging sites within the European flyway” (2011-2016), three identification training workshops have been carried out. In these workshops, 36 participants from 14 countries (Estonia, Lithuania, Poland, Hungary, Romania, Bulgaria, Greece, Turkey, Russia, Ukraine, Kazakhstan, Azerbaijan, Iran, Iraq) have brought with them experience and pictures (of varying quality) of these two species, to help train in identification. Several photos of aberrant Greater White-fronted Geese have been presented, of which the most typical are birds with a distinct yellow eye ring, which is not uncommon in Greater White-fronted Geese (see example photo in Tolvanen & Pynnönen 1997). Also, pose of the bird could give impression of shorter wings, as well as effects of light conditions which could give the impression of dark neck or vice versa. Overall, no presumed hybrids have ever been seen within these countries, despite intensive surveys for Lesser White-fronted Geese.

#### **4.10 Escapees, illegal releases and feral populations**

This chapter is not exhaustive in terms of documenting where and how many escapees or feral Lesser White-fronted Geese exist in Europe, but it is nonetheless substantial. The best-documented and most easily accessible material is from Great Britain, which has one of the highest density of ornithologists in the world (Parkin & Knox 2010), as well as easy accessible literature since English is one of the major world languages. Great Britain and Ireland, as well as the Netherlands and Germany, probably have the highest number of wildfowl collections, both private and public, anywhere in Europe, and much of the available literature published on feral or escaped wildfowl is easily accessible. It is, however, a more daunting task tracing records from other countries unless one has a good grasp of the relevant languages. As an example, if people from Britain or Germany should attempt to access all observations of Lesser White-fronted Geese in Norway, it would require knowledge of Norwegian language since most old records are published in the plethora of local, regional and national birding magazines (at present Norway has 16 local magazines and four national magazines/journals for wild birds alone). Even for a Norwegian it would require a large amount of detective work to locate all the relevant information within the various regions in Norway.

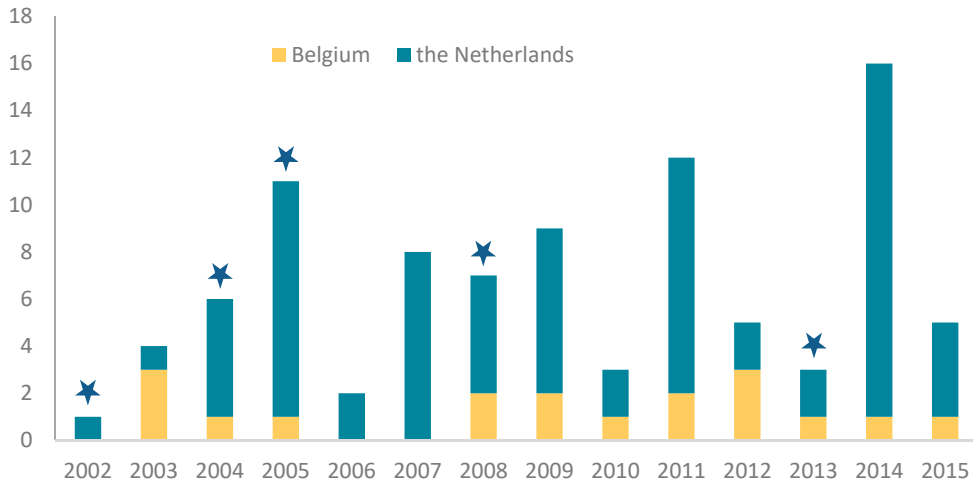
The oldest documented escaped Lesser White-fronted Goose we are aware of comes from Somerset in England, where a bird was shot in January 1888 (Gurney 1902). Due to the regular occurrence of birds clearly of captive origin, it has been difficult to estimate or validate the number of genuinely wild Lesser White-fronted Geese in Britain & Ireland (Parkin & Knox 2010, Cabot 2009, data from British Birds Rarities Committee (BBRC) and the British Trust for Ornithology (BTO). Only about 130 birds of probable wild origin have been recorded since the first official record of an immature shot on Fenham Flats in 1886 (Parkin & Knox 2010, BBRC). Since the majority are of feral origin, the species is included in the British Ornithologist’s Union Records Committee (BOURC) category AE\*, with records thought to largely represent feral birds, but with occasional wild vagrants. Breeding has been reported occasionally in the past but there are no records in recent years (Banks et al. 2008). An increasing number of records are likely to be escapees from wildfowl collections. Four birds recorded during the Wetland Bird Survey (WeBS) in winter 2005-2006 were thought to be escapees (Musgrove

et al. 2007, Cabot 2009). Apart from birds originating from the releases in Sweden (see **chapter 5.2.4**), only presumed escapes have been seen in Great Britain in recent years, for example at five sites during the winter 2009-2010 (Holt et al. 2011) and four sites in 2010-2011 (Holt et al. 2012).

In 1991, an extensive survey was carried out in Britain to produce accurate estimates for all introduced goose species and of hybrids between them. This was especially due to rapidly increasing populations of introduced Canada Goose and Greylag Goose (Delany 1992). There was a growing pressure to control population numbers, particularly of Canada Geese, from farmers whose crops were damaged and also due to damage to sites of conservation interest. Owen et al. (1986) describes the situation for the Canada Goose as “*only coordinated action can prevent this introduced species from assuming pest proportions*”. A total of 29 feral/introduced Lesser White-fronted Geese were found during the nationwide survey in 1991, of which 24 were in East Anglia. The principal site was at the Otter Trust near Bungay, Suffolk, where a flock of 15 full-winged birds were kept. The site at Bungay was formerly home to a small collection of waterfowl. Two hybrid Lesser White-fronted Goose x Greater White-fronted Goose were found in the River Sure system, Norfolk (Delany 1992).

Kampe-Persson (2010) summarised data on naturalised goose populations in Europe. Besides elucidating which populations ought to be considered as naturalised, basic data were presented for 69 national populations of naturalised *Anser* and *Branta* geese. Regarding the Lesser White-fronted Goose Kampe-Persson wrote that the population breeding in Sweden is the last remnant of a formerly abundant Scandinavian population, and is a mixture of the original population and birds from the Swedish Lesser White-fronted Goose project. It is also stated that they follow one of the traditional migration routes, routes that were well separated from that of the North Fennoscandian population and refers to his own work (Kampe-Persson 2009). He concludes that the population should be described as re-inforced. No other populations or countries are mentioned, but in the summary table the total number of naturalised Lesser White-fronted Geese is given as 3 pairs / 7 individuals. The erroneous statement regarding migration routes and status of the Swedish population are discussed in detail elsewhere in the present report. However, it is important to comment that the estimate for the naturalised Lesser White-fronted Goose in Kampe-Persson (2009) is far too low. According to available data, there are annually observations of 10-30 individuals in Great Britain, 5-15 in the Netherlands, and 1-3 in Belgium, and presumably the situation is similar in France and Germany, although no data were available for these countries at the time of writing this report.

Looking at the complete datasets of records of Lesser White-fronted Geese (Waarneming.nl) for the Netherlands (9,205 records as of 07.10.2015) and Belgium (Waarnemingen.be, 724 records), there are 74 and 18 observations respectively of exotic/feral origin, of which only one record from the Netherlands is before 2002 (in 1994). The lack of records before the early 2000s is probably an effect of when the databases went online and became common usage, rather than an absence of escapees/birds of feral origin. In the Netherlands, 5 to 15 birds of feral origin are recorded annually (**Figure 23**), and also numbers during summer are quite high with as many as 10 birds during a survey in July 2005 (van der Jeugd et al. 2006), and 7 individuals in 2009 (de Boer & Voslamber 2010). It has not been proven if these individuals involve any Swedish birds that have stayed behind after winter, but Koffijberg & van Winden (2013) assess this as not likely judged by the sites where these Lesser White-fronted Geese were recorded during summer. There are also a number of breeding records in the Netherlands, also involving hybridisation, with the first in 2002 (van der Jeugd et al. 2006). An adult with four pulli was seen in 2004 and three pairs were recorded breeding in 2005. In 2008, two pure pairs plus one hybrid pair involving a Greylag Goose was recorded (Voslamber et al. 2010), while a hybrid pair of Lesser White-fronted Goose x Greylag Goose produced one gosling in 2013. The number of feral birds are probably higher as not all observers submit records of escaped waterbirds (Koffijberg & van Winden 2013).



**Figure 23.** Maximum numbers of Lesser White-fronted Goose of feral origin in the Netherlands and Belgium 2002-2015 (source: Waarneming.nl, Waarnemingen.be). Columns marked with stars are years where Lesser White-fronted Geese were confirmed breeding in the Netherlands (van der Jeugd et al. 2006, Voslamber et al. 2010, de Boer & Voslamber 2010).



An escape from the Hämeenkoski farm in Finland in September 2013. According to the farmer, the bird escaped through a hole in the fence. It was first seen on 17th September 2013 at Teivaanranta, Lahti, Finland. Photo: Petri Kuhno.





A family of Barnacle Goose foster parents and juvenile Lesser White-fronted Goose that was illegally released at the lake by Näkkälä village, Enontekiö municipality, Finland, in August 2013. All the birds, including the Barnacle Geese, seemingly bore colour rings. A request for an investigation by the police was made by the Finnish state management organisation “Metsähallitus”, though the outcome of this is unknown. Photo: Pekka Sulkava.



An escape or illegally released Lesser White-fronted Goose in Espoo, Finland, 15th June 2004, originating from Germany. This bird, with a green plastic leg ring (D 15 01 KS 725), was seen in Helsinki region annually from August 2003 and at least until June 2008, as documented on the Finnish report system for rare birds (Tarsiger.com). Photo: Matti Rekilä.



The code on the green plastic leg ring D 15 01 KS 725 yields the following information: D = Deutschland, 15 = size (15 mm), 01 = ringing year (2001), KS 725 = individual part; KS may refer to the farm/society running the farm, so the bird in question originated from some (unknown) German goose farm/zoo or wildfowl collection. Photo: Pasi Pirinen.



One of many escapes or illegally released birds in Wijngaarden, Oosteinde, the Netherlands, 17th January 2015 (<http://waarneming.nl/waarneming/view/97373605>). Part of the ring number is readable as “3044 03”. Photo: Hans Verheij.

**Table 2.** Some example records of Lesser White-fronted Goose escapes recorded by the Dutch bird reporting system at <http://waarneming.nl/>. The list is not complete and includes some observations between 30.03.2014-17.01.2015.

Date	Nb.	Status	Age	Activity	Locality	Observer
17.01.2015	2	Escape	unknown	present	Wijngaarden - Oosteinde [ZH]	Hans Verheij
05.01.2015	1	Escape	adult	present	Cuijk - Maasboulevard [NB]	Gert-Jan Caspers
25.12.2014	1	Escape	adult	present	Middelaar - Schiereiland [LI]	Gert-Jan Caspers
15.12.2014	1	Escape	unknown	present	Nieuwegein - Lekkanaal [UT]	Herman Bouman
07.12.2014	1	Escape	unknown	present	Nieuwegein - Lekkanaal [UT]	Herman Bouman

25.11.2014	1	Escape	adult	present	Katwijk (NB) - Maasuitewaarden [NB]	Gert-Jan Caspers
13.11.2014	1	Escape	adult	present	Cuijk - Maasboulevard [NB]	Gert-Jan Caspers
06.11.2014	1	Escape	adult	resting	Katwijk (NB) - Maasuitewaarden [NB]	Gert-Jan Caspers
16.10.2014	1	Escape	adult	present	Cuijk - Maasboulevard [NB]	Gert-Jan Caspers
13.10.2014	1	Escape	adult	present	Cuijk - Maasboulevard [NB]	Gert-Jan Caspers
07.10.2014	1	Escape	adult	present	Katwijk (NB) - Maasuitewaarden [NB]	Gert-Jan Caspers
29.09.2014	1	Escape	unknown	flying NW	Mookerplas - Noord [LI]	Gert-Jan Caspers
22.09.2014	1	Escape	adult	present	Katwijk (NB) - Maasuitewaarden [NB]	Gert-Jan Caspers
10.09.2014	1	Escape	adult	present	Middelaar - Schiereiland [LI]	Gert-Jan Caspers
08.09.2014	1	Escape	adult	present	Cuijk - Maasboulevard [NB]	Gert-Jan Caspers
29.08.2014	1	Escape	unknown	present	Nieuwegein - Lekkanaal [UT]	Herman Bouman
16.08.2014	1	Escape	adult	present	Katwijk (NB) - Maasuitewaarden [NB]	Gert-Jan Caspers
16.08.2014	1	Escape	adult	present	Stellendam - Buitenhaven [ZH]	Albert de Jong
06.08.2014	1	Escape	unknown	present	Nieuwegein - Lekkanaal [UT]	Herman Bouman
06.06.2014	1	Escape	unknown	present	Eindhoven - Karpendonkse Plas [NB]	Wim Hallink
09.05.2014	1	Escape	unknown	present	Middelaar - Schiereiland [LI]	Gert-Jan Caspers
30.03.2014	1	Escape	unknown	present	Arcen - Straelensche Broek/Hanik [LI]	Herman Rothoff

That Europe still has a large number of escapes does not come as a surprise since farmed/captive Lesser White-fronted Goose can be traded without restrictions, as the species is not listed on any of the appendices of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Due to the European Single Market and the absence of systematic border controls within the EU, the provisions of CITES have been implemented uniformly in all EU Member States. CITES is implemented in the EU through a set of Regulations known as the EU Wildlife Trade Regulations.

In the case of Sweden, the main national legislation relevant to the implementation of the EC Wildlife Trade Regulations is the Species Protection Ordinance of 2007 (Artskyddsförordningen 2007:845). For the EU there is another set of directives relating to the keeping of wild animals in zoos, of which the most important is the Council Directive 1999/22/EC of 29th March 1999 (see Appendix F).

In a study of zoos in Spain, Fabregas et al. (2010) found that 14% of the evaluated enclosures were not secured against animal escaping, either due to problems associated with the physical barrier surrounding the enclosure and/or the possibility of the public releasing the animals, and that 75% of the zoos in the sample had at least one non-secured enclosure in their facilities. Given that 75% of all the Spanish zoos participated in the study, he considered that the results reflected quite accurately the situation in Spain, and that the actual number of enclosures from which animals could potentially escape was near 1,000. For the Netherlands, the situation is probably not very different judging by the slightly increasing number of Lesser White-fronted Geese recorded as of feral origin. Since 2002 an average of 6.8% of all records in the Netherlands are believed to be of feral origin, and with the recent strong decline in the population of Swedish reintroduced origin this proportion is now over 12%.

## 4.11 Spread of diseases

The spread of diseases due to the extensive farming and releases of geese from zoos, and the subsequent risks to the wild populations of Lesser White-fronted Geese, has to date not been properly assessed. There are several cases showing that this is not only a theoretical threat (described below), but something that should be thoroughly identified as a potential negative factor to be dealt with in the conservation work on Lesser White-fronted Goose. Altizer et al. (2011) suggested that there was some evidence to show that less-virulent strains circulate in migratory populations than in resident populations. The recent releases of hand-reared Lesser White-fronted Geese have now resulted in shorter migrations and a more sedentary population, with birds now wintering in southern Sweden. If the suggestion of Altizer et al. (2011) is correct, then there may be a risk of an increase in zoonotic pathogens in humans as a result. In addition, releases of farmed birds into the wild are one of the potential main vectors of spread of avian influenza virus, and should not be treated lightly (cf. Prosser et al. 2013). Outbreaks of highly pathogenic avian influenza (HPAI) in poultry during the last decade have resulted in a number of studies on virus ecology and interplay between avian viruses and their wild hosts, including in wild geese (Kleijn et al. 2010). The subject of diseases of geese in captivity has a long history. For example, Keymer et al. (1982) studied tuberculosis in birds in Regent's Park in London, and Hillgarth et al. (1983) looked at mortality causes of northern geese in captivity in the Wildfowl & Wetlands Trust (WWT) collections where causes such as renal malfunction, tuberculosis, amidostomiasis, pneumonia, egg peritonitis, aspergilliosis and cardiac conditions were documented under post-mortem examinations. Infectious diseases of viral aetiology present epidemic threats to goose production, of which Derzsy's disease is perhaps the most important. There is a mass of literature on the subject, and we mention here for example the study of Kozdrun et al. (2012), who recently showed the presence of parvovirus, haemorrhagic polyomavirus and circovirus in geese collected from farms in various locations in Poland.

Legislation on animal welfare, invasive species and human safety exists at international, European and national levels. The legislation is complex and it is essential to consult the actual legislation which applies in each country as well as the appropriate authority that is responsible in each particular circumstance. The relevant authority may not necessarily be in the same government body as the CITES management or scientific authority.

The following is written in the overview from the European Commission about welfare, invasives and health issues related to exotic animals and plants: "People involved in wildlife trade and in the keeping of live animals and plants are legally obliged to take adequate care of the specimen they possess, in order to prevent unnecessary mortality and suffering among live animals, damage to indigenous flora and fauna from the invasion of exotic species, potential health risks through the escape of dangerous and/or poisonous specimens, or the transmission of diseases from animals to animals and from animals to humans. This applies particularly to live animals and plants, and to other kind of vectors that may carry diseases or pests (e.g. meat, seeds or raw timber)". ([http://ec.europa.eu/environment/cites/info\\_welfare\\_en.htm](http://ec.europa.eu/environment/cites/info_welfare_en.htm)).

There are many permanent exhibitions of animals and plants worldwide, generally in the form of zoos, safari parks, aquaria, botanical gardens and orangeries, and all have to comply with wildlife trade regulations, as well as with nature conservation, animal welfare, animal transport, veterinary, phytosanitary and customs laws. In addition, the keeping of wild animals in zoos has been regulated at the EU level since 1999 through the Council Directive 1999/22/EC of 29th March 1999 relating to the keeping of wild animals in zoos (see **chapter 4.10**).

#### 4.11.1 Mycobacteriosis in 1991

In Finland, the Hailuoto farm where Lesser White-fronted Geese were being bred in captivity had serious problems with Mycobacteriosis. An epidemic broke out during winter 1991-1992, and many birds died. In addition, one case of Mycobacteriosis was diagnosed in the Hämeenkoski farm. The Hailuoto farm was under quarantine for several years. The outbreak was studied by the Veterinary Organisation of the State and the University of Helsinki, where an examination work was made by Mika Aho, led by professor Eeva-Liisa Hintikka (Markkola et al. 1999). The spread of the disease was attempted stopped by: 1) Isolating the old birds from the young. This meant that eggs were incubated in an incubator and the goslings grew up without their parents. 2) Sterilisation of the farm by changing the upper soil layer, heating the soil with steam via pipes and alkalifying the soil (Mycobacteria prefer low pH). The outbreak was contained and no new cases were diagnosed after 1997 (Markkola et al. 1999). A PCR-based typing study of *Mycobacterium avium* isolates of the epidemic verified four *M. avium* strains as inducers of avian tuberculosis and all were distinct from the three environmental strains identified in the farm environment. The study indicated the high susceptibility to avian tuberculosis of Lesser White-fronted Geese in captivity (Kauppinen et al. 2001).

#### 4.11.2 Embryonic death caused by bacteria in Sweden

In 1999, only 14 eggs out of 45 were fertilised at one of the Swedish farms. Analyses carried out at the Wildlife Division of the Swedish National Veterinary Institute proved bacterias as the culprit, which probably penetrated the egg shells and caused embryo deaths. The measure taken following this was improvements in hygiene (von Essen 1999a). The specific strain of bacteria involved was not published.

#### 4.11.3 Norwegian case in 2010

One of the two adult Lesser White-fronted Geese sent from “Nordens Ark” in Sweden to Norway in 2010 together with goslings for release died in the holding pen at the Valdak Marshes within the planned release period in autumn. It was already known by the staff at “Nordens Ark” that one of the adults was sick, but they nevertheless sent them to Norway without knowing what the disease could be, nor notifying the staff in Norway. When the bird was found dead the release of geese was put on hold and the corpse sent by courier to the National Veterinary Institute in Trondheim for autopsy. A final report for the analyses was never produced, but in the preliminary note delivered on 20th August 2010 the veterinarian concluded that *“Results of the autopsy revealed changes indicating serious failure of both the liver and the spleen, which is the probable explanation for cause of death for this individual. However, we have insufficient information as to the likely causes of such injuries”*. In the accompanying e-mail the veterinarian wrote that *“we still suspect a bacterial infection, likely caused by E. coli. This would be in line with a comment from the Swedish Environment Protection Agency (SEPA) that the farm of origin earlier had problems with these bacteria”*. The veterinary institute collected samples for further analysis on bacteriology, histology, parasitology, virology and cytology, and provided these have not been disposed of, they should still be possible to analyse.



Dead adult captive Lesser White-fronted Goose in the holding pen at the Valdak Marshes in Norway in 2010. The bird came from “Nordens Ark” in Sweden to accompany the goslings to be released at the same site. Photo: Tomas Aarvak.

#### 4.11.4 The most common goose diseases

Listed in this chapter are the most common goose diseases arranged alphabetically as described by the Food and Agricultural Organisation of the United Nations (Buckland & Guy 2002), and we include them here as a reference on goose diseases.

Aspergillosis is defined as any disease condition caused by a member of the fungal genus *Aspergillus*. In geese, as in most other classes of poultry, the organs most affected are the lungs, hence the term Pulmonary Aspergillosis. The disease can be quite severe in young goslings as they may become infected during hatching and even embryos may become infected. The source of infection can be either dirty incubator equipment and/or dirty eggs. Dirty eggs can contaminate both the setter and hatcher. In addition, it is possible for *Aspergillus* to penetrate the egg which is how embryos can become infected. Young growing goslings are also susceptible to Aspergillosis but usually not as severely although they can be infected from contaminated litter.

Coccidiosis Geese can get two distinct types of coccidiosis. The most prevalent form is renal coccidiosis caused by *Eimeria truncata*. While intestinal coccidiosis is less prevalent, it is caused primarily by *Eimeria anseris*. At least five additional species of *Eimeria* have been isolated from the intestines of geese. The level of infection and degree of economic loss associated with coccidiosis in geese is generally low, and it is not regarded as a major problem.

Cryptosporidiosis is a protozoan disease caused by parasites of the genus *Cryptosporidium* which infects both the lungs and intestines of geese. It is found worldwide wherever commercial poultry are raised and, as poultry health specialists develop appropriate tools to identify it, it is expected that more cases will be reported. This probably explains why reports from the goose industry are that its incidence seems to be on the increase.

Derzy's disease is a viral disease also known as Parvovirus disease because of the causative agent. Other names include Goose Plague, Goose Hepatitis, Goose Enteritis, Goose Influenza, Infectious Myocarditis and *Ascetic Hepatonephritis*. It is a highly contagious disease that affects young geese. The disease has been reported to exist in any part of the world where geese or Muscovy ducks *Cairina moschata* are raised since they are also susceptible to it and can transmit the disease to geese. In its acute form, the disease can result in up to 100 percent mortality rate or it can occur in a more chronic form. If birds are infected during the first week of age, very high losses can occur but if the goslings are 4-5 weeks old or older, the mortality rate will be negligible.

Duck virus enteritis (DVE) is an acute, contagious disease caused by a herpes virus that can infect ducks, geese and swans although the incidence of the disease in geese is very low. DVE can be transmitted directly, by contact between infected and susceptible birds, or indirectly, by contact with a contaminated environment. Birds that have recovered from DVE are immune to re-infection by the DVE herpes virus. It should be noted that in Australia a herpes virus has been isolated from a flock of infected geese (with a mortality rate of 97 percent) which was antigenically distinct from the duck viral enteritis herpes virus.

Erysipelas is generally an acute, sudden infection of individual geese within the flock. In both young and adult birds, it is caused by the bacterium *Erysipelothrix rhusiopathiae*. Outbreaks of this disease which are economically significant are uncommon in avian species, with the exception of turkeys, but some cases have been reported for geese. *Erysipelothrix rhusiopathiae* is somewhat unique in that it can infect over 50 animal species and can also infect humans. In the latter case, the infection usually enters through scratches or puncture wounds and is considered a safety issue for people working with infected animals. Human infections can be treated with antibiotics.

Flukes (trematodes) are flat, leaf-like parasitic organisms. Over 500 species belonging to 125 genera and 27 families are known to occur in birds. Generally, flukes are not a problem for geese, however, geese with access to natural lake or pond water may become infected. This is because most flukes have an aquatic snail (genus *Limnaea*) as an intermediate host. Dragonflies (genus *Odonata*) are the second intermediate host in many cases.

Fowl cholera, also known as *Pasteurellosis*, is a contagious disease affecting all domestic and wild birds. *Pasteurella multocida* is the causative agent, to which geese are highly susceptible and mortality can be high.

Leucocytozoonosis is a parasitic disease of birds which affects the blood cells (especially the white blood cells) and the tissues of various internal organs (parasite multiplication occurs in the macrophages of brain, liver, heart, lungs, and spleen). It is a very uncommon disease in geese but outbreaks of economic significance have been reported. *Leucocytozoon simondi* is the causative agent in waterfowl and has been reported in 27 species of ducks and geese in North America, Europe and Vietnam.

Listeriosis is not a common disease of geese but some instances have been reported in temperate areas of the world. This is probably due to the fact that, in temperate climates, *Listeria*

*monocytogenus* (the causative agent) is found in both faeces and soil. Also, it is in these areas that many geese are kept on pasture and therefore are exposed to the organism.

Mycoplasma infections, also known as Pleuro-Pneumonia Like Organisms or PPLO, can cause relatively serious problems in geese. These organisms have an intermediary structure between that of bacteria and viruses. At least three species of Mycoplasma (*Mycoplasma anseris*, *Mycoplasma claucale* and Strain 1220) have been isolated in geese. In recent years the prevalence of *Mycoplasma* infections in geese in a number of areas appears to have increased. This is most notable when birds are managed under intensive conditions.

Necrotic enteritis is caused by *Clostridium perfringens* and has been reported to occur in geese although the incidence of the disease does not appear to be high. *Clostridium perfringens* can be found in soil, faeces, dust, litter and contaminated feed.

Nematodes, or roundworms as they are commonly called, constitute the most important group of helminth parasites of poultry. In geese, *Ascaridia* are generally not a problem but various species of *Capillaria* and *Heterakis* can cause problems. The most common nematode in geese is *Amidostomum anseris*.

Nephritic hemorrhagic enteritis is a disease that is currently quite prevalent in the south western region of France and is often referred to simply as NEHO. It can infect geese from 4-20 weeks of age and causes mortality rates from 30-100 percent. The causes of this disease are not well understood but it seems to be primarily poor management. An excess of protein in the feed or any sudden change in the diet of the birds can also bring it on, as can poor quality drinking water and parasite infections.

Paratyphoid, or salmonellosis, is an important disease in geese with young birds, generally under six weeks of age, being the most susceptible. In addition, the concern regarding salmonella infection in humans and the demand for salmonella-free poultry products has increased the awareness of this disease and resulted in various monitoring programmes being undertaken in many countries. Over 2,000 types of salmonella organisms have been isolated from various species of fowl worldwide. Generally, the salmonella serotypes isolated from poultry are more characteristic of the region than the species of poultry. Paratyphoid is easily spread through contact with either infected birds, their faeces or through infected equipment, particularly that used for hatching and brooding. It now appears that salmonella is spread by salmonella entering the egg both in vivo before it is laid and by penetrating the egg after it is laid. In both cases it can multiply in the egg. For this reason, the importance of collecting eggs frequently before they get dirty, and cleaning and fumigating them as soon as possible, cannot be over emphasised.

Riemerella anatipestifer infection is a contagious disease affecting domestic geese, ducks and various other birds which means that infections in geese can originate from other species.

Reticuloendotheliosis refers to a group of syndromes caused by the retroviruses of the REV group. The disease occurs in a wide variety of domestic poultry but is rare in geese. It is sometime called the Runting Disease because it is characterised by poor growth and abnormal feathering. In geese, viruses have been isolated from tumours of the spleen, liver, pancreas and intestines. No vaccine has been developed for this disease because the incidence and economic importance of the disease is very low.

Staphylococcosis All avian species are susceptible to staphylococcal infections though geese do not appear to be affected to any great degree. If and when they are infected, it is generally as a



secondary infection but even this is rare in geese. *Staphylococcus aureus* is the most common infection in birds. One of the major concerns is that staphylococcus infections can be transmitted from birds to humans. This has been observed among both slaughterhouse workers and people performing autopsies.

Streptococcus There are a number of species of streptococcus that infect birds. However, to date, streptococcus infections in geese are very rare although *Streptococcus mutans*, a common bacterium of the human oral cavity, has been identified as a cause of septicaemia and mortality in geese.

Trichomoniasis is a protozoan disease that infects mostly mature geese in breeder flocks. The causative agent in geese is *Trichomonas anseris* while for other classes of poultry it is *Trichomonas gallinae*. These organisms are transmitted from bird to bird through the water and, to a lesser degree, through the feed.

Veneral diseases Bacteria, especially *Neisseria*, *Mycoplasma*, and *Candida albicans* have been associated with a venereal disease in ganders although it now seems that *Mycoplasma* are the primary infective agents.

#### **4.12 Dutch Council of State ruling on designating SPA area**

In the course of two court cases in March and December 2004 (Appendix D & E), the Ministry of Agriculture, Nature and Food Quality in the Netherlands, in an injunctive relief by the Dutch Council of State<sup>2</sup>, was to treat the “De Abtskolk-De Putten” area as if it had been designated as a special protection area under the terms of Article 4 (1) of the EU Birds Directive (see Appendix G) for the Lesser White-fronted Goose. The case is interesting as the state refused to designate an SPA (Special Protected Area), on the grounds that the Lesser White-fronted Geese in the Netherlands come mainly from the reintroduction project in Sweden, meaning that they do not form part of a population naturally occurring in the wild. Additionally, the fact that they occur in the Netherlands is solely the result of the reintroduction programme altering the birds’ migration route. Genetic crossbreeding with other goose species was also an argument against the naturalness of this population.

The Dutch Council ruling was strongly based on a decision by the European Court on a case known as “the Vergy case” (C 49/94, European Court Reports 1996 p. I-00299). The Vergy case decision indicated that the Birds Directive does not apply to birds born and reared in captivity, but does so to birds occurring in the wild in Europe and thus for all EU countries even if the country does not have the original habitat for that bird population but the bird population does occur there. This is exactly the way the Dutch Council applied that decision for the Swedish reintroduced population. The Dutch Council does not consider them as born and reared in captivity any more, even if they may be genetically polluted through their captive history.

In the wake of these court rulings, it is evident that there are unclear definitions as to when an individual can be defined as wild or as captive. However, the Netherlands judged the wintering Lesser White-fronted Geese as wild based upon the population occurrence and trend, independent of releases undertaken in Sweden. This gives rise to a number of principal question: When does a species change status according to legislation in Europe? When does a bird reared in captivity and

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<sup>2</sup> The «Dutch Council of State» is their Administrative Jurisdiction Division which is the Highest Administrative Court in the Netherlands, but they also call themselves Council of State.

subsequently released into the wild change status from captive to wild? Are such birds not protected, but their offspring are? And similarly, when does a wild-caught bird change status in captivity, or are their offspring automatically assigned status as captive/captive-bred? See **chapter 2.1** on definitions for a further elaboration on these issues.

#### **4.13 Finnish court rulings on catching and illegal releases in Finland**

In Finland, there has been three court trials concerning catching and illegal releases of geese within the country.

Lapland district court 7.9.2005 (R 05/197). *Release of juvenile Lesser White-fronted Geese with Barnacle Goose foster parents in Lapland. Criminal case.* Charges were rejected, as the court did not find evidence that the captive birds were from an alien population.

Supreme Administrative Court 20.2.2009 (DNo 1327/1/07). Application to catch wild Barnacle Geese in southern Finland to be used as foster parents for Lesser White-fronted Goose did not fulfil legal demands. The court stated that according to the Ministry of Environment's and AEWA's position it was not possible to release birds currently held in captivity into the wild. Barnacle Geese could establish an alien population in Lapland which is outside their natural range. The planned activity contradicted the Nature Protection Act. Following this decision, the reintroduction group was not legally able to use foster parents for introducing Lesser White-fronted Geese into the wild.

Lapland district court 8.6.2011 (R 11/398). Three defendants were prosecuted for releasing juvenile Lesser White-fronted Geese together with Barnacle Goose foster parents in Lapland in July 2009. All three defendants were found guilty, and one defendant was sentenced. The court took the view that the captive-bred Lesser White-fronted Geese and Barnacle Geese were alien species. The court stated that captive-bred Lesser White-fronted Geese are alien species because their genetics differ from the genetics of wild birds. Released Lesser White-fronted Geese could establish a permanent population and it is possible that they could mix with wild Lesser White-fronted Geese in northern Norway, where the population is genetically pure. Additionally, Barnacle Geese were viewed by the court as an alien species in Lapland because they are outside their breeding range and they could establish a permanent population in Lapland. The court ruled that it is illegal to release both Lesser White-fronted and Barnacle Geese into the wild. The case was later referred to the Rovaniemi court of appeal in 2012, and in 2014 the Supreme Court did not grant the defendants leave to appeal, so the decision that the releases were illegal still stands.

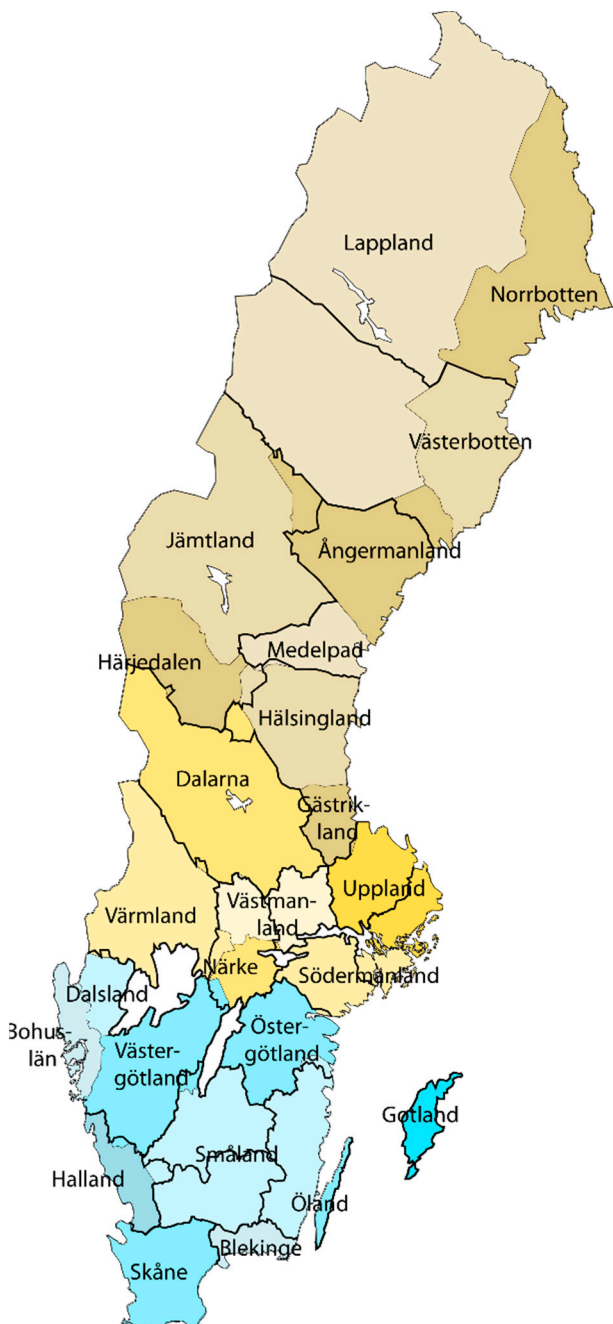
## 5. STATUS AND EVALUATION OF THE SWEDISH REINTRODUCED POPULATION

Already in the mid-1980s concerns were raised by many, including the International Council for Bird Preservation (ICBP) (APPENDIX A), about the Swedish reintroduction project because of possible negative effects of artificial rearing and manipulation of the migration route that would put the remaining wild population under further pressure. In addition, diverting resources from the protection work on the wild populations to reintroduction were considered to be counterproductive.

It is interesting to note a striking lack of comprehensive analyses and presentations of baseline data on the Swedish population, so the present chapter and data presented here are gathered from numerous published sources, of which the annual reports from *Projekt Fjällgås* have been important (Andersson 2001, 2003, Anderson & Holmqvist 2010, 2011, von Essen 1990, 1993a,b, 1994, 1995, 1996a,b, 1997a,b,c, 1999 a,b,c, Liljebäck et al. 2012, 2013), although we do not have access to all

reports produced by the project. In addition, the annual bird reports by SOF/BirdLife Sweden (Hellström & Strid 2008, 2009, Lerner & Kampe-Persson 2006, Lerner 2005, Strid & Eriksson 2012, 2013, Strid & Wærn 2010, 2011, Strid 2004, 2005, 2006, 2007) are good sources of information as well as the plethora of local birding magazines (for example Bern et al. 2014, Dalin et al. 2010, Kyrk 1987). Lastly, we have used data from the Swedish Species Observation System (Artportalen.se). Despite us having on multiple occasions requested complete data from Sweden, we did not receive access to data hidden automatically by the system, such as records of breeding birds during summer. Sweden is the only country that's has not supplied any data upon request, neither from the Artdatabanken nor from the Bird Ringing Office.

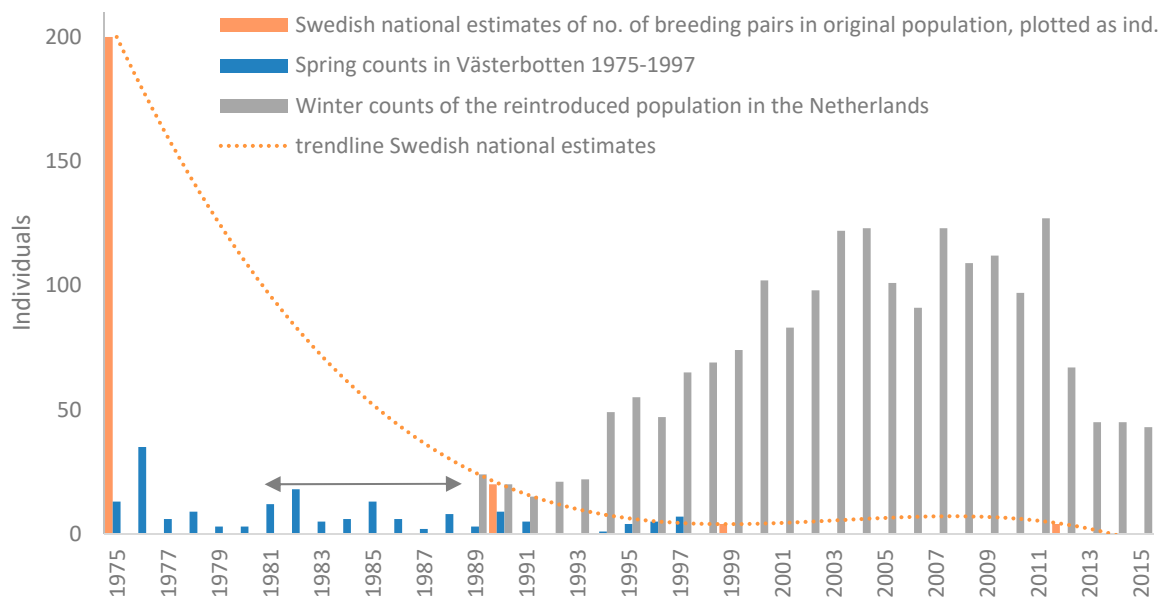
To ease reading of the present report we have added a map of Sweden showing the names of the provinces that are often mentioned in the text and figures. Another map showing the reintroduction area and most important sites along the human-mediated migration route to the Netherlands (**Figure 32**) is presented in **chapter 5.2.2** on page 79.



**Figure 24.** Map of Sweden. Bold lines represent county borders, colors represent provinces. Copyright by Sveriges Län 2007, Koyos derivative work: Cassowary [CC BY-SA 3.0 (<http://creativecommons.org/licenses/by-sa/3.0>)], via Wikimedia Commons.

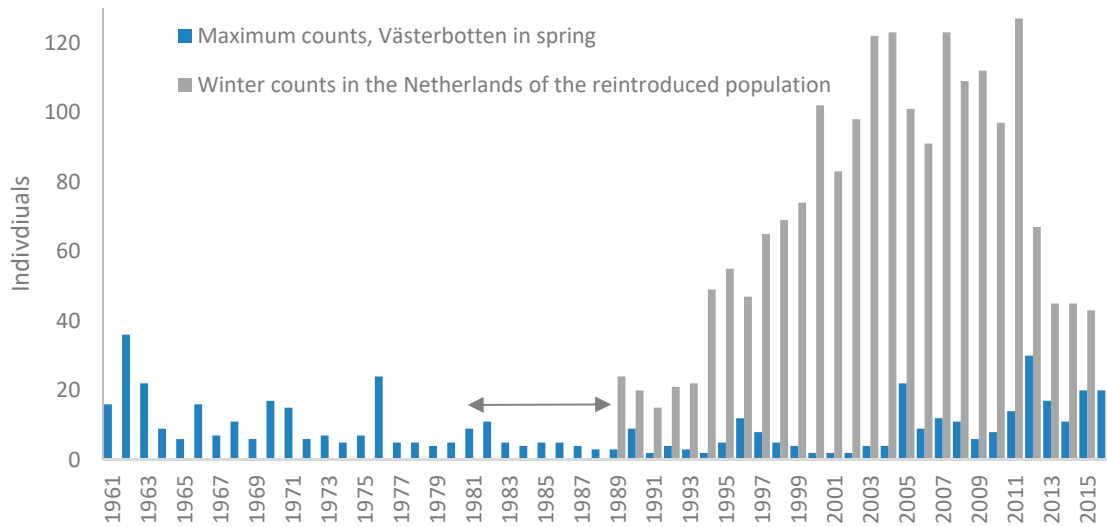
## 5.1 The extinct wild Fennoscandian breeding population in Sweden

In 1976 the Swedish population was estimated to be approximately 100 pairs (Ulfstrand & Högstedt 1976). In 1990, Lambert von Essen, one of the founders of the Swedish reintroduction project, estimated the remaining wild population to be 10 pairs or less (von Essen 1991). In 1998, the situation had worsened and von Essen (1999c) concluded: “*the Lesser White-fronted Goose is no longer breeding annually in Sweden outside the reintroduction area*”. The situation has not changed since then and, in the latest publication about bird population sizes and distribution in Sweden, Ottosson et al. (2012) estimated the breeding population to be 15-25 pairs, but noted that these were probably only descendants from the reintroduction project run in the period 1981-1999. Ottosson et al. (2012) stated specifically that “*the original population must be treated as extinct, or at best of single pairs*”.

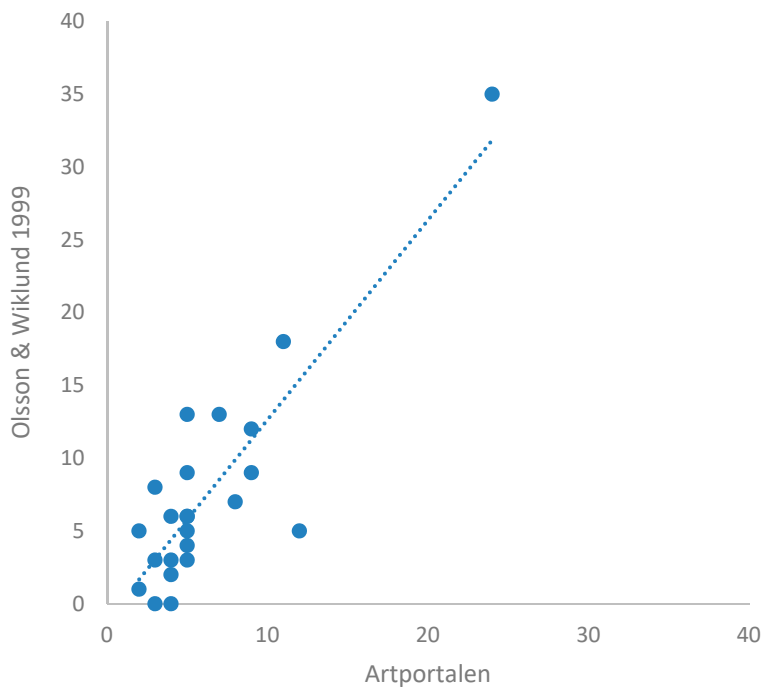


**Figure 25.** Population trajectories for the original wild Lesser White-fronted Goose in Sweden and the Swedish reintroduced population as assessed during winter in the Netherlands (data from Ulfstrand & Högstedt 1976, von Essen 1991, 1999c, Ottosson mfl. 2012, Olsson & Wiklund 1999). Arrows denote years 1981-1988 where estimates of the size of the reintroduced population are missing (winter counts in the Netherlands).

Counts of spring-staging Lesser White-fronted Geese in Västerbotten for the years 1975-1997 (Olsson & Wiklund 1999) clearly indicated a declining trend for the original wild population until 1980. These birds mainly used other breeding areas than where the reintroduced population was established, as the numbers did not substantially increase in the years after 1981 when releases started (see **chapter 4.1**). Olsson & Wiklund (1999) published records of colour-ringed birds from the release project up until spring 1997, when three individuals were observed in Umeälven river delta. Therefore, any population estimates after 1981, or 1982 when the released young in 1981 had acquired adult looking plumage, are unable to distinguish between Lesser White-fronted Geese from the original wild population and those stemming from the releases.



**Figure 26.** Maximum number of spring staging Lesser White-fronted Geese in Västerbotten county, Sweden, 1961-2016. Arrows denote years 1981-1988 where estimates of the size of the reintroduced population is missing (winter counts in the Netherlands). There is no correlation between maximum numbers during spring and winter counts in the Netherlands ( $R^2 = 0.005$ ,  $n=23$ ,  $p=0.726$ ). Data from Västerbotten downloaded from Artportalen June 2016.



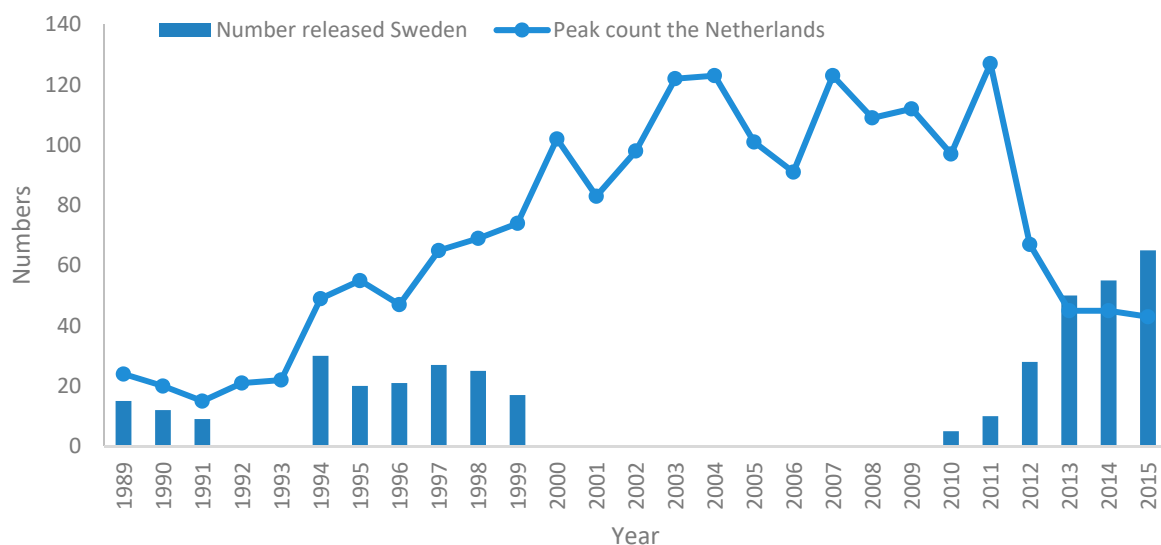
**Figure 27.** Correlation between maximum spring numbers of Lesser White-fronted Geese in Västerbotten for the years 1975-1997 between data given by Olsson & Wiklund (1999) and observations reported in Artportalen ( $R^2 = 0.743$ ,  $n=27$ ,  $p<0.001$ ). Data downloaded from Artportalen June 2016.

## 5.2 Status of the reintroduced free-flying population in Sweden

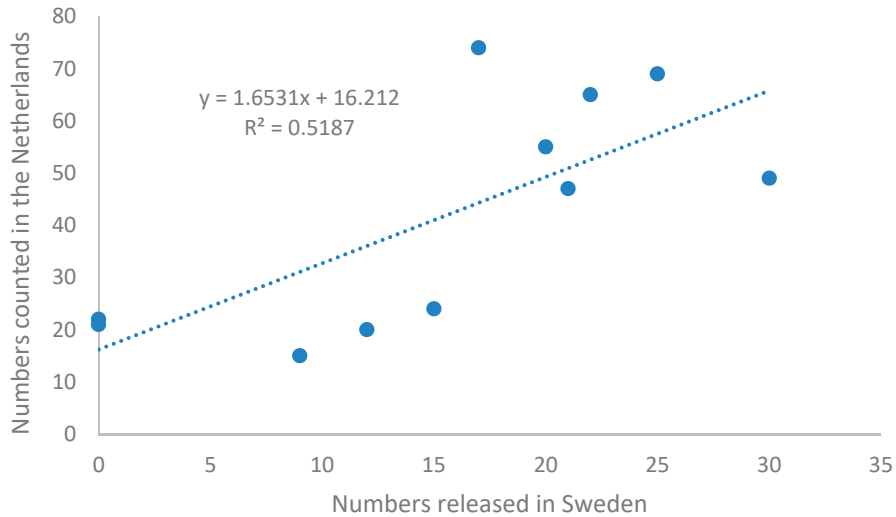
### 5.2.1 Swedish population numbers

The annual size of the Swedish “free-flying” reintroduced population is traditionally estimated based upon numbers seen in autumn in Sweden and counts during the winter period in the Netherlands. The best data come from the Netherlands, where the population built up gradually until 2002, and thereafter fluctuated between 110-130 individuals between 2003-2011 (Koffijberg & van Winden 2013, **Figure 28**). Following a break of a few years, new releases started again in 2010, after which the population has since crashed, though the cause of this decline is currently unexplained. Predation by Red Fox and White-tailed Eagle *Haliaeetus albicilla* has been cited as important mortality factors in the release area (Andersson & Holmqvist 2011, Liljebäck et al. 2012, 2013). However, an increase in predation levels cannot fully explain why the population size decreasing despite continued the releases of birds since 2010.

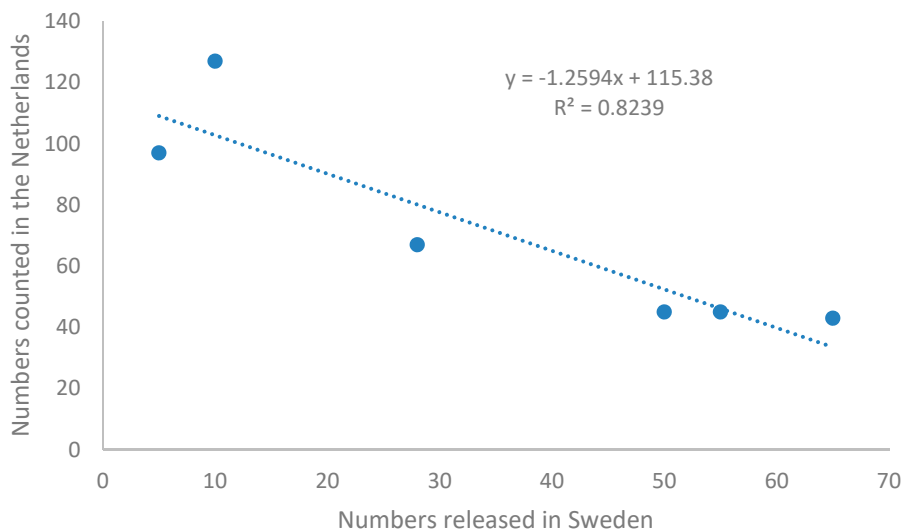
There is, as expected, a significant positive correlation between numbers of birds released and the population development during the years 1989-1999 based upon population size estimated from counts during winter in the Netherlands (chi-square = 0.72,  $p = 0.012$ , **Figure 29**). However, after the new release regime started in 2010, there is now a significant negative relationship between release numbers and estimated population size during winter for the years 2010-2015 (chi-square. = -0.908,  $p = 0.012$ , **Figure 30**). There are several possible explanations for the decline in numbers since 2010. Possible explanations include that the birds released from 2010 onwards have unusually high mortality rates. This high mortality level may also affect the population that was already present in the release area (for example by attracting predators into the area in search of easy prey). Alternatively, the Lesser White-fronted Geese released after 2010 do not mix with the extant population, and are therefore not recorded during winter counts in the Netherlands. Data on colour-ringing and resightings of individuals released are not publicly available for the Swedish birds. However, many of the birds released after 2010 are observed in the Netherlands, so they should make a contribution to the total numbers recorded during winter, even if they don't mix with the population that was established during the first release project.



**Figure 28.** Population trend and annual number of releases for the Swedish reintroduced Lesser White-fronted Goose population. Trend data are based upon counts during winter in the Netherlands. Data from Koffijberg & van Winden (2013), updated with data from Waarneming.nl (2016) and Kees Koffijberg (pers. comm.).



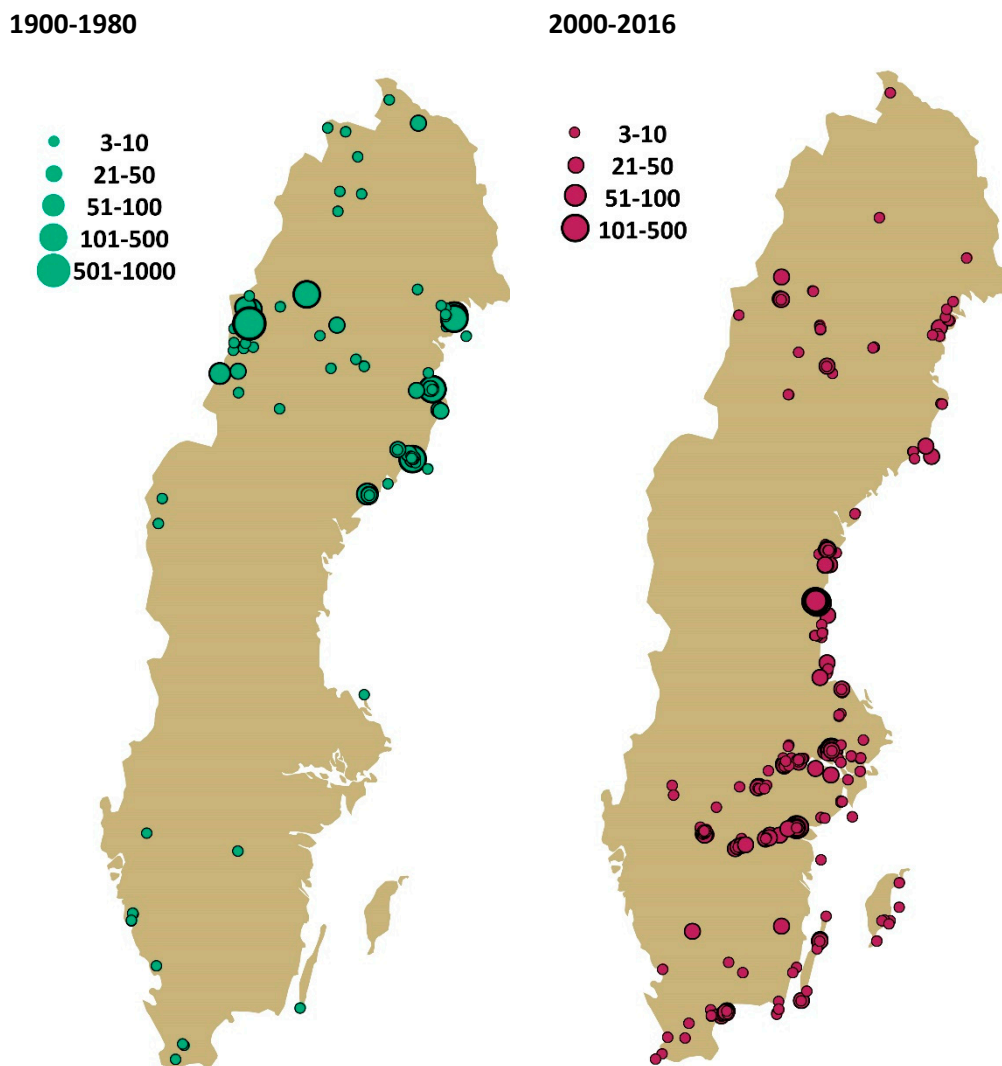
**Figure 29.** Relationship between number of birds released in Sweden and population size estimated during winter in the Netherlands, for the years 1989-1999 where both release numbers and estimates from the Netherlands exist (Koffijberg & van Winden (2013)). Data are from the first release period in Sweden by using Barnacle Goose foster parents.



**Figure 30.** Relationship between number of birds released in Sweden and population size estimated during winter in the Netherlands, 2010-2015. Data for the Netherlands from Koffijberg & van Winden (2013), updated with data from Waarneming.nl (2016) and Kees Koffijberg (pers. comm.).

A multiple regression on population size as the dependent variable and releases and number of fledglings observed in autumn for the years 2010-15 as independents, show that the releases are affecting population size (numbers) negatively, and that this is significant ( $\beta = -.631$ ,  $p = 0.008$ ). On the other hand, the number of fledglings produced naturally affects the population size positively as expected ( $\beta = 0.482$ ,  $p = 0.17$ ), although with less magnitude than the negative influence of the releases after 2010. The releases in both 2014 and 2015 were larger than the estimated population size, and it is evident that this method does not work as the population is being negatively affected by releases, despite the intentions to increase the population size. Part correlations are  $-0.517$  and  $0.395$  for releases and fledglings respectively.

The distribution of records has changed considerably when comparing all records from before 1981 when the first releases were conducted and in recent years as exemplified with data from the years 2000-2016. Since we are interested in understanding what is happening at the population level, we have excluded all observations of records of 1-2 individuals to remove the effect of stray individuals and vagrants. For geese, the family is the most important unit, so the smallest biologically interesting group is three individuals, - a pair with one gosling. One could argue that a pair without goslings is also valid, but at population level there is no transfer of migration- or site knowledge without the accompaniment of goslings. If a site is important at population level, we expect that at least once, a family with goslings would be recorded at the site within the generation time of the adults. From the maps in **Figure 31** it is evident that pre any of the reintroduction projects the Lesser White-fronted Goose had a northerly distribution in Sweden, with large numbers registered at some key inland breeding and moulting sites, and some three to four important staging areas around the river deltas in Väster- and Norrbotten. Looking at the current distribution (2000-2016), the species is now mainly found in central and southern Sweden, and where inland/farmland/cultivated areas predominate.

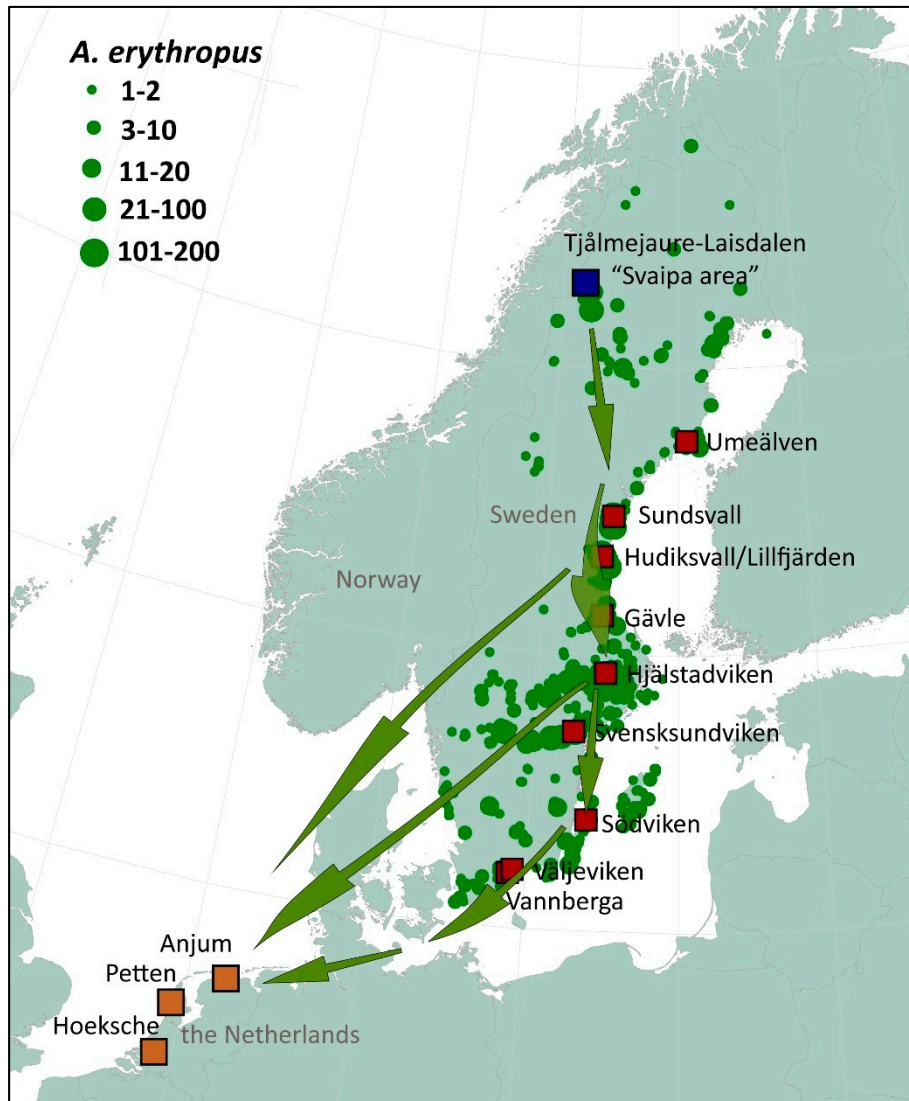


**Figure 31.** Distribution of groups (>3 ind.) of Lesser White-fronted Goose in Sweden in two time periods, 1900-1980 (pre reintroduction projects) and 2000-2016 (after the first release scheme with Barnacle Goose foster parents, and partly during the one without any parents). Open access data from the Swedish Reporting System (data downloaded 24.10.2016).



### 5.2.2 Migration routes for the reintroduced Swedish population

An unknown, but nevertheless large, number of the farmed and released Lesser White-fronted Geese in Sweden in the years 1980-1999 and 2010-2015 have been colour-ringed. At least all birds released in the years 1981, and in the period 1984-1991 were colour-ringed (von Essen 1993a, von Essen 1989), though Andersson & Holmqvist (2010) writes that “Releases were made almost annually in 1981-1999, all with colour-ring marked birds.” However, no analyses or publications of this material are known to exist. Only anecdotal information for single individuals are available in some of the annual reports of the Swedish *Projekt Fjällgås* and in shorter popular articles (von Essen 1993a,b, Waldmann 1998, 2000). In general, the birds from the original releases (pre-2010) migrated to wintering grounds in the Netherlands (Andersson et al. 2004, **Figure 32**), although resightings of birds from that period also exist from many areas outside the “manipulated” migration route, such as from central Norway (Waldmann 1998, 2000), Estonia (Aivar Leito pers. comm), Finland (von Essen 1996a) and Spain (Kampe-Persson 2001). In addition to Swedish birds, Lesser White-fronted Geese from releases made in Finland have also been recorded in Spain during winter (Kampe-Persson 2001).



**Figure 32.** Presumed human modified migration routes by Lesser White-fronted Geese originating from the Swedish reintroduction project. Routes are after Andersson et al. (2004). The release area is shown as a blue square. Green dots represent all observations of “free-flying” birds from the Swedish Reporting System, for the years 2000-2016 (n=8370, data downloaded 24.10.2016). Red squares indicate sites where geese are regularly recorded. Brown squares indicate regular wintering sites in the Netherlands.

### 5.2.3 Wintering areas for the Swedish reintroduced population

Counts and observations of colour-ringed individuals revealed that the majority of Lesser White-fronted Geese that were released together with Barnacle Geese as foster parents flew to wintering areas in the Netherlands, which was the intention of releasing birds using this method (Koffijberg & van Winden 2013, von Essen 1991). Analyses of sightings of colour-rings after 1995-1996 when the coverage was better than the previous seasons, showed that 77 out of 92 colour-ringed individuals (84%) were seen at least once in the Netherlands (Koffijberg & van Winden 2013). When an annual (calculated) mortality rate of 7% was taken into account, this proportion was more than 90%, and in line with statements by Lambart von Essen and Åke Andersson, who estimated that up to 96% of the reintroduced Swedish birds were wintering in the Netherlands (Koffijberg et al. 2005).

However, following new releases since 2010, there has been an increasing tendency for birds to winter in countries other than in the Netherlands, including in Sweden (see **chapter 5.2.5**). Prior to 1981, and before any releases were made in Sweden or in Finland, there were only six records of Lesser White-fronted Geese in Sweden in December, with three records in January, and two records in February (data from the Swedish Reporting System, 2016).

### 5.2.4 Occurrence of released geese during the non-breeding season in Sweden and abroad

Since 2010, Lesser White-fronted Geese have been released in the Svaipa/Arjeplog area in Swedish Lapland without parent birds or foster parents. In addition, since 2013 birds have also been released around Hudiksvall without any parents/foster parents.

As discussed under section 3.4.1 these birds have not learned a migration route from their parents, and travel in different directions. Many of the birds have been subsequently recorded both in Sweden as well as in many other countries. A large number of these birds are reported via various national recording systems, and we have examined records available from within Sweden as well as several countries where Swedish-released Lesser White-fronted Geese are recorded.

In Sweden, most of the records following recent releases have been from around Hudiksvall, as well as from many other sites, in particular from around Hjälstadviken, near Enköping (Uppland) (Artportalen.se 2016). Hudiksvall is also where a large proportion of birds from previous releases (pre-2010) stage and moult. Monthly maxima for each month between January 2000 and December 2015 in Sweden are presented in **Figure 33**. Note that the report authors do not have access to data from the breeding areas and thus the true number of individual birds present in summer is higher than shown in the figure. Sweden is the only country from which we have not got access to complete datasets, even after several requests to the administrators of Artportalen.se.

As described in detail in **chapter 3.2** and 5.2.1, there are numerous reports of wintering Lesser White-fronted Geese from the Netherlands. Records from the Dutch online bird reporting system (Waarneming.nl) confirm the trend described in more detail in section 5.2.1. The Swedish Lesser White-fronted Goose population shows a decrease in total numbers wintering in the Netherlands despite the increase in numbers of birds released annually in Sweden since 2010 (**Figure 34**).

Most records of Lesser White-fronted Geese from Belgium are considered to be escapes from captivity (Waarnemingen.be and the Belgian Rare Birds Committee). All of the hitherto accepted records (n=15) of birds not considered to be escapes have involved single individuals, and all have been recorded after March 2009 (Waarnemingen.be). There are a number of records that are under consideration (n=20 records), all of these being since 2012. Most of these involve records of one or

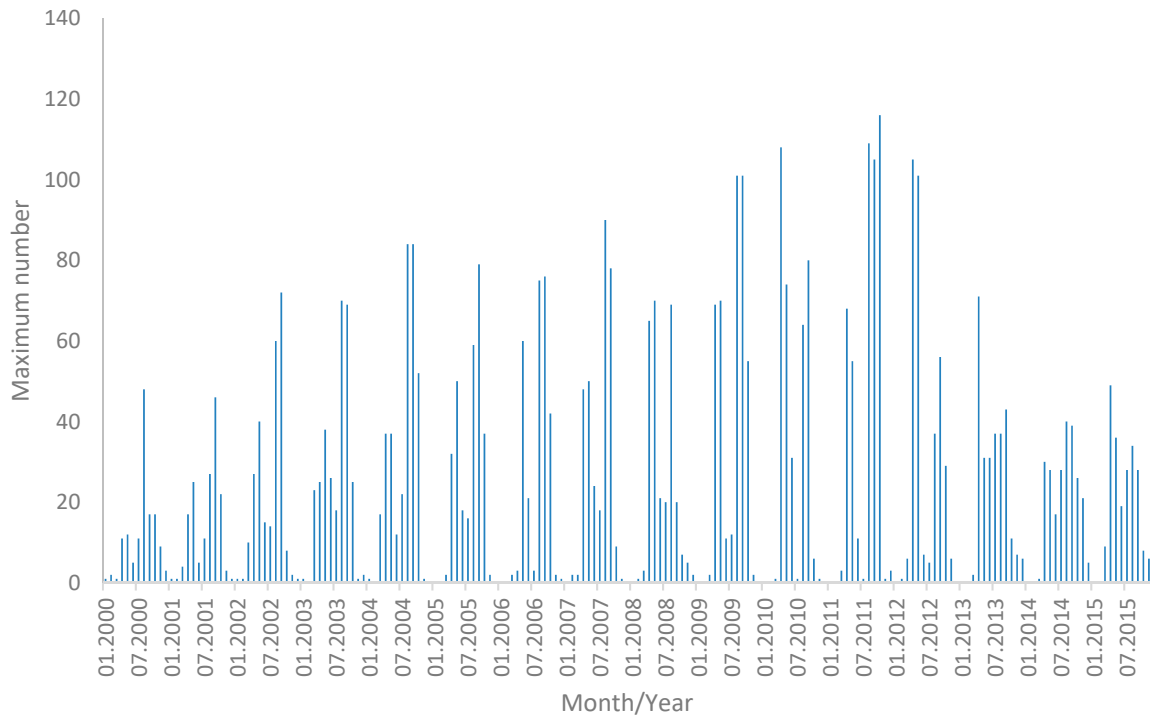
two individuals, although there are also two records of a flock of four first-winter birds from January 2015. The four birds in January 2015 are undoubtedly the same group that was first seen in Norway and then later in the United Kingdom before they reached Belgium (see details later in this chapter).

There are a number of records of Lesser White-fronted Geese from Germany involving birds from post-2010 releases in Sweden. Although we have not obtained all potential data from Germany, some information is available on the website for the Germany birdwatching “Club 300” (2016). According to the records available from “Club 300”, then there were at least two Lesser White-fronted Geese in Germany in winters 2011-2012, 2012-2013, and 2013-2014. In the following winter (2014-2015), no more than two Lesser White-fronted Geese were recorded at any one time. However, photographs posted on the same website show three different colour-ringed individuals during that same winter. During winter 2015-2016, only one Lesser White-fronted Goose was reported on the German Club 300 website. Photographs confirmed that this bird was not colour-ringed.

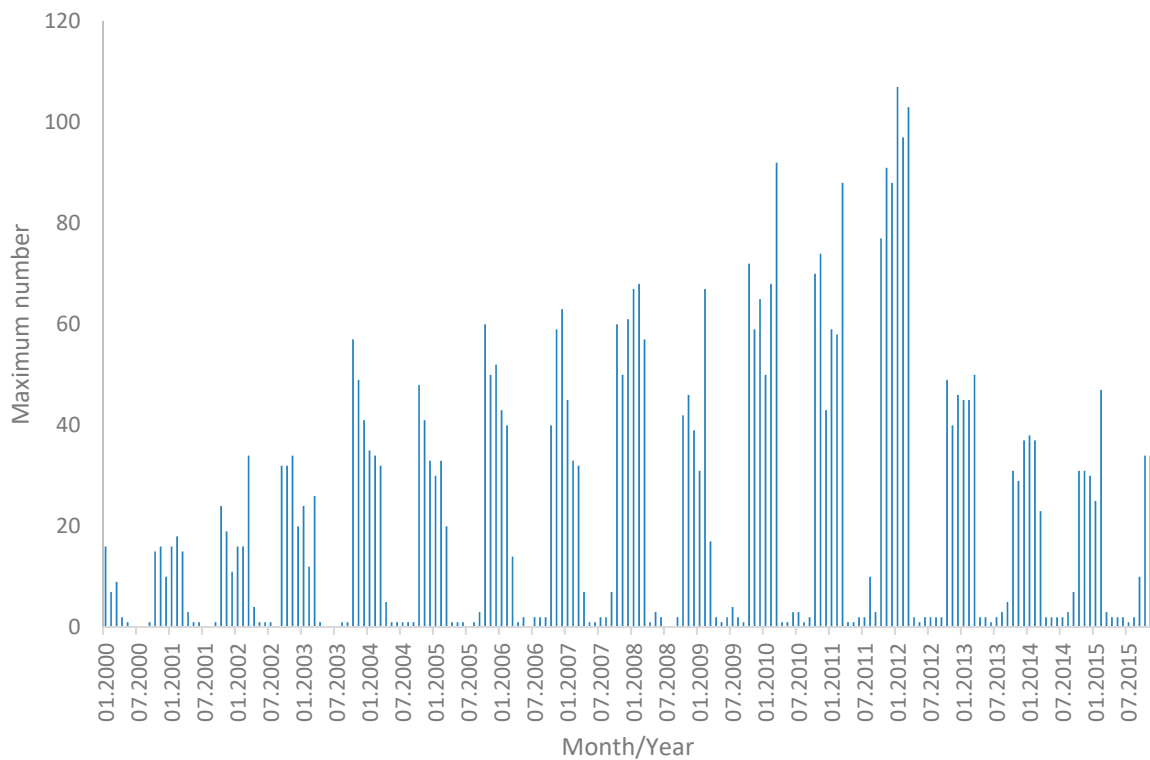
As records of Lesser White-fronted Geese are few and involve only 1-3 individuals, then it would seem that birds released in Sweden are not wintering in Germany. The Club 300 is a website designed with twitchers/listers in mind, i.e. the hard-core birdwatchers that seek to see as many species as possible, and the website acts to quickly spread information on rare birds. One would expect many more reports and possibly reports of more than just a couple of birds reported on any single day if they were commoner in the country. The fact that there are few records from Germany indicates that any birds missing in the Netherlands are probably not wintering in Germany, but may indeed have perished following release. This supposition of high mortality is also supported by the paucity of records from Belgium, where one also might predict that birds could winter in larger numbers.

Observations from Denmark show that in most winters few Lesser White-fronted geese are recorded with only singles or small flocks of up to 15 birds (**Figure 35**). However, in April 2010 a total of 67 were observed staging in Denmark (source Dansk Ornitologisk Forening’s database, DOFbasen 2016).

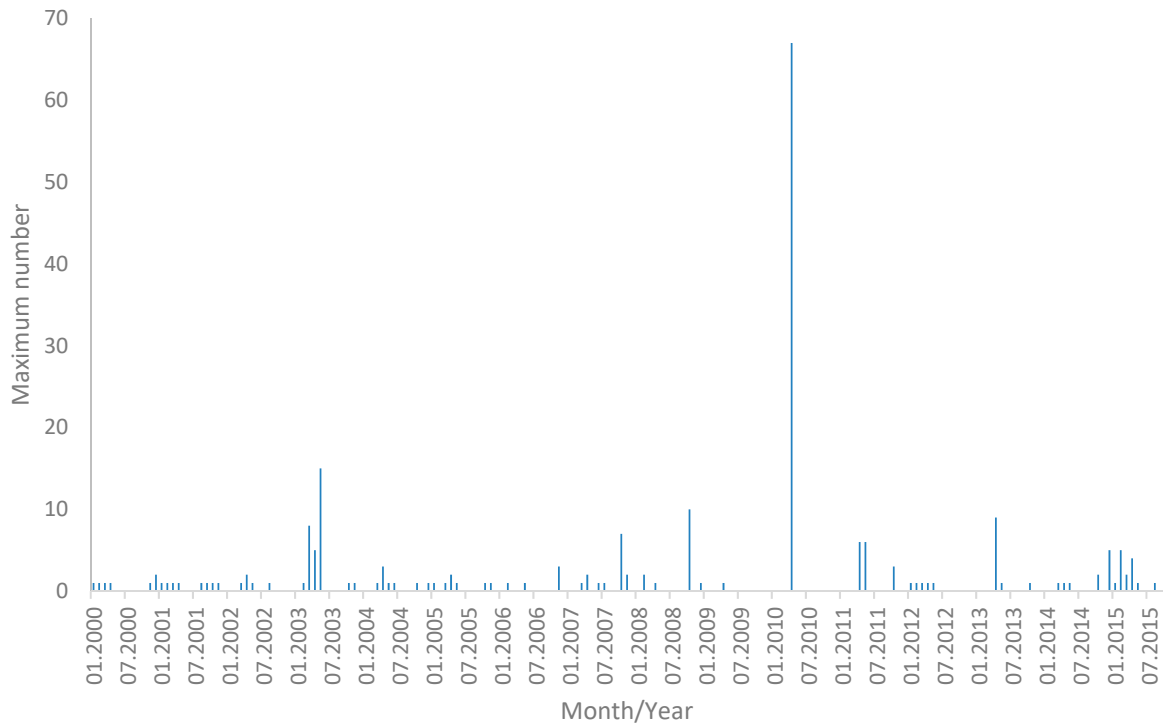
There has recently been an increase in records of Lesser White-fronted Geese outside the breeding season from sites in Norway, other than the traditional staging areas for the wild Fennoscandian population in Finnmark County (**Figure 36**). These observations involve birds from the Swedish release project that commenced in 2010, and the origins of which are confirmed by observations of colour-ringed individuals or information from tracking of satellite-tagged individuals.



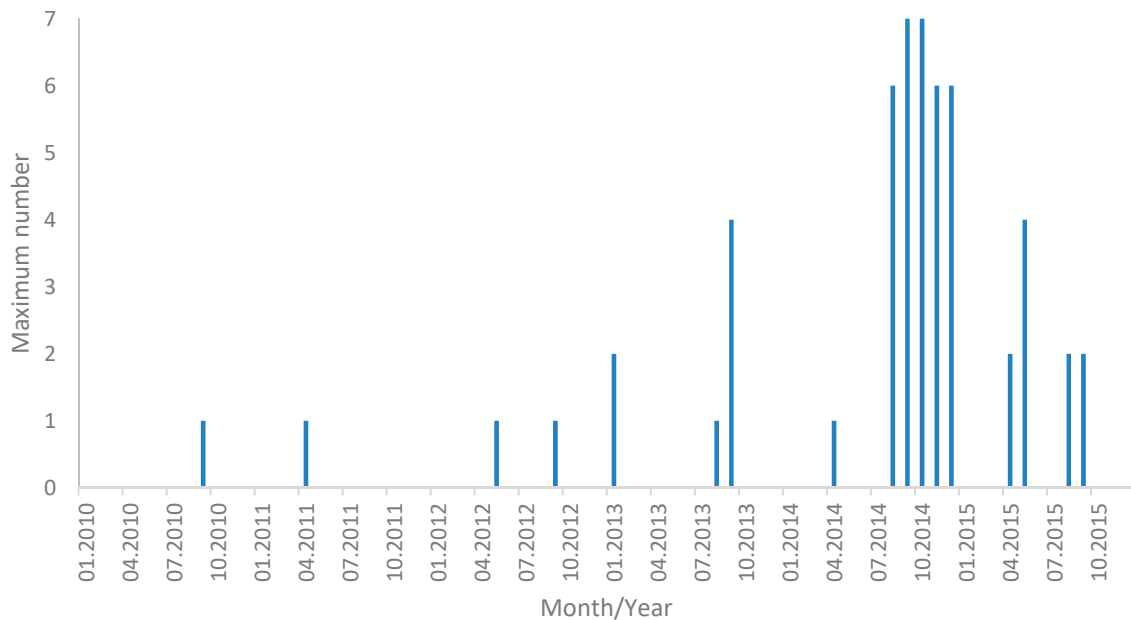
**Figure 33.** Monthly maxima of Lesser White-fronted Geese counted in Sweden in the period 2000-2015. Note that no counts are available during mid-summer when the geese are on the breeding grounds. Source: Artportalen.se 2016.



**Figure 34.** Monthly maxima of Lesser White-fronted Geese counted in the Netherlands in the period 2000-2015. Source Waarneming.nl 2016.



**Figure 35.** Monthly maxima Lesser White-fronted Geese counted in Denmark in the period 2000-2015. Source DOFbasen.dk 2016.



**Figure 36.** Monthly maxima of Swedish released Lesser White-fronted Geese recorded in Norway from 2010 onwards. Note that there are also records of birds from the previous release project pre-2010. Source: Artsobservasjoner.no 2016.

The Lesser White-fronted Goose is considered a rare vagrant in the United Kingdom (Owen et al. 1986, Parkin & Knox 2010, **chapter 3.2**). However, in the light of recent records of released birds from Sweden being recorded in the UK, it is becoming increasingly difficult to ascertain the true status of any birds observed. One Lesser White-fronted Goose that was equipped with a satellite transmitter in Sweden was tracked travelling westwards in late summer 2014, first flying to Norway where it was recorded at several sites, then to south-east England in late December. This individual was together with three other Lesser White-fronted Geese that were colour-ringed (Surfbirds 2016, BirdGuides 2016, German Geese Research 2016a), see **chapter 5.2.5** for further details on the movements and behaviour of this group. Finally, in early January 2015 the tagged bird was tracked to wintering grounds in Belgium although the flock had by that time split up (Rare Bird Alert 2016). A juvenile Lesser White-fronted Goose had been released in Sweden on 8th July 2015 which turned up in the Shetland Isles, Scotland on 7th October that year, and was last reported there on 5th December (Nature in Shetland 2016). Even more recently, two colour-ringed second calendar-year birds from the Swedish release project turned up in Orkney in March 2016 (Alan Leitch pers. comm.).

There were no records of Lesser White-fronted Geese from the Swedish release schemes being recorded in Hungary (David Bogyo pers. comm., Hungarian BirdWatcher's Site 2016) until 2015, when one colour-ringed individual was observed in Hortobágy National Park in company a flock from the wild Fennoscandian Lesser White-fronted Goose population on 30th September.

Two different colour-ringed birds from the Swedish release schemes have also been reported from Lithuania (Julius Morkūnas pers. comm.).

One Lesser White-fronted Goose (of unknown origin) was observed near Pärnu, Estonia on 27th March 2016, and presumably the same bird was observed near Polva on 1st April that year. Lesser White-fronted Geese from the wild Fennoscandian population have traditionally staged in Estonia, particularly in spring (Toming & Pynnönen 2009).

There are also a number of records from Poland of Lesser White-fronted Geese originating from recent releases in Sweden. One bird with a satellite transmitter that was released in Sweden was recorded at several sites in Poland during winter 2015-2016 ([www.piskulka.net](http://www.piskulka.net), [www.blesgans.de](http://www.blesgans.de), [www.facebook.com/BirdingPoland](http://www.facebook.com/BirdingPoland)), and this same individual was also tracked to sites in Germany that same winter.

As can be seen from **Figures 33-35** above, there are large discrepancies between the number of Lesser White-fronted Geese that have been released between 2010 and 2015 and the number that are being reported as seen in the field. Despite the fact that more Lesser White-fronted Geese are being released each year in Sweden, numbers of birds observed in Sweden and the Netherlands have declined ever since. The decline in numbers is also apparent in the districts of Hälsingland and Uppland that are regularly used by Lesser White-fronted Geese (see **Figure 50, Figure 51** in **chapter 8.5**). There may be several possible explanations for this anomaly, and perhaps a combination of factors may be involved:

- Survival rates of the released individuals are very low and many birds quickly succumb soon after release.
- Geese are wintering in areas/countries for which we have no available data (e.g. Germany, Belgium).
- Observers are less willing to report Lesser White-fronted Geese seen in the field at present compared to for five years ago. This may be because these are not wild birds and thus are of less interest to many birdwatchers.

Today, there is now a small number of Lesser White-fronted Geese present throughout the year in the Netherlands, currently numbering at least 10 individuals (Koffijberg & van Winden 2013). Breeding has also been documented in recent years. In 2008, three pairs were breeding in the Netherlands, of which one involved a mixed pair of Lesser White-fronted Goose x Greylag Goose (Voslamber et al. 2010). The first breeding record is from 2002 (van den Jeugd et al. 2006). These are most likely of feral (Dutch park) origin and some of these have avicultural leg-rings. In addition, the sites where these feral individuals occur are outside the main places where Swedish Lesser White-fronted Geese tend to be recorded (Kees Koffijberg pers. comm.).

A classic example of how rapidly a small population of geese newly established in an area outside its natural range, and how it can increase to a very large population is the development of a breeding population of Barnacle Geese in the Baltic Region. In 1971, one pair bred on a group of small islands east of Gotland, and the population increased, reaching 450 breeding pairs in 1985, just 15 seasons later (Larsson et al. 1988). In addition to the breeding adults, there were also large numbers of non-breeding individuals. The population continued to increase, and the numbers in Gotland alone numbered around 4,390 breeding pairs in 2005 (Feige et al. 2008). In addition, there are many thousands of pairs of Barnacle Geese breeding in other states around the Baltic Sea, and the total Russian/Baltic/North Sea population was in 2009 estimated to be 770,000 individuals (Fox et al. 2010).

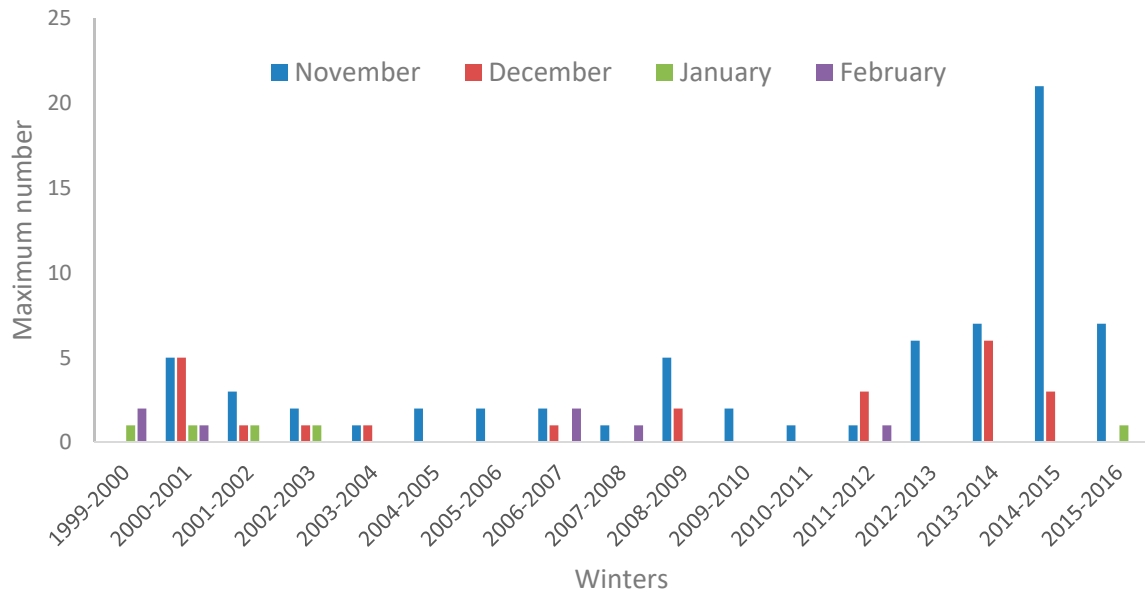
The development of the breeding population of Barnacle Geese on Gotland and elsewhere in the Baltic region and its rapid increase illustrates just how easily goose populations can increase if remained uncontrolled. There is already one published record of a pair of Lesser White-fronted Goose that bred on the Swedish coast in Medelpad in 2006, producing two goslings, both of which survived to fledging. One of the birds in the pair was colour-ringed and had been previously seen in the Swedish mountains (Allberg & Marklund 2006). Despite the fact that one of the individuals in this pair was colour-ringed and probably from the Swedish release project, Kampe-Persson (2010) stated that there was no known link between these birds and the Swedish *Projekt Fjällgås*. However, the author does not elaborate on this statement, nor as to where the birds might have originated if they were not released in Sweden.

Whether or not Lesser White-fronted Geese could colonise islands along the Swedish coast in the same way as Barnacle Geese have done in the Baltic is a matter of conjecture. Nonetheless, this could have profound consequences if the birds should start to breed in new areas well away from traditional sites and at latitudes outside the species' natural range.

### **5.2.5 Establishment of a wintering population in southern Sweden**

Since 2010, Lesser White-fronted Geese have been released in the Svaipa/Arjeplog area in Swedish Lapland without parent birds or foster parents. In addition, birds have also been released around Hudiksvall without any parents/foster parents since 2013.

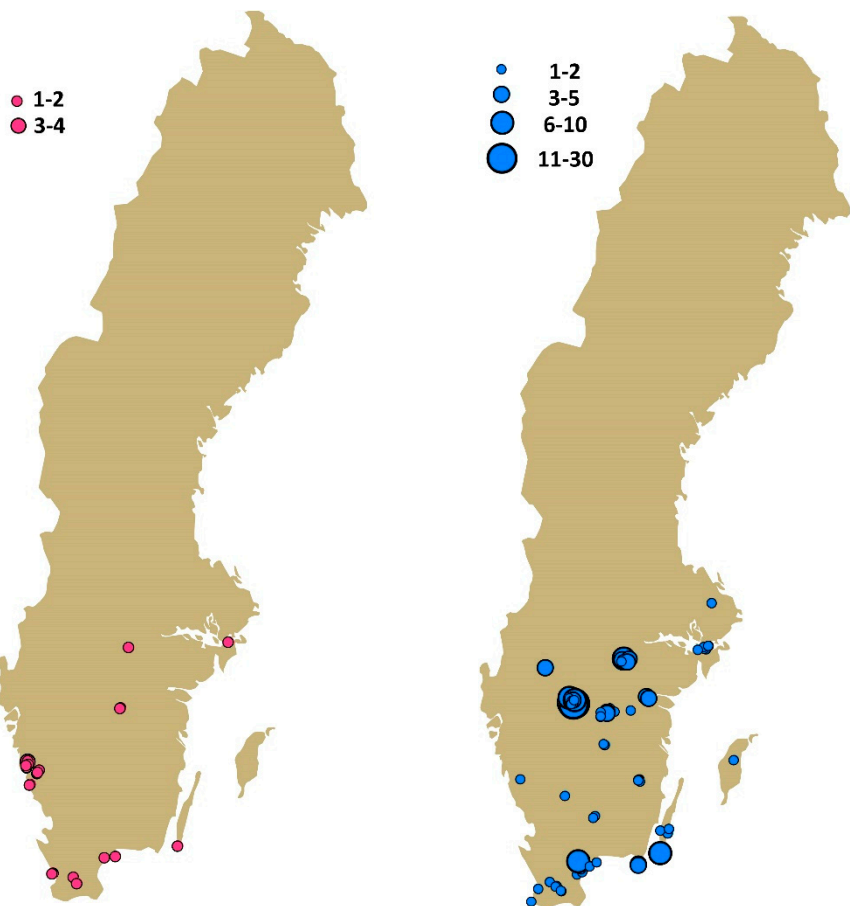
Since 2010, there has been a marked and significant increase in numbers recorded during winter in Sweden, with a maximum of 21 wintering birds in 2014-2015 (**Figure 37**). Normally, Lesser White-fronted Geese have left Sweden in September or October at latest. Birds begin to return again in spring in March, which is considerably earlier than for the wild Fennoscandian population, which return to the staging areas in Norway in May. The main difference between the two periods 1900-1980 and 2000-2016 (**Figure 38**) is that all records before 1980 were single vagrants (1-2 ind). There is only one record with more than two individuals, when four birds were recorded in 1966 within a flock of 650-700 Bean Geese.



**Figure 37.** Wintering of Lesser White-fronted Geese in Sweden shown as maximum counts each month between November to February for the years 2000-2016. Data from the Swedish Species Reporting System (2016).

**1900-1980**

**2000-2016**



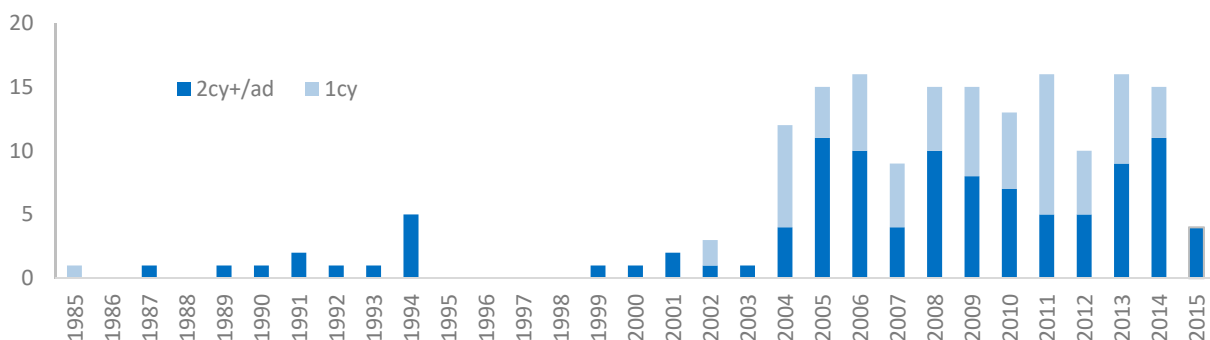
**Figure 38.** All open access records of wintering (November to February) Lesser White-fronted Geese in Sweden in the years 2000-2016 (n=189) and years 1900-1980 (n=50, pre reintroduction projects) registered in the Swedish Species Reporting System (data downloaded 24.10.2016).



Releasing large numbers of goslings and one year old birds with no knowledge of where to migrate will necessarily lead to a situation that birds will never leave Sweden. The establishment of regular wintering of Lesser White-fronted Goose in southern Sweden does have serious implications, as the southern parts have the most heavily hunted goose areas in Sweden. In Norway, the environmental authorities established a non-hunting zone for geese totalling an area of 38,000 square kilometres in Finnmark County. This was done to protect the Lesser White-fronted Goose as well as the dwindling population of Taiga Bean Goose from accidental shooting. By 2016 this non-hunting zone is still active, so hunting of Greylag Goose can only occur on the outer coastal areas of the county. There are no such large-scale hunting restrictions in place in southern Sweden, but will be necessary as an increasing part of their reintroduced population winters there. Lesser White-fronted Geese are regularly shot during legal hunting, with the latest known incidence as recent as 23rd August 2016 in Vesterålen, Norway (Norwegian Bird Ringing Central in letter, ref. 2016-01035).

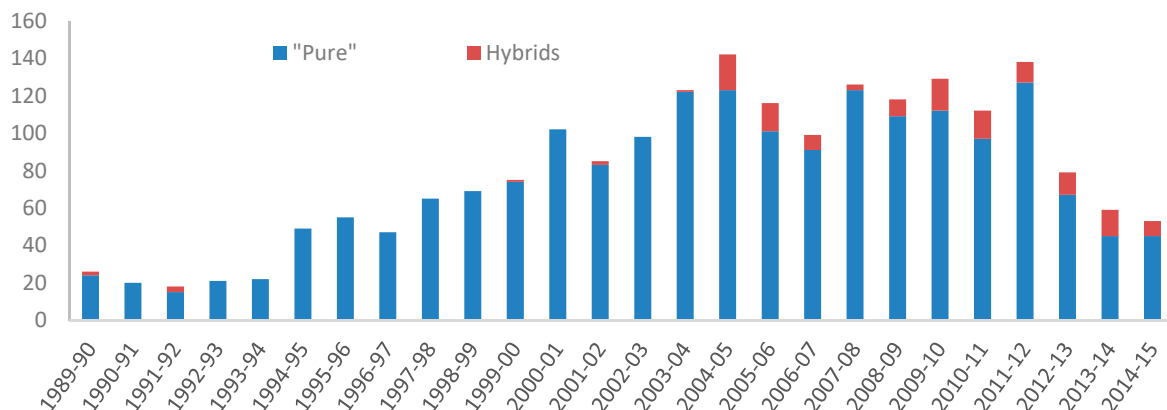
### 5.2.6 Status of hybrids between Lesser White-fronted Goose and Barnacle Goose

The free-flying population in Sweden includes not only birds looking like text-book individuals of Lesser White-fronted Geese (which are themselves of mixed species genetic background), but also a number of hybrids between Lesser White-fronted Geese and Barnacle Geese that were used as foster parents in the period 1980-1999. When population estimates are given, neither Koffijbeg & van Windem (2013) nor any of the annual reports by the reintroduction project *Projekt fjällgås* (Andersson & Holmqvist 2011, Liljebäck et al. 2012, 2013) take into account the number of Lesser White-fronted Goose x Barnacle Goose hybrids which also belong to the Swedish free-flying population. Numbers on these are hard to obtain, but are reported occasionally in the Swedish Reporting System (2016) and in the annual reports by SOF/BirdLife Sweden (cf. Strid & Eriksson 2012, Strid & Wærn 2010, 2011). Hybrids are most likely underreported<sup>3</sup> since most ornithologists do not bother to report observations of hybrid birds, especially when they are controversial or of captive origin, as is the case with the free-flying Swedish reintroduced birds. At least five Lesser White-fronted Goose males are known to have paired up with Barnacle Goose females, and 1-4 broods have been observed annually since 2000 (maksimum of 4 broods in 2004). A maximum of 19 individual hybrids were recorded in 2009. Since these are an effect of the releases undertaken in Sweden they should be recognised as part of that population and for the years 2004-2015 they constitute on average 14.6% of the Swedish population (data from the period 2004-2014, **Figure 39**, **Figure 40**).



**Figure 39.** Minimum number of hybrid Barnacle Goose x Lesser White-fronted Goose individuals observed annually in Sweden in the years 1985–2015. The number of birds in 2015 is an absolute minimum as local journals and the Swedish magazine *Fågelåret* has yet to be published with validated data from 2015.

<sup>3</sup> Data prior to 2001 are probably underrepresented since the Swedish Reporting System for birds did not go online until autumn 2000.



**Figure 40.** Population trend for the Swedish reintroduced free-flying population. It is estimated as peak number during winter in the Netherlands and total number of hybrids the preceding summer and autumn in Sweden (data from the Swedish Reporting System, Koffijberg & van Winden 2013, as well as annual reports in the magazine *Fågelåret*). "Pure" = Swedish free-flying reintroduced population, hybrids = Lesser White-fronted Goose x Barnacle Goose.

The hybridisation issue with the Barnacle Goose (foster parent species) dates back to at least 1999, when the project recorded their first hybrid breeding at Öster-Malma, when a three-year-old male Lesser White-fronted Goose that staged at Öster-Malma chose to stay, and paired up with an older female Barnacle Goose (von Essen 1999b). The clutch hatched, and the goslings were subsequently killed and sent to the Zoological Museum in Stockholm for documentation (**Figure 41**). However, Kampe-Persson & Lerner (2007) & Kampe-Persson (2010) documented hybrids between Lesser White-fronted and Barnacle Geese as early as in 1985 in Stockholm, several years before the hybrids reported from Öster-Malma in 1999. In addition, von Essen (1989) described a recovery of a Lesser White-fronted Goose that was released in 1982 which was found as dead in August 1985 on Novaya Zemlya in Russia. He believed that the individual had been imprinted on a Barnacle Goose and followed that species from the Netherlands to its breeding area in Russia. He further notes that hybridisation should not be a big problem in the reintroduced population and further refers to work by E. Fabricius (1983) who used Canada Goose as foster parents for Greylag Geese and found that 26% of male Greylag Geese later paired with female Canada Geese, while none of the Greylag Goose females paired with Canada Goose males.

Many of the hybrids that still occur in a "wild" state are from the former release project in Sweden between 1980 and 1999. Hybrids between these two species continue to appear and are observed both in the breeding areas, at staging sites as well as in the wintering grounds (**Figure 42**).

Hybrid pairs have continued to produce offspring since the first record of a hybrid pair between these two species in 1985. Since 2004 there have been annual records of 1-2 broods and possibly as many as 5 broods in 2004.

The maximum number of hybrid Lesser White-fronted x Barnacle Geese recorded in one month was in 2004 with 19 individuals, but also as late as in 2013 as many as 14 individuals were reported. However, not all areas where these birds may occur are checked on the same date, so the true numbers may be higher than data in **Figure 39**, **Figure 40** and **Figure 42** suggest. According to Liljebäck & Larsson (2015), there were between 6 and 10 individual hybrid Lesser White-fronted

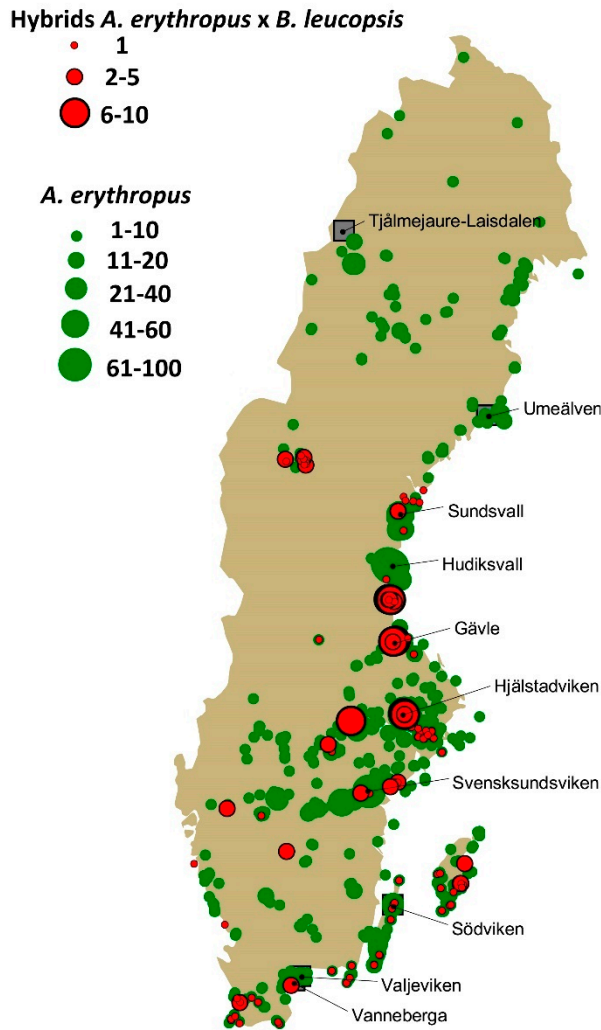
Goose x Barnacle Goose in 2014. Up to six individual hybrids were observed at one time in the Netherlands in the first half of the year (i.e. late winter 2013-2014), whereas up to six were recorded in Sweden later in 2014 (between October and December). According to the Swedish Species Observation System (Artportalen) then there were in fact at least 11 hybrids present in 2014 (**Figure 39**).

According to a recent report from *Projekt Fjällgås* (Liljebäck & Larsson 2015) which summarises results from 2014, then first generation hybrids between Lesser White-fronted Geese and Barnacle Geese have been reported more or less annually in Sweden since 2002. Liljebäck & Larsson (2015) state that “*There has been no verified observations of second-generation hybrids*”. This statement is both erroneous and misleading, as Kampe-Persson & Lerner (2007) report second-generation hybrids might have been produced and this has since been confirmed by Strid & Wærn (2011) (see **chapter 5.2.6**). The number of second-generation hybrids is low, but in recent years, there has still been a

significant number of first-generation hybrids in circulation. According to Liljebäck et al. (2014) there were an estimated 6-10 individuals in 2014, but also this is found to be an underestimate as at least 15 hybrids were in circulation in Sweden, of which two broods of one and four goslings respectively.



**Figure 41.** Hybrid Barnacle Goose x Lesser White-fronted Goose offspring (1st calendar year, collected 14.09.1999) from the Swedish reintroduction project at Öster-Malma, deposited at the Zoological Museum in Stockholm, Sweden (Leg. A 996394). Photo: Tomas Aarvak.



**Figure 42.** Distribution of hybrid Lesser White-fronted x Barnacle Goose hybrids in Sweden and observations of individuals registered as Lesser White-fronted Goose, of which the majority are birds originating from the reintroduction program that started with releases in 1981. Open access data from the Swedish Reporting System for the years 2001-2016 (data downloaded 24.10.2016).



First generation hybrid *A.erythropus* x *B. leucopsis*, Turku, Finland, 27 May 2008- Photo: Kalle Rainio/ Tarsiger.com. Additionally, second-generation hybrids have been found in Sweden.

### 5.2.7 The association of released geese with other waterfowl species

There are numerous records from countries where Lesser White-fronted Geese released in Sweden since 2010 have turned up where they have been reported associating with other goose species or other *Anatidae* species (**Table 3**). Such associations are recorded both for single individuals as well as for small groups of Lesser White-fronted Geese. We have here summarised information received from the various national rarities committees as well as from other internet sources. These records refer to birds known to have originated from releases in Sweden, as they are either colour-ringed and/or tagged with satellite transmitters.

Most of the winter records of Lesser White-fronted Geese are from the Netherlands, which is a natural consequence of the effort to direct the migratory route to new wintering grounds in the 1980s and 1990s. Lesser White-fronted Geese have been recorded together with a long list of goose species in the Netherlands, as follows: Greylag, Greater White-fronted, Tundra Bean, Snow, Canada, Barnacle, Brent, and Red-breasted Geese. There are very few records of Pink-footed Geese together with Lesser White-fronted Geese. In neighbouring Belgium, Lesser White-fronted Geese have been recorded associating with Greylag, Greater White-fronted, Pink-footed and Barnacle Geese.

Records from Germany during the past five years have involved Lesser White-fronted Geese associating with Greater White-fronted, Tundra Bean, Barnacle and Canada Geese, as well as with Common Shelducks *Tadorna tadorna* present in a mixed species flock.

Almost all of the records in Norway of Lesser White-fronted Geese originating from releases in Sweden from 2010 onwards have been in the company of Greylag Geese, although there are also records of Swedish Lesser White-fronted Geese associating with Pink-footed and Bean Geese in Norway.

From Denmark, there are records of Swedish-released Lesser White-fronted Geese associating with both Greylag, Greater White-fronted, Bean, Pink-footed, and Barnacle Geese. These individuals has also been recorded together with Egyptian Geese *Alopochen aegyptiaca*.

There have been recent records of Swedish-released Lesser White-fronted Geese turning up in the United Kingdom, as well as older records of Lesser White-fronted Geese from previous release programmes. One flock of four Lesser White-fronted Geese arrived in Suffolk in England at the end of 2014, having spent the previous three and a half months in western Norway. This flock associated with Greylag Geese whilst in Norway, whereas they were seen in the company of Greater White-fronted Geese in Suffolk, England. After having spent a few days in Suffolk, the birds flew onwards to Belgium in early January 2015 (see **chapter 5.2.4**), where they associated with both Greater White-fronted and Pink-footed Geese. A juvenile Lesser White-fronted Goose arrived in the Shetland Isles, Scotland on 7th October 2015. This bird was colour-ringed, and had been released in Sweden the same year. The bird remained in Shetland at least until 5th December 2015. Having arrived alone, it was later reported associating with Pink-footed Geese (Nature in Shetland 2016). Two colour-ringed birds were recorded in Orkney, Scotland in February 2016 (Alan Leitch pers. comm.).

Even in the country of release (Sweden), Lesser White-fronted Geese are frequently observed associating with other goose species. This includes the following: Greylag, Greater White-fronted, Bean, Pink-footed, Barnacle, Brent and Canada Geese, as well as in the company of Whooper Swans *Cygnus cygnus*.

As described in detail in **chapter 4.6** in this report, since 2010 Lesser White-fronted Geese have been released in Sweden without their parents. The idea has been to imprint these birds onto adults with

young in the mountains of Swedish Lapland (World Association of Zoos and Aquariums 2016). However, **chapter 3.2.2.** explains at length why it is very unlikely that these goslings would ever become imprinted on the free-flying population in the Swedish mountains. Rather than becoming imprinted on their own species, these Lesser White-fronted Geese attach themselves to flocks of other species. This is a typical behaviour for lone vagrant geese, regardless of species or their origin (captive or wild).

The risk of hybridising is considerable, particularly as there is a disproportionate sex ratio in the birds released in Sweden (predominantly males, see **chapter 5.7**), as well as the fact that there are a number of lone individuals circulating among flocks of other goose species throughout Europe. Such lone individuals are quite likely to migrate with their adopted goose flock and may never come in contact with any conspecifics. Although perhaps not exhaustive, Reeber (2015) and McCarthy (2006) lists the following species as hybridising with Lesser White-fronted Geese: Greater White-fronted, Snow, Barnacle, Red-breasted, Bar-headed, Canada, Cackling (described as probable), as well as possible hybrids with Ross's and Emperor Goose. In captivity, further hybrids are reported between Lesser White-fronted Geese and Greylag, as well as with Brent Goose (Horsbrugh 1910).

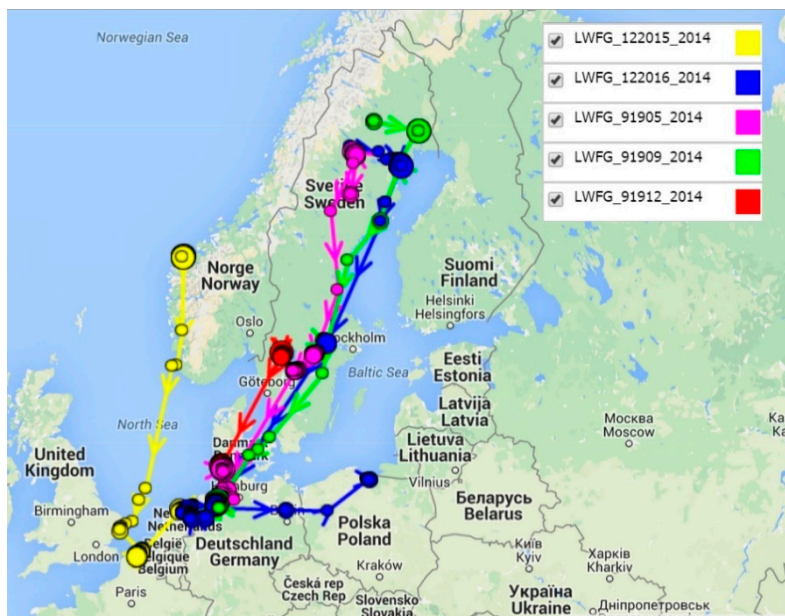
The risk of Swedish-released Lesser White-fronted Geese spreading to new areas in both Norway and elsewhere in Fennoscandia is great, especially when Lesser White-fronted Geese readily attach themselves to flocks of Greylag Geese, as described in the national summaries above. Greylag Goose is a widespread breeding bird species found over much of Fennoscandia, particularly in Norway and Sweden. This risk is a real one, as illustrated by the presence of Swedish Lesser White-fronted Geese in Greylag Goose flocks in Norway. The Lesser White-fronted Geese from the Swedish release project that was shot at the staging site for the Fennoscandian birds (Valdak Marshes in Finnmark) in May 2015 arrived with, and associated with, Greylag Geese.

**Table 3.** Summary table over waterfowl species with which Lesser White-fronted Geese released in Sweden from 2010 onwards have been observed associating with, and the countries where these species associations have been recorded.

Association with species/country	NL	BE	D	NO	DK	SWE	UK
Whooper Swan						X	
Greylag Goose	X	X		X	X	X	X
Greater White-fronted Goose	X	X	X		X	X	X
Tundra Bean Goose	X	X	X		X	X	
unspecified Bean Goose				X		X	
Pink-footed Goose	X			X	X	X	X
Snow Goose	X						
Canada Goose	X		X			X	
Barnacle Goose	X	X	X		X	X	
Brent Goose	X					X	
Red-breasted Goose	X						
Common Shelduck			X				
Egyptian Goose					X		

### 5.2.8 Site connectivity between reintroduced Swedish - and the wild Fennoscandian population

Many of the Lesser White-fronted Geese released in Sweden have been marked with individually identifiable coloured leg rings, allowing recognition of birds in the field. Reports of colour-ringed individuals allow us to build up a picture of some of the movements of Lesser White-fronted Geese from release programmes. Lesser White-fronted Geese released in Sweden since 2010 have been observed at several sites which are also utilised by, or have previously been utilised by, Lesser White-fronted Geese from the Fennoscandian population. A summary of known available records of colour-ringed individuals from releases in Sweden that have either been observed in Norway on at least one occasion or have been reported from sites known to be used by the Fennoscandian Lesser White-fronted Goose population is presented in **Table 4**. As can be seen, there are many records of Swedish Lesser White-fronted Geese in Norway, although not all ring codes have been read in full. In addition, some of the geese released in Sweden have satellite tags mounted on their backs. A limited amount of information is available as to the whereabouts of the Swedish Lesser White-fronted Geese. Although the intention was for the observations to be available online, many of the historical records of satellite tagged geese have been removed from the *Project Fjällgås* website. We do, however, have some information from screen grabs from the earlier movements of tagged birds. The addition of records of tagged individuals allows us to build up a better picture of the movements of the Lesser White-fronted Geese released in Sweden, and supplements the observations of ringed individuals presented in **Table 4**.



**Figure 43.** Movements of five Lesser White-fronted Geese equipped with satellite transmitters and released in Sweden. Screen grab from [www.blesgans.de](http://www.blesgans.de) 10.05.2015.

Lesser White-fronted Geese from the Swedish release project have been recorded at the following sites which are also important functional areas for the Fennoscandian Lesser White-fronted Goose population:

**Valdak Marshes, Norway:** the most important spring and autumn staging sites for Fennoscandian Lesser White-fronted Geese. Ringed birds from the current Swedish release programme have been recorded in both spring and autumn 2015. The individual recorded in spring was shot a few days after it first appeared in order to prevent it entering the Fennoscandian population. The individual recorded in autumn 2015 turned up a few weeks later on the wintering grounds in Hungary (see next page).

**Nemunas Delta, Lithuania:** Fennoscandian Lesser White-fronted Geese have been recorded incidentally at Nemunas (Šilute district) during the spring migration period. The first record was of a satellite-tagged male dubbed “Finn” which was recorded as having utilised the Nemunas Delta between 22nd and 24th April 2007, after which it lost its transmitter, but was still alive based upon later observations (Karttunen et al. 2009). In recent years, colour-ringed birds from the Swedish release programme have been recorded at Nemunas Delta in spring, with at least three ringed individuals recorded there in 2014, and one ringed individual in spring 2015 (Julius Morkūnas pers. comm.)

A Swedish released bird was feeding together with Greater White-fronted and Barnacle Geese at Rupkalviai pastures, Nemunas delta. Lithuania on 19th April 2015. Photo: Boris Belchev.



**Hortobágy national park, Hungary:** During winter 2015-2016, a colour-ringed Lesser White-fronted Goose (“White 3”) which had been released in Sweden 01.08.2014, was observed 30th September 2015 together with Fennoscandian Lesser White-fronted Geese at Hortobágy, Hungary. This same ringed individual has been observed at several sites (**Table 4**).

**Poland:** Poland is situated along the flyway for Lesser White-fronted Geese moving between the wintering grounds and spring-staging sites. This is confirmed by a direct observation of a satellite-tagged bird (“Finn”) observed flying northwards over north-east Poland on 18th April 2007 (the same bird was later recorded in the Numenas Delta, Lithuania). During winter 2015-2016 one satellite-tagged Lesser White-fronted Goose from the Swedish release programme has wandered around Poland and sites in eastern Germany (<http://jagareforbundet.se/projekt-fjallgas/folj-fjallgassen-med-satellit/>).

That Lesser White-fronted Geese originating from Swedish releases have been observed at the natural staging sites used by Fennoscandian Lesser White-fronted Geese illustrates just how potentially easy it is for Swedish birds to enter into the Fennoscandian population. Lone geese will often try to tag along with other geese, although not necessarily of their own species. In the case of Lesser White-fronted Geese, there are four regular carrier species for presumed original wild birds, namely Greylag Goose, Greater White-fronted Goose, Bean Goose and Red-breasted Goose. In addition, Lesser White-fronted Geese released in Sweden have been imprinted on Barnacle Geese, the species used as foster parents during earlier releases. Many of the recent sightings of Swedish released Lesser White-fronted Geese in Norway (and other countries) have been in the company of Greylag Geese. At the time of writing the origins of the Greylag Geese that the Lesser White-fronted Geese are associating with is unclear. However, as the Netherlands are important wintering areas for Nordic Greylag Geese (Nilsson et al. 1999) then it is highly probable that Lesser White-fronted Geese also follow Greylag Geese to the Netherlands, or follow these back to Scandinavia in spring.



**Table 4.** Summary of observations of Lesser White-fronted Geese released in Sweden since 2010 and which have later been observed at sites in Norway and/or sites known to fulfil a function for the Fennoscandian population of Lesser White-fronted Goose. BE=Belgium, DE=Germany, HU=Hungary, NL=the Netherlands, SE=Sweden, NO=Norway. # = numbers of Lesser White-fronted Geese present. Individuals where the code or colour of ring were not recorded are marked a question mark (?) followed by roman numerals (I,II, III or IV) for those known to be unique individuals.

Bird ID		Date		Start	End	Place name	Region	Country	# ind.	Associates/ carrier species
colour	Inscr. bird no.	Satellite transm.								
black	S	122014		08.08.2014	12.08.2014	islets west of Blomsøya	Alstahaug	NO		
black	S	122014		17.08.2014	19.08.2014	Stokkøya	Bjugn	NO		
black	S	122014		20.08.2014	22.08.2014	Skjørøya	Bjugn	NO		
black	S	122014		23.08.2014	26.08.2014	several sites Hareid	Hareid	NO		
black	S	122014		28.08.2014	21.12.2014	Makkevika	Giske	NO	6	
black	S	122014		28.08.2014	21.12.2014	Makkevika	Giske	NO	6	
black	S	122014		10.01.2015	10.01.2015	Stalhille - Weiden	(WSH) [WV]	BE		
black	S	122014		11.01.2015	11.01.2015	Stalhille - Weiden	(WSH) [WV]	BE		
black	S	122014		27.01.2015	27.01.2015	IJzervallei - Rillebroeken Woumen		BE		
black	? I	91912		19.08.2014	21.08.2014	Fugletårnet, Verdal	Nord-Trøndelag	NO	3	Greylags
black	? I	91912		21.08.2014	24.08.2014	Alnesfjæra, Levanger	Nord-Trøndelag	NO	3	
black	? I	91912		27.08.2014		Värmlandsnäs, Säffle		SE	4	
black	? I	91912		16.12.2014	16.12.2014		Schleswig-Holstein	DE	3	
black	? I	91912		15.05.2015	18.05.2015	several sites	Oslo og Akershus	NO	1	
black	? I	91912		16.10.2015	26.10.2015	several sites	Kvismaren/ Örebro	SE	?	
white	3	none		21.01.2011				NL		
white	3	none		30.01.2011				NL		
white	3	none		25.08.2011	25.08.2011	Hudiksvall		SE		
white	3	none		21.01.2012				NL		
white	3	none		27.03.2013	02.04.2013	Alblasserdam, polder Blokweer		NL		
white	3	none		31.12.2015	01.01.2015	Minsmere & North Warren	Suffolk	GB	4	
white	3	none		10.01.2015	10.01.2015	Stalhille - Weiden	(WSH) [WV]	BE		
white	3	none		11.01.2015	11.01.2015	Stalhille - Weiden	(WSH) [WV]	BE		
white	3	none		27.01.2015	27.01.2015	IJzervallei - Rillebroeken Woumen	[WV]	BE		
white	3	none		23.08.2015	09.09.2015	Valdakmyra, Porsanger	Finnmark	NO		Lesser White-fronts
white	3	none		30.09.2015		Hortobagy		HU		Lesser White-fronts
black	K			28.08.2014	21.12.2014	Makkevika, Giske	Møre og Romsdal	NO	6	
black	K			31.12.2015	01.01.2015	Minsmere & North Warren	Suffolk	GB	4	
black	K			10.01.2015	10.01.2015	Stalhille - Weiden	(WSH) [WV]	BE		
black	K			11.01.2015	11.01.2015	Stalhille - Weiden	(WSH) [WV]	BE		
black	K			27.01.2015	27.01.2015	IJzervallei - Rillebroeken Woumen	[WV]	BE		
white	S	yes		28.08.2014	21.12.2014	Makkevika	Giske	NO	6	
white	S	yes		10.01.2015	10.01.2015	Stalhille - Weiden	(WSH) [WV]	BE		
white	S	yes		11.01.2015	11.01.2015	Stalhille - Weiden	(WSH) [WV]	BE		

white	S	yes	27.01.2015	27.01.2015	IJzervallei - Rillebroeken Woumen	[WV]	BE		
blue	P		04.09.2013	17.09.2013	Gaulosen, Melhus	Sør-Trøndelag	NO	1	Greylags
blue	P		16.04.2014	26.04.2014	Ergavatnet, Klepp	Rogaland	NO	1	
blue	P		30.01.2015	30.01.2015	Wallach, Kr. Wesel		DE		
blue	P		18.02.2015	18.02.2015	Wesel Wea. Aue		DE		
blue	P		11.04.2015	12.04.2015	Leka	Nord-Trøndelag	NO	1	Greylags
blue	P		11.05.2015	14.05.2015	Valdakmyra, Porsanger	Finnmark	NO	1	Greylags
black	U		06.09.2014	08.09.2014	Karstø, Tysvær	Rogaland	NO	1	
black	8		09.10.2014	12.10.2014	Kråka, Ørland	Sør-Trøndelag	NO	1	
white	8		05.12.2014	05.12.2014	Hooge, Nordfriesland		DE		
white	8		19.04.2015	19.04.2015	Grandefjæra, Ørland	Sør-Trøndelag	NO	1	
white	8		23.04.2015	23.04.2015	Falstadbukta, Levanger	Nord-Trøndelag	NO	1	
white	8		30.04.2005	02.05.2005	Tautra, Frosta	Nord-Trøndelag	NO	1	Greylags
yellow	K		31.05.2015	31.05.2015	Engasjyen, Rana	Nordland	NO		
yellow	K		09.07.2015	09.07.2015	Hudiksvall		SE		
yellow	K		23.11.2015	23.11.2015	Waverveen, Waverhoek		NL		
black	?		19.08.2014	21.08.2014	Fugeltårnet, Verdal	Nord-Trøndelag	NO	3	Greylags
black	?		21.08.2014	24.08.2014	Alnesfjæra, Levanger	Nord-Trøndelag	NO	3	
black	?		19.08.2014	21.08.2014	Fugeltårnet, Verdal	Nord-Trøndelag	NO	3	Greylags
black	?		21.08.2014	24.08.2014	Alnesfjæra, Levanger	Nord-Trøndelag	NO	3	
black	3		31.12.2015	01.01.2015	Minsmere & North Warren	Suffolk	GB	4	
black	6		16.09.2013	19.09.2013	Kvismaren		SE		
black	6		28.08.2014	21.12.2014	Makkevika, Giske	Møre og Romsdal	NO	6	
black	6		29.09.2015	29.09.2015	Karlsholmviken	Uppland	SE		
?	?		28.08.2014	21.12.2014	Makkevika, Giske	Møre og Romsdal	NO	6	
?	?		28.08.2014	21.12.2014	Makkevika, Giske	Møre og Romsdal	NO	6	
white	?		10.04.2015	10.04.2015	Espem, Åkersvika, Hamar	Hedmark	NO	2	pink-footed
yellow	?		10.04.2015	10.04.2015	Espem, Åkersvika, Hamar	Hedmark	NO	2	pink-footed
?	?		27.05.2015	31.05.2015	Storeidvatnet, Vestvågøy	Nordland	NO		pink-footed
white	?		30.08.2015	30.08.2015	Storleiret, Frosta	Nord-Trøndelag	NO	1	
black	?	V	13.09.2015	13.09.2015	Gjølsjøen, Marker	Østfold	NO	1	Greylags

### 5.3 Is the Swedish population reintroduced or supplemented?

An investigation into historical records of Lesser White-fronted Geese within the original range of the Fennoscandian population was presented by Andersson & Holmqvist (2010). Here the authors presented records of Lesser White-fronted Geese within the area where the geese were released in Swedish Lapland between 1981 and 1999.

Based on 23 records of birds from the original population in, or close to, breeding habitat within a distance of 50 km from the release localities they conclude that the releases into the area were a supplementation of the existing Fennoscandian Lesser White-fronted Goose population rather than a reintroduction: "*The large number of observations of birds from the Fennoscandian population proves that the release of goslings in the actual area was a supplementation of a small but extant population and not a re-introduction*". This statement is not a valid scientific conclusion, but rather a misinterpretation of the facts. If these two populations met and interbred in the release area, the few individuals left from the wild Fennoscandian population may potentially become swamped up into the new introduced population rather than birds from the Swedish releases making any contribution to the original wild population. This is evident since no Lesser White-fronted Geese with ecological characteristics of the wild Lesser White-fronted Geese have been observed there after late 1980's. Those remnants of the wild Fennoscandian Lesser White-fronted Goose population in the release area at the time of the first releases, were therefore soon eradicated, and the release activities would in that case have contributed to the extinction of the wild Fennoscandian population in Sweden. The migration route of the birds that later began breeding in these areas was changed to wintering areas in the Netherlands due to the release method of using Barnacle Geese to alter the migration route. The genetic composition of the released birds was degenerated through generations of captive breeding and they also carried genetic material from Greater White-fronted Geese.

More importantly, there are no records of the reintroduced population from Sweden within the major migration routes or areas of the wild populations throughout the 1980s and the 1990s, which would be expected if the released birds supplemented the original population, and thereby continued to use traditional migration routes. It has been argued by Kampe-Persson (2008) and Mooij et al. (2008) that the original migration route from these areas was in the direction of Western Europe, although no data exists to support this view. On the contrary, there are two ring recoveries from Sweden showing a similar migration history as has been proved for birds breeding in Finnmark, Norway (see **chapter 3**). The fact that there are no historical records of a build-up of migrating Lesser White-fronted Geese at potential staging sites on the Swedish coast suggests an eastern migration route. Hansson (2005) described that the original autumn migration route for the wild Fennoscandian Lesser White-fronted Geese breeding in the release area in Sweden went in a south-eastern direction crossing the Bothnian Bay at the narrowest point "Norra Kvarken". Our unanimous conclusion is therefore that, even when the first releases were made in Swedish Lapland whilst there were still genuinely wild birds in the area, estimated as 1-2 pairs annually in late 1970s Andersson & Holmqvist 2010), then the naturalness of this remnant population was destroyed by the introduction of birds of impure genetic make-up that lacked natural ecological traits and with a human modified migration route.

At the same time as the Swedish releases were started in Lapland in 1981, there were still Lesser White-fronted Geese breeding in Nordland County in Norway, to the west of the release site. NOF-BirdLife Norway's local branch in Rana municipality carried out regular monitoring of Lesser White-fronted Goose breeding sites, both in search of the geese themselves, as well as feeding signs (excrements) and other signs (moulted feathers). The last breeding record in Nordland was in 1988 (Norsk Ornitologisk Forening, avd. Nordland 2004).

In recent years, birds found in Rana municipality have proven to be from the Swedish releases e.g. colour-ringed birds described by Waldmann (1998, 2000). Similarly, birds observed at staging sites elsewhere in Nordland are also from the stock released in Swedish Lapland (colour-ringed individuals described in the Norwegian Species Reporting System: *Artosbservasjoner*). A Lesser White-fronted Goose observed at Sør-Herøy in Nordland in late October 1999 was extremely tame (Shimmings 2000). Despite the activities taking place on land, this bird settled in the bay around 25-30 metres from fishermen, and was still present some 5 hours later. This individual exhibited such abnormal behaviour that any ideas that it might be a wild bird were quickly eliminated.

Thus, the releases of Lesser White-fronted Geese in Swedish Lapland may well have been the final nail in the coffin for the already dwindling breeding population in the mountainous regions of the eastern part of Nordland County. Any records from the area post-1981 releases could equally be from the remaining wild birds, from the Swedish releases, or a mixture of both. Observations of Lesser White-fronted Geese bearing colour-rings from both the earlier releases in Sweden (and from the current project started in 2010, see **chapter 5.2**) clearly demonstrate that Swedish-released Lesser White-fronted Geese have been observed in Nordland (including at traditional staging and breeding areas for wild birds) since at least the mid 1990s.

Andersson & Larsson (2006) also used the term reintroduced and introduced throughout their whole article entitled “Reintroduction of Lesser White-fronted Goose *Anser erythropus* in Swedish Lapland”. The information in the article of Andersson & Holmqvist (2010) does not alter the fact that the reintroduced population has a very different ecological and genetical character as compared to the original wild Fennoscandian population breeding in Sweden, and is now considered as a separate population that also today poses a threat to the wild Fennoscandian population. The release of 19 birds on average annually the first 11 years (208 ind. before a short halt of releases) in an area suspected to hold 1-2 pairs. This is not a supplementation as the released birds are of a different ecological and genetical character compared to the extant population. The releases represent a 50-100 fold number of birds in proportion to the birds originally present. The term supplemented is therefore misleading and the term reintroduced is the correct term for the Swedish population.

#### **5.4 Is the Swedish reintroduced population a “wild” population?**

A question that is often raised is as to whether the Swedish reintroduced population can be considered to be “wild” or not. Firstly, we need to define the term “wild”. According to the Oxford English Dictionary *wild* is defined in the case of an animal or plant as “*living or growing in the natural environment; not domesticated or cultivated*”.

We consider that the Swedish reintroduced population of Lesser White-fronted Goose cannot be classified as wild due to the following points:

- The reintroduced population is founded on birds that have been raised in captivity and are therefore considered as either domesticated or cultivated.
- The individuals that have been reared and released into the Swedish mountains and their offspring produced in the wild utilise parkland during the summer and have become very tame and allow close approach, thereby having lost their natural shyness to humans. They no longer exhibit the same behaviour as genuinely wild Lesser White-fronted Geese.
- The birds have adapted to unnatural environments (agricultural land, town parks and one known instance of breeding in coastal rather than mountain habitats). This is contrary to the habitat choice of individuals from the wild populations of Lesser White-fronted Goose that do not occur in such environments.

- Unlike any wild population of Lesser White-fronted Goose, the Swedish reintroduced population regularly interbreed with other species (Barnacle Goose).

There is also a genuine risk, that as a result of the genetical and ecological traits of this population, it could become one of the many feral/reintroduced populations in Europe that are regarded as pest species and not something which occur naturally. Such a scenario could arise due to preference for agricultural habitats or parkland (see **chapter 5.6.2**), or through a rapid increase in numbers following breeding in new sites outside the natural range (see **chapter 5.2.4**). Such growth in populations have caused severe problems both towards agricultural and recreational interests, and are in many countries regarded as either “nuisance species” or “pest species”. There are many examples of introduced wildfowl populations reaching pest proportions, and where numbers are so great that they are difficult to control. This includes birds released deliberately into former breeding areas e.g. Greylag Geese in Great Britain, or introduced for hunting and/or ornamental purposes in areas where they never occurred naturally e.g. Canada Geese in several European countries (Delany 1992, Austin et al. 2007). The problem of breeding, staging or even wintering within the confines of a town environment should not be overlooked. In such areas the public often defend what they consider to be wild birds and are often adverse to any measures that may be suggested (or even implemented) in order to alleviate the problem. Birds that become established in towns are often hand-fed by the general public and become so tame that any control measures become difficult to implement because the public will sympathize with such birds and defend them vigorously. The fact that Lesser White-fronted Geese spend some weeks (or months, depending upon individual strategies) in the town park at Lillfjärden in Hudiksvall in eastern Sweden, and that they allow close approach by people demonstrates that the geese are habituated to human beings. This is not a surprise given that many geese have been released within the town park in Hudiksvall. However, it is perhaps surprising that birds released in Swedish Lapland also stage at Lillfjärden. The geese use Lillfjärden as a staging site both during pre- and post-breeding periods.

## 5.5 Genetic aspects

### 5.5.1 Captive stocks and hybridisation

Studies of captive Lesser White-fronted Goose stocks have shown that hybridisation between Lesser White-fronted Goose and Greater White-fronted Goose has occurred several times in the captive stock in Sweden that was used for releases in the 1980s and 1990s. It was found that the captive Lesser White-fronted Geese carry the mitochondrial DNA of Greater White-fronted Geese (cf. Ruokonen 2001), and evidently part of the nuclear DNA of the captive Lesser White-fronted Geese is inherited from Greater White-fronted Geese. In other captive stocks (in Finland), partly originating from the same stock, hybridisation with Greylag Goose has also been proven (Ruokonen et al. 2007): *“A total of 36% of the captive lesser white fronted goose stock was shown to be contaminated: 4% of the captive individuals had greater white-fronted goose mtDNA, 19% carried private microsatellite alleles from the greater white-fronted goose and 13% of the individuals showed both greater white-fronted goose mtDNA and microsatellite alleles. In reality, levels of genetic contamination may be much higher, but the similarities in nuclear alleles between the species make more detailed estimates impossible”*.

*“In this study the sampled individuals were traced back to 11 farm stocks of which 6 are in Sweden and five elsewhere in Europe (Fig. 1). In eight of the stocks, either nuclear or mitochondrial genes (or both) from an alien species were detected (Fig. 1). Because captive lesser white-fronted geese have been exchanged among breeding units, in an attempt to avoid possible inbreeding, it is probable that*

*genes from the greater white-fronted and greylag goose are widespread in captive stocks of the lesser white-fronted goose throughout Europe.”*

Because the mitochondrial and nuclear DNA of Greater White-fronted Geese are not linked in the captive Lesser White-fronted Goose stocks, and the mitochondrial DNA is only inherited matrilineal, eliminating only the individuals proven to carry the mitochondrial DNA of Greater White-fronted Geese does not solve the problem, because there are also individuals possessing only mitochondrial DNA of Lesser White-fronted Goose, but nuclear DNA of both species.

Hybridisation between Lesser White-fronted Goose and Greater White-fronted Goose in the wild has not been recorded in DNA studies, even though more than 100 individuals of each species have been sampled covering the whole distribution range of Lesser White-fronted Goose, and despite the fact that the two species occur in mixed flocks during migration and wintering when pair formation is supposed to take place (Ruokonen 2001). Several stakeholders of continued reintroduction activities have claimed proof of high rates of hybridisation in the wild, but we question the validity of the scientific methods and many of the conclusions reached in such studies (see **chapter 7.3** for an elaboration of this issue).

Based on studies on mitochondrial DNA, the genetic composition of the wild Fennoscandian Lesser White-fronted Goose population differs significantly from other Lesser White-fronted Goose populations and thus the Fennoscandian population is considered a separate management unit in conservation biology (Ruokonen 2001).

In addition to the introgression of genes from Greater White-fronted Goose, the present free-flying reintroduced population in Sweden consists of a mixture of western and eastern mitochondrial DNA types of Lesser White-fronted Goose. In addition, a high percentage (>5%) hybridises with Barnacle Geese, the species that were used as foster parents in the Swedish reintroduction project during the 1980s-1990s (see **chapter 5.2.6**).

It is not known what effects hybridisation have on the ecological function of the birds. The genetic screening has only shown that the existing Swedish free-flying population has a hybrid origin and there exists no research on the effects of this. However, the hybridisation problem could manifest itself through change in habitat preferences (see below), increased vulnerability to predators and possibly a lower threshold for interbreeding with other *Anser* species. Based on the examination of photos, the free-flying reintroduced Swedish population may also differ morphologically from the wild Fennoscandian birds. Some birds had diminished eye rings and pale yellow and elongated bills.

In another experiment to establish even one more human mediated migration route and wintering area for Lesser White-fronted Geese released in Sweden, this time by use of ultra-light planes, a French project used birds originating from a zoo in Belgium (see **chapter 4.3**). These birds were also quite likely of hybrid origin, because experienced birders were not able to identify the birds as Lesser White-fronted Geese based upon the usual identification features such as swollen yellow eye ring and short triangular, intensively pink bill. The birds used had elongated, pale pink, slim bills typically associated with Greater White-fronted Goose. Only 12 of the 30 released birds were recaptured, although the original plan was to recapture all (Tegelström et al. 2001).

One study has tried to find support for the claim that it is normal with a large proportion of hybrids with Greater White-fronted Geese in wild Lesser White-fronted Goose populations (Nijman et al. 2010). However, the study failed to prove that the two sampled individuals (collected in England and the Netherlands, out of the normal wintering range of wild Lesser White-fronted Geese) were of wild origin and not escapes from local zoos or similar. This article is discussed in detail elsewhere in this

report (**chapter 8.3**). Further, Nijman et al (2010) argue that the specimens are collected before the Swedish reintroduction project started. However, Western Europe has, at least since the 1850s, experience numerous deliberate releases and unintentional escapes from zoos and wildfowl parks (Barrat et al. 2010, Bauer & Woog 2011, Chiron et al. 2009, Fabregas et al. 2010, Kark et al. 2009, Sol et al. 2005) something which resulted in, amongst other things, the establishment of a “*European code of conduct on zoological gardens and aquaria and invasive alien species*” in 2012 (Convention on the conservation of European wildlife and natural habitats - 32th meeting of the Standing Committee 2012) for zoos and aquariums. Hybridisation involving Lesser White-fronted Geese is known from zoos in Europe at least since 1926 (Nagy 1950, **chapter 4.8**), and hybridisation between geese under captive and semi-captive conditions is common. In Sweden, the farm of Bengt Berg, that later supplied Lesser White-fronted Geese to the Swedish reintroduction project, had geese hybridised of several different constellations already from the establishment in late 1920s, such as Greylag Goose x Barnacle Goose, Greater White-fronted Goose x Snow Goose, Greater White-fronted Goose x Bar-headed Goose (Berg 1937).

### 5.5.2 Selection and gene flow

The question of genetics of the Lesser White-fronted Goose has been debated and discussed ever since the beginning of the release project in Sweden, with arguments for and against the use of captive stocks and the potentially negative effects of this. Regarding the issue of selection against individuals of hybrid origin the following basic population genetic principles are worth taking into consideration when dismissing the potential negative effects of birds of hybrid origin or very different subspecies:

In a small population with low effective population size ( $N_e$ ), genetic drift is a stronger force than natural selection. Hence, in small populations even detrimental (e.g. hybrid) alleles can be driven to fixation despite a selection against them. This derives from the simple relationship between efficiency of selection ( $s$ ) and effective population size ( $N_e$ ) according to which natural selection on given locus is effective only when

$$s \gg 1/(2N_e)$$

In other words, selection must be very strong in small populations to be effective, which also means that more selective deaths are needed to selection response (adaptation). Hence, it is not a wise strategy to increase the genetic load of a small population e.g. with foreign genes that are selected against, because this would mean that large proportion of the members of that population would be destined for selective deaths. Additionally, even if the selection would not drive the population to extinction, the small population could be swamped by detrimental alleles of hybrid origin or detrimental alleles that have increased in frequency in captivity due to inbreeding and relaxed selection.

Several of the reintroduction advocates have suggested that the wild Fennoscandian population is in need of released farmed birds to avoid inbreeding, but this can be refuted for several reasons. Ruokonen et al. (2010) showed how the genetic diversity increased equalling 0.56 per generation despite a dwindling population. This was shown to be related to an increased immigration of males of Russian origin (from the Western main population). The effect of male-mediated gene flow is potentially dichotomous. On the one hand, it helps safeguarding the Fennoscandian Lesser White-fronted Goose from loss of genetic variability, but on the other hand, it eradicates the original genetic characteristics of this population, the local adaptation. Additional input of birds of farmed origin would further drive a potential outbreeding process. Fortunately, no potential negative population genetic effects have been observed, such as inbreeding depression or imbalanced sex

ratios. On the contrary, the wild breeding population has an average brood size of 3.3 goslings per pair (1994-2015), or 3.2 goslings per pair (2010-2015). This is 0.6 goslings per brood larger than for the reintroduced population in Sweden with an average of 2.7 goslings per pair (1981-2015), which is the same also in the most recent years 2010-2015. The total relative reproductive success in the wild Fennoscandian population was considerably higher than in the reintroduced Swedish population in the period 1994-2015 (0.42 juveniles produced per individual in the Fennoscandian population as compared to 0.14 juveniles produced per individual in the Swedish reintroduced population - see **chapter 5.6.4** Population viability for details).

In a quantitative model by Ford (2001) it was predicted that even low levels of gene flow from a captive population to the wild will shift the wild population's mean phenotype. The fitness consequences of the phenotype shift depended on the details of the model, but a >30% decline in fitness could occur over a wide range of parameter values. In the model, Ford (2001) showed how the gene flow has two important implications for conservation efforts. Firstly, that selection in captivity may significantly reduce a wild population's fitness during supportive breeding and that even continually introducing wild individuals into the captive population will not eliminate this effect entirely. Secondly, the sensitivity of the model's outcome to the wild environment's quality suggests that conserving or restoring a population's habitat is important for preventing fitness loss during supportive breeding.

### 5.5.3 Introgression

Turning back to the discussion about introgression from birds of hybrid origin in Sweden, it has been difficult to validate and discuss the conclusions published by Amato (2010) because a report was never published. In the executive summary, he wrote that introgression could have two outcomes, either selected against, or neutral:

*“We would predict that if the genes make individuals less fit then they will be selected against in nature. If they are neutral, they will remain at current levels or decline through drift. Natural introgression is not uncommon in many closely related species but seems to be controlled mostly by positive assortative mating within species. While an unfortunate experiment, no specific management actions seem warranted for this subpopulation.”*

There could also be a third option in that the introgressed genes will be positively selected for, and we suspect that this is the case for the reintroduced population in Sweden. In Western Europe, a common belief is that the swift recovery of the many endangered goose populations since the early 1960s was caused by two factors; establishment of protected areas, but equally as important was the change in feeding habitat from natural wetlands to agricultural land (Fox et al. 2005). The latter seems to be a very important factor, with higher quality and easily accessible food and a relaxation from hunting and natural winter mortality. Only one species did not make this change in habitat use - the Lesser White-fronted Goose, which still feeds in natural steppe habitats or marshlands with salt tolerant grass species. This is probably one important explanation to the fact that the Lesser White-fronted Goose and the Greater White-fronted Goose have different population trajectories since they are exposed to quite similar levels of hunting throughout the year (which includes spring and summer hunting in Russia).

The reintroduced population in Sweden are founded on individuals bred in captivity, where a large proportion of the birds now moult in a town park, and where the majority spend the entire winter in agricultural fields in the Netherlands. The introgression of Greater White-fronted Goose (and apparently Greylag Goose) genes could be the sole explanation for this population being able to utilise agricultural crops efficiently, and since this provides an advantage in energy available for



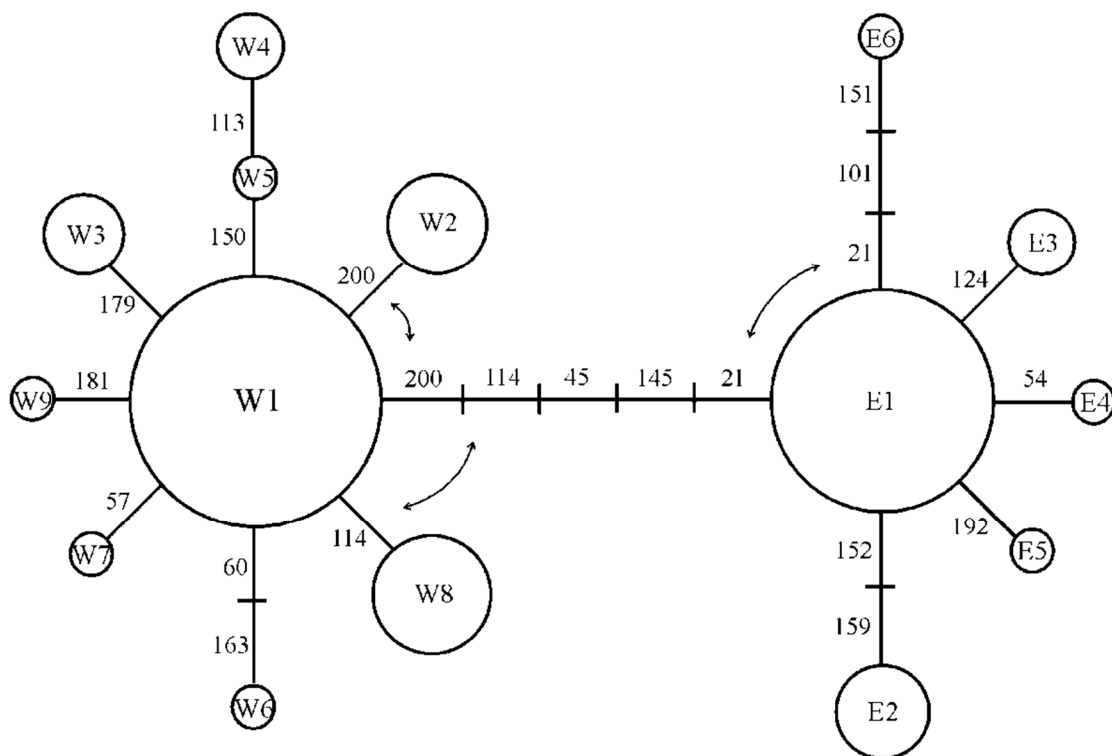
winter survival and spring migration (including bringing sufficient energy stores for successful reproduction), it will be positively selected for. Positive selection is a real likelihood, especially because a reintroduction program can tip the bias in favour of success where it will have specifically exploited circumstances to offer a population a set of "survival" habitats (outside of the breeding season) and a breeding habitat (in which to reproduce). Such linkages become hard-wired behaviourally because of family structures and the cultural learning, so offspring will adopt these traits. By their very nature, these projects will have linked opportunities that were not necessarily available to geese in recent evolutionary time (not least because many survival habitats are man-made). So, reintroduced goose populations can exploit a series of novel protein-rich feeding opportunities that were never available before. This may even circumvent evolutionary adaptations such as Lesser White-fronted Geese adaption to feeding on very dense short swards may become able to exploit longer swards that they are less efficient at handling because they are richer in nutritional content. For instance, the Bar-headed Goose *Anser indicus* has successfully established feral populations in European parks and farmland environments, which is very dissimilar from their original native habitats. It is natural that if a strategy for survival is successful in a modern landscape, no matter how alien to the original ecological context to which that organism was adapted, there will be positive selection for the traits that perpetuate that success.

#### 5.5.4 Phylogenetics and future

With the new releases conducted in Sweden since 2010 with a new stock with different genetic composition (of Western Russian origin) than used in the first reintroduction years (zoo background with hybrid history with two other *Anser* species) it is clear that more thorough research is needed to understand how genetic drift, introgression, selection and migration shape genetic and phenotypic variation, and how this relates to population viability and potentially negative effects on neighbouring populations. With the first release project in Sweden introducing a 50-fold number of birds to the original almost extinct local population (in the release area), we would, as discussed above, expect that the original population has left few traces in the present mix of birds present throughout the year in Sweden. From our viewpoint, it is clear that a genomic approach, whether whole-genome sequencing, sequencing targeted portions of the genome or direct genotyping of a random subset (GBS), is necessary to improve the precision of estimates and not least, to understand the effects of past and ongoing releases of birds bred in captivity (cf. Shafer et al. 2014). Recent advances in genetic analytical methods has cast new light on phylogenetic relationships and evolutionary history of geese. Earlier incongruence in phylogenetic analyses could be caused by analytical shortcomings or the result of biological processes such as hybridisation, incomplete lineage sorting and gene duplication, and the relationship within the *Branta* and *Anser* families was never fully resolved (Ottenburghs et al. 2016). Recent technological advances have substantially reduced the cost of sequencing, though the assembly of whole genomes has remained a challenging computational problem. Scally et al. (2012) using whole genome analyses, gave astonishing insights into the evolution of hominids (humans *Homo*, chimpanzee *Pan sp.* and gorilla *Gorilla* genus) and showed how incomplete lineage sorting (ILS) affected interpretation of relationships. More specifically, they found that across the genome 30% of bases exhibited ILS and that the fraction of ILS varied with respect to genomic position more than expected under a model of genome-wide neutral selection. Interestingly that variation reflects local differences in the ancestral effective population size  $N_e$  during the period between the gorilla and chimpanzee speciation events. In geese, Ottenburghs et al. (2016) sequenced nineteen goose genomes and used an exon-based phylogenomic approach. For the controversial Bean Goose complex they reported a sister species relationship between the Pink-footed Goose and Tundra Bean Goose, but found that the phylogenetic relationship in this complex are highly influenced by incomplete lineage sorting and/or hybridization. Within the grey geese clade, the Lesser White-fronted Goose was, not surprisingly, established as a sister species of the Greater White-fronted Goose. The placement of the Lesser

White-fronted Goose in earlier studies (Lee et al. 2008, Ruokonen et al. 2000) in the clade with Taiga Bean Goose and Pink-footed Goose using mtDNA analyses, could be explained by incomplete lineage sorting and/or hybridisation. Again, this shows how pertinent it is to pursue in-depth studies on the genetics of the Lesser White-fronted Goose.

Our skepticism and warnings against possible negative effects are not without merits. Early warnings against the genetic compositions of the captive reintroduction stock and its possible negative effects proved to be correct when genetic analyses showed that the birds in the captive stocks were of hybrid origin (through their captive history). New worries and warnings have since been issued related to the massive releases of young birds without parents and subsequent lack of parental guiding to traditional wintering areas. This most likely has also genetic effects, as more recent studies on a related species, the Barnacle Goose, has shown how recent changes in migratory traditions leads to genetic differentiation (Jonker et al. 2013). A newly established nonmigratory population of Barnacle Geese in the Netherlands was significantly differentiated from four other migratory populations and was characterised by high emigration and low immigrations rates. There was also evidence of minor mixing of individuals of a captive origin, or possible hybridisation with Cackling Geese (Jonker et al. 2013). For the Swedish reintroduced Lesser White-fronted Goose population with a human mediated migration route to the Netherlands, mixing with birds of captive/feral origin is expected in the Netherlands as well as mixing with birds stemming from the new large-scale releases of birds of captive origin that has been undertaken from 2010 and onwards.



**Figure 44.** Minimum spanning network of mitochondrial haplotypes found in the study of Ruokonen et al. (2004). This shows how the Lesser White-fronted Goose has two clades of birds, which also is in line with knowledge that birds breeding west of Taimyr Peninsula in Russia, migrates to southwest, while birds breeding east of the Taimyr peninsula migrates southeast to China in winter. Each line indicates the number and locality of the nucleotide differences observed among the haplotypes, sizes of the circles are approximately proportional to the number of individuals. Arrows indicate possible reversals (nucleotide positions 21, 114 and 200). W=western haplotype (sampled to the west of Taimyr Peninsula), E=Eastern haplotype (sampled to the east of Taimyr Peninsula).

## 5.6 Ecological aspects

### 5.6.1 Manipulation of migration routes and establishment of new wintering areas

The Swedish reintroduced population was manipulated to establish a new wintering area by using of Barnacle Geese as foster parents, where the Barnacle Geese had already established a migration route to the Netherlands (von Essen 1982, von Essen 1991, von Essen 1993b, Andersson & Larsson 2006). The founder of the Swedish project, Lambart von Essen wrote (1982): *“In spite of the fact that the natural migration route of the Anser erythropus from Scandinavia goes in a southeast direction we have decided to try the Branta leucopsis as foster-parents”*. The Swedish Association for Hunting and Wildlife Management contemplated using the Canada Goose, but deemed the species too big as a foster parent (von Essen 1982). The intention of using Barnacle Geese was that the Lesser White-fronted Geese would follow their foster parents to new wintering quarters in the Netherlands (the wintering area for the foster parents). The Swedish reintroduced population now winters in areas that are not traditional wintering areas for Lesser White-fronted Geese, and this is contrary to the claims by the stakeholders for continued releases (see review by Marchant & Musgrove 2011).

Close to 95% of the Swedish reintroduced population winters regularly in the Netherlands, but due to release activities in Sweden in recent years, an increasing number now winters in southern Sweden and, since 2014, also on the southwestern coast of Norway (data from the Norwegian and Swedish Report Systems) see **chapters 5.2.3-5.2.5**. This is yet another undesired negative effect of the reintroduction scheme in Sweden.

### 5.6.2 Change of habitat requirements

Wild, natural populations of Lesser White-fronted Geese are habitat specialists, almost exclusively exploiting natural steppe and saltmarsh habitat during migration and winter, as well as short-grazed semi-natural grasslands (including grazed coastal meadows), although also at times cereal stubbles (Jones et al. 2008, Karmiris et al. 2009, Toming & Tolvanen 2009).

Intensive studies of the diet of wintering Lesser White-fronted Geese in Greece have shown that the winter diet is mainly comprised of graminoids and aquatic plants at Lake Kerkiní and of graminoids and halophytes at the Evros Delta. Lesser White-fronted Geese feed in marsh areas at the edge of Lake Kerkiní, and the availability of feeding areas is influenced by the water regulation regime at that site. When feeding at the Evros Delta, the geese utilise halophyte vegetation in soils with high salinity. The study of the dietary preferences of Lesser White-fronted Geese wintering at both Lake Kerkiní and Evros Delta showed that the geese are habitat specialists using marshy areas around lakes as well as saltmarshes and coastal meadows (Karmiris et al. 2014).

Studies of Lesser White-fronted Geese in China have also revealed that the species feeds mainly on graminoids, and that food is a constraint that explains the restricted distribution of Lesser White-fronted Geese during winter. The geese in China feed mainly on recessional grasslands (i.e. natural meadows exposed as floodwaters recede). By grazing on the shortest swards, Lesser White-fronted Geese rarely mixed with other goose species during feeding, as the other species present did not preferentially select shorter swards. The restricted diet of the Lesser White-fronted Goose was thought to explain the species' highly restricted winter distribution and global rarity (Wang et al. 2013).

The reintroduced Swedish population has, contrary to wild Lesser White-fronted Geese breeding in Fennoscandia and Russia, made the transition to feed on cultural habitats/farmland during winter in

the Netherlands and Germany, a trait not shared by wild Lesser White-fronted Geese. At the staging/moulting grounds in Sweden, the deviation in habitat choice is even more prominent, as the Swedish reintroduced population utilises fertilised and mown lawn areas in a park in the Swedish town of Hudiksvall as the main staging and moulting site for non-breeders. The use of public parks has never been recorded for wild Lesser White-fronted Geese. The adaptation to feeding on cultural habitats (farmland and lawns) might be influenced by the brood rearing process in the rearing pens prior to release. According to a memorandum sent to BirdLife International (Liljebäck 2015) then geese *“bred in captivity in Sweden fed on a mix of “natural grass”, pellets and different kinds of vegetables (favouring salad and carrots)...”*. Further, Liljebäck wrote in the same memorandum that this shows *“that wild-born LWfG are well adapted to thrive on “unnatural” food”*. It should be emphasized in this context that the geese concerned are held in captivity, and therefore are not able to select what to feed on, being instead forced to eat what is made available to them in a captive environment. On this basis we consider the argument that wild-born Lesser White-fronted Geese are well adapted to thrive on “unnatural” food is a bold and incorrect statement, and cannot be used as an argument to defend the adaptation of the Swedish reintroduced birds to atypical feeding habitats such as grass lawns in a public park. Further, an adaptation to feeding on vegetables must be considered as undesirable. In England there are problems with Pink-footed Geese feeding on carrot crops, and in southern Norway, Greylag Geese are reported to do considerable damage to vegetable production, particularly to beans and lettuce crops. Once geese learn that there is a new food source available they can be difficult to stop, often resulting in complaints purporting damage and economic loss.

Liljebäck (2015) also argues that Greater White-fronted Geese, and more specifically the Greenland subspecies *A. a. flavirostris*, made a shift to agricultural land and that resulted in the recovery of the species/subspecies. Liljebäck argues that such shifts in diet may be beneficial for a species. However, Liljebäck has failed to address the reasons behind the recent major decline in numbers of Greenland Greater White-fronted Geese, despite the fact that the subspecies has all but abandoned the traditional natural habitats in favour of more modern monocultures. The recent declines in numbers of Greenland Greater White-fronted Geese have been most significant at sites with large numbers of birds, mainly feeding on intensive agricultural habitats (Francis et al. 2011). Although geese may benefit from feeding on agricultural land by achieving more rapid increase in body condition in terms of increased body reserves, feeding on agricultural habitats may in fact be detrimental in terms of reproductive success. Prop & Black (1998) examined the build-up of body reserves in Barnacle Geese staging in two distinct habitat types during the spring migration, and how this affected subsequent reproductive success of these same individual birds. One group of birds fed on traditionally managed staging islands with low-intensity management (natural hay meadows lacking in alien plant species, no artificial fertilisers, hand-cutting of hay meadow areas), whereas the other group of birds fed on intensively-managed agricultural fields (sown grass fields including monocultures, use of artificial fertilisers, machine-harvested to produce silage). Although the accumulation of fat stores (as measured by recording the abdominal profiles for individual birds) was higher on agricultural land compared to traditional habitats, then the amount of gain in protein content was higher for the birds using traditional habitats. Despite achieving the highest fat scores, the geese using the agricultural fields had a depressed probability of successful breeding and this was perhaps due to insufficient protein acquisition during the crucial spring-fattening period. This study showed that the geese did not benefit from feeding on agricultural land, but there were however benefits in terms of improved reproductive success when feeding on traditional habitats.

A further issue is that Liljebäck made no mention in the memorandum that the wild Fennoscandian population of Lesser White-fronted Geese has not made the transition to new habitats, and that this population continues to feed exclusively in traditional natural/semi-natural habitats. As stated repeatedly elsewhere in this current report, there are many reasons why a change in migration route

or change in habitat choice for Fennoscandian Lesser White-fronted Geese must be avoided, as these changes may well be detrimental to the population. The risk of mixing with released birds from Sweden could lead to a change in choice of feeding habitat.

At the wintering site at Oude Land van Strijen in the southwestern Netherlands, Lesser White-fronted Geese feed in damp grass fields. Birds feed in a similar habitat in the Harger and Pettermerpolder in Nord-Holland. The birds also exhibit prolonged feeding in trenches and ditches in these areas. This was the situation up to at least winter 2007/2008 (Ouweneel et al. 2008). A search of photographs of Lesser White-fronted Geese taken in the Netherlands in the period autumn 2010-winter 2015/2016 shows that some are also feeding on intensively managed agricultural grasslands, often in the company of other goose species. These photographs reveal that Lesser White-fronted Geese have also made the switch to intensive farmland in the wintering areas, a habitat that is not natural for the species as the habitat type itself is man-made.

In the process of updating the ISSAP, it would be beneficial that the International Lesser White-fronted Goose working group consider this deviation in habitat choice as well as the human-modified migration route and if the adaptation to agricultural land could be an effect of introgression of genes from other goose species, that have adapted to feeding on agricultural land.



A flock of Swedish reintroduced Lesser White-fronted Geese feeding on a recently mown lawn at Lillfjärden, Hudiksvall in Sweden in July 2015. Grass lawns are not natural habitats for wild Lesser White-fronted Geese. Note also the close proximity of the geese to the observer and the public footpath in the bottom right corner of the photograph. Photo: Paul Shimmings



Another view of the flock shown in the previous photograph. Note that these Lesser White-fronted Geese are feeding close to the trees in the foreground and to the tall fence and tall vegetation in the background, areas where predators can easily conceal themselves. Indeed, a domestic cat was concealed in the very same vegetation at the time the photograph was taken. Wild Lesser White-fronted Geese are birds of open habitats and not of enclosed locations such as that shown here. Photo: Paul Shimmings

### 5.6.3 Hybridisation with the foster parent species

The use of Barnacle Geese as foster parents in the Swedish reintroduction project has led to hybridisation between the two species, with second-generation hybrids also recorded (Kampe-Persson & Lerner 2007). This problem was claimed by the Swedish Environmental Protection Agency (SEPA), to have been resolved as obvious hybrid birds were shot in 2012, but it does not alter the fact that hybridisation has occurred, and still occurs. In 2013 at least 14 hybrids were observed in Sweden (minimum 3 broods and 11 goslings produced), and in 2014 a minimum of 8 hybrids were observed (minimum 2 broods and 5 goslings produced (Swedish Reporting System 2016). Based on population size data for the last 5 years (2009-2013, where estimates exist from both Sweden and the Netherlands), it can be concluded that the Swedish reintroduced population contains on average 10.5% Barnacle Goose x Lesser White-fronted Goose hybrids (hybrid occurrence data are gathered from the Swedish Reporting System and population size estimates from Koffijberg & van Winden (2013) (in the latter only estimates for “pure” looking Lesser White-fronted Geese are given). For a full overview of the history and occurrence of such hybrids in Sweden, see **chapter 5.2.6**).

The concern that Lesser White-fronted Goose x Barnacle Goose hybrids could well be fertile has previously been raised by others, and that such individuals could potentially pair with other geese and produce second-generation hybrids. Such fears have not been unfounded. The first confirmed record of a hybrid Barnacle Goose x Lesser White-fronted Goose attempting to breed was in 1989. A male hybrid Lesser White-fronted x Barnacle Goose bred unsuccessfully with a female Canada Goose where none of the six eggs hatched, at Gussjön, Ångermanland in 1989 (Sjöberg 1990, Kampe-

Persson & Lerner 2007). In 2010, a female hybrid Barnacle Goose x Lesser White-fronted Goose which was paired to a male Barnacle Goose was observed incubating on a nest at Skatön in Hälsingland on 31st May 2010 (Stefan Persson & Lars Henningson pers. comm.). Three goslings hatched on 11th June, proving that the eggs were fertile. These young birds were later also observed in autumn. The record is included in the Swedish Reporting System, and has been validated and accepted by the regional report committee and subsequently published (Strid & Wærn 2011).

<p>Fjällgås x vitkindad gås  <i>Branta leucopsis x Anser erythropus</i>          En samhäckning mellan fjällgås och vitkindad gås          på Skatön, Hls. Den resulterade i 3 pull som blev 2          flygga ungar. Dessutom en samhäckning mellan en</p>	
<p>FÅGELÅRET 2010 <span style="float: right;">57</span></p>	
<p><u>hybrid fjällgås x vitkindad gås och en vitkindad vid Kastmorstenarna, Hls. Den sistnämnda resulterade i tre flygga ungar. De båda familjerna gick senare ihop i en flock med vitkindade gäss och sågs vid Alsjön, Hls 14.8 samt vid Hjälstaviken, Upl 20.8.</u></p> <p><b>Bl:</b> Första (2008) och andra (2010) fyndet av denna hybridtyp. 1 ex. str. O Lindö udde 17.5 (Fredrik Lennartsson, Lars-Magnus Jansson, Jan Svantesson).  <b>Gt:</b> 1 ex. Ronehamn 4.5 (Kjell Ekelund).  <b>Srm:</b> Femte fyndet: 1 2K+ rast. Horns båtvarv, Nyköping 24.4 (Jan Hägg, Jan Gustafsson, Monica Lindahl).</p> <p><b>Tillägg 2008:</b>  <b>Bl:</b> 1 ex. Utlängan 10.10 (Sven Gustafsson).</p>	<p><b>Gt:</b> Det totala antalet fynd på Gotland av rasen är nu 16 inklusive årets fynd.  <b>Tillägg 2009:</b>  <b>Gt:</b> En godkänd observation från 2009: 1 2K+ str. NO Bredsandsudde, Gotska Sandön 3.6 (Kalle Brinell).  <small>(HENRIK LERNER)</small></p>

**Figure 45.** Screen dump from the Swedish annual bird report for 2010. The first validated and accepted record from the Swedish Reporting System of fertile first generation hybrids from the Swedish reintroduction project breeding and producing three young, second generation hybrid individuals (Strid & Wærn 2011).

#### 5.6.4 Population viability

The Fennoscandian wild population of Lesser White-fronted Goose has an annual mortality rate of around 33%, and an annual return rate between years of 80% (BirdLife Norway, Lesser White-fronted Goose Conservation Project data). Figures for mortality rate for birds released in Sweden and in Finland are difficult to interpret, not least as methodology used in calculating mortality rate and return rate for released birds is not the same as methodology used in calculating such rates in the wild Fennoscandian population. Calculations on mortality and return rates need to take into account rates for all age classes, and also take into account the likelihood of individually marked individuals being identified in later seasons.

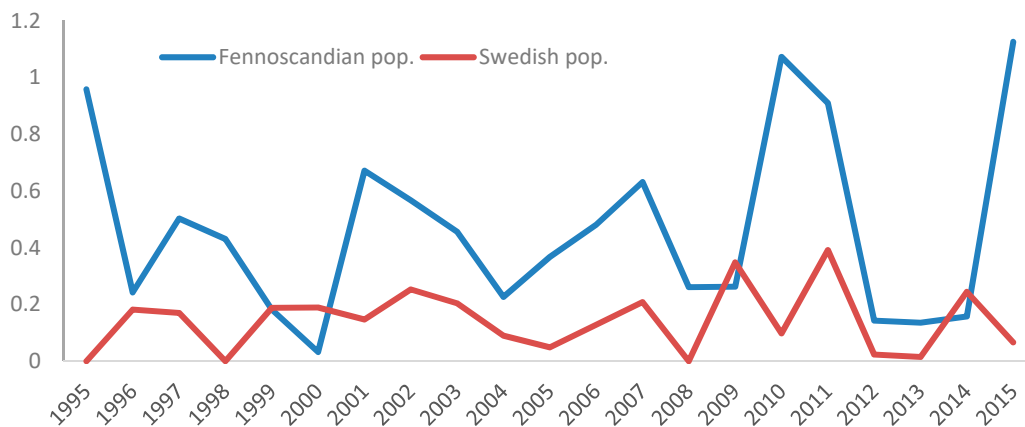
Regardless of the lack of standardised methodology to calculate mortality and return rates for released versus wild birds, one thing is clear, namely that the return rate for released Lesser White-fronted Geese is lower than for wild birds, and that higher mortality rates for released birds is the likely cause for this. This assumption is supported by the data on the population development of the Swedish reintroduced Lesser White-fronted Goose population that in the period 2010-2015 have continued to decline despite continued releases that in numbers exceed the population size in each year. This is evidenced by count trend data both from the Swedish staging areas as well as from the main wintering areas in the Netherlands. It has been shown that mortality in summer can be high, also for adult birds. In 2012, it was discovered that a relatively high proportion of the Swedish Lesser White-fronted Goose population were predated by White-tailed Eagles in the Swedish mountains, and that 30% of the birds released in 2010 were killed (Liljebäck et al. 2012). With such a low return

rate and corresponding high mortality rate, the Swedish Lesser White-fronted Goose population cannot be sustainable, and we question the long-term viability of this population.

In addition, the Swedish reintroduced population is also suffering from lower production as compared to the wild Fennoscandian population. As the annual number of breeding pairs (spring population size) is not known, a comparison between years or populations, in total numbers of broods or juveniles is not straightforward as they are not independent of the population size. However, average brood size is as such independent and can be compared, as good years produce bigger broods than in poor breeding years.

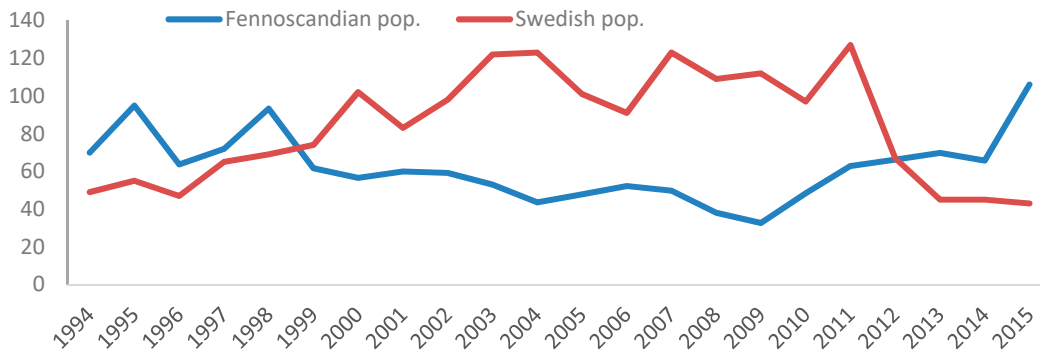
In the Swedish reintroduced population, the average brood size of fledged juveniles in autumn is 2.7 for the years 1986-2015 (287 juveniles, 106 broods). The corresponding figure for the wild Fennoscandian population is 3.3 in the period 1994-2015 (594 juveniles, 181 broods).

The proportion of broods produced in the Swedish reintroduced population is far lower than in the wild Fennoscandian population. From the accessible data on number of broods produced in the Swedish reintroduced population in the period 1994-2015 (99 broods) compared to the number of broods produced in the wild Fennoscandian population in the same period (181 broods), it is evident that the proportion of pairs that successfully produce young is considerably lower in the Swedish reintroduced population, as the size of that population was higher than the wild Fennoscandian population during much of this period. Since the size of the Swedish reintroduced population is not estimated during spring migration as is the case with the wild Fennoscandian population, we have used the wintering population size numbers in the Netherlands and Greece respectively (**Figure 47**). Numbers from Greece are estimated since count coverage has been of high quality only since 2005. Estimates are based on spring total numbers, juvenile production and expected mortality for adults and juveniles until mid-winter. For Greece, actual (average 65 ind.) and estimated numbers (average 62 ind.) are closely correlated (Chi.sq.=0.916,  $p < 0.000$ ,  $n=12$ ) with an average of 104% individuals observed in comparison with numbers estimated. Comparing the winter population size for the Netherlands (average number of ind.=84.0) and Greece (average number of ind. =62.1) shows that the size of the Fennoscandian population has been on average 74% of the Swedish reintroduced population in the years 1994-2015 (**Figure 47**). Dividing the annual number of goslings counted in autumn with corresponding total estimate of winter population size the preceding winter gives an estimate of effective production in these populations. The Swedish reintroduced population produced on average 0.14 juveniles per adult ( $n=21$ ,  $SE=0.071$ ), while the corresponding figure for the Fennoscandian population is 0.47 ( $n=21$ ,  $SE=0.025$ ), a threefold significant difference ( $t=4.338$ ,  $df=40$ ,  $p < 0.000$ ,  $SE=0.074$ ) (**Figure 46**).



**Figure 46.** Annual estimate of juveniles produced per adult in the winter population the preceding winter for the Swedish reintroduced population and the wild Fennoscandian population for the years 1994-2015.





**Figure 47.** Annual winter population size for the Swedish reintroduced population in the Netherlands (sums) and for the Fennoscandian population in Greece (expected) for the years 1994-2015.



**Figure 48.** A Lesser White-fronted Goose with deformities, from the captive breeding stock at Öster-Malma, deposited at the zoological museum in Stockholm, Sweden. Photo: Tomas Aarvak.

### 5.6.5 Changes from natural behaviour

A phenomenon typically attributed to captive history of birds is changes associated with behaviour. Captive born birds will show less fear for humans and predators. In the Finnish restocking project (1987-1997), one of their conclusions for explaining its failure was that the birds did not show natural shyness and therefore had increased mortality (Markkola et al. 1999). As an example they wrote *“The released birds were observed in yards, and once one individual landed in a kennel and was killed by dogs”*

The reduced shyness is also a behaviour typical for the reintroduced Swedish Lesser White-fronted Geese. Amongst other aspects, this is also expressed by their preference to moult and stage in a city environment. The fact that many of these do not behave like wild birds from the original population are evident from descriptions like: *“The bird was very tame and followed the observer during the morning. Migrated later northwards (Bertil Persson 21.5)”* and *“The bird at Hornborgasjön came straight into a group with preschool children who sat eating”* (Tyrberg 2001).

From photographs, it is easy to determine that they are of birds originating from captive projects since these are not shy and can be approached at close range. The lack of natural shyness of the Lesser White-fronted Geese at the town park by Lillfjärden in Hudiksvall was clearly highlighted in summer 2015, when one of the authors of this report approached a flock of lesser White-fronted Geese down to two metres, without the birds exhibiting any fleeing response such as would be expected in wild geese!

Reduced antipredator behaviour in captivity have been proposed to explain the higher invasiveness of wild-caught exotic species, and a recent multispecies experiment showed the loss of antipredatory responses and escape abilities in captive-bred birds compared with wild-caught ones. An intraspecific comparison between the wild-caught and first generation captive-bred birds pointed to a rapid loss of natural anti-predator behaviour in captivity (individual lifetime) rather than to differences among species (evolutionary exposure) (Carrete & Tella 2015).

Lesser White-fronted Goose at Lillfjärden, Hudiksvall, Sweden in July 2015. This photograph was taken from a distance of two metres from the goose. Note the relaxed posture of the bird, which was completely unperturbed by the presence of the photographer, allowing the photographer to lie down besides the bird. During the same photo session several walkers, including noisy children and dogs, passed at a distance of 5-10 metres from the geese. Photo: Paul Shimmings



## 5.7 Ethical considerations, animal welfare and the importance of the family unit in geese

Earlier releases in Sweden (between 1981 and 1999) of Lesser White-fronted Geese raised in captivity used Barnacle Geese as foster parents. The problems arising from the use of other goose species as foster parents are discussed in detail in **chapter 5.2.6**. Due to the problems associated with the use of Barnacle Geese as foster parents, birds introduced from 2010 onwards have been released without foster parents (Andersson & Holmqvist 2011, Liljebäck et al. 2012, 2013). However, they have been released without parents at all, which has led to other problems (see **chapters 5.2.4** and **5.2.5** for detailed descriptions).

The most important functional unit for all goose species is the family unit, not least in the early stages of life (Black & Owen 1984). It is as part of a family that goslings learn to acquire skills which are essential to their future survival.

Young geese learn social and foraging skills from their parents. Goslings reared in captivity without parents are lower in the dominance hierarchy compared to geese reared by parents, and this was illustrated in experiments using captive Barnacle Geese (Black & Owen 1987). Orphaned goslings are attacked more frequently, feed almost continually and attain a poorer body condition than those goslings in families (Black & Owen 1984, 1989a, b). Orphaned geese have the lowest status in the social rank within a goose flock. Single orphans have the lowest status of all, only superseded in the hierarchy by orphans in loose groups. Orphans may adopt one or more of several strategies during their first winter (*i*) remain alone (so-called single orphan or single juvenile), (*ii*) form a group together with one or more other orphans (so-called group orphans), or (*iii*) attempt to join a family (so-called tagging behaviour). Such tagging behaviour appears to rarely be successful, and it appears that an orphan is rarely (if ever) successful in being accepted into a family (apart from in the very early stages of life), and they are more likely to attempt to form temporary liaisons with several different families in the space of a winter (Paul Shimmings, unpublished observations based upon direct observations on colour-ringed Barnacle Geese in the wild). The fact that single juveniles were not accepted into families except that when they were very young goslings has been demonstrated in other studies (Glasgow 1977).

Goslings gain benefits in being within families, as they can spend less time being vigilant, more time feeding and will subsequently be in a better condition (Siriwardena & Black 1998). Being in better condition leads to improved survival. In adult life, birds in better condition are more likely to be successful breeders. Being within a family also allows access to better foraging opportunities as families feed on the edge of flocks and get to the best food first (Black et al. 1992)

In a study of the importance of the family unit in Barnacle Geese, Black & Owen (1984) found that orphaned goslings were rejected when they attempted to join a family, suggesting that the optimum brood size in winter was not necessarily the largest and there was no advantage in recruiting extra (family) group members. This means that it is very unlikely that Lesser White-fronted Geese released into the wild without accompanying parents will be successful in finding an adoptive family, where they might then have been able to learn important skills. Such goslings must then either feed for themselves, or else form loose groups together with other conspecifics.

The releases of birds without (foster) parents in Sweden are open to discussion as regards the ethical issues this poses towards the birds that are released. Goslings have been released without other flock members/family members with experience to show them where to go during migration. Without parents, some goslings are unable to find their way along the migration route, and may

become lost, if they even survive to undertake the autumn migration. Such individual, inexperienced geese are therefore likely to choose a route which has not normally been used by conspecifics in the past. There is good evidence to support this presumption as individuals released in Sweden from 2010 onwards have dispersed in all directions away from the release site. Several individuals appeared in Norway in autumn 2014, and were still wintering in the country in December of that same year. Niklas Liljebäck, the project leader of *Projekt Fjällgås* wrote in e-mail as a comment to comments on pictures of the birds in Norway (in the Norwegian Species Reporting System, Artosbservasjoner): “2014 was a bad breeding year for LWfG in Sweden and as you know the population is small. So the released birds had problems to find wild conspecifics to follow. Now some of these birds are following other goose species- we have reports of that they follows Greylags in Norway but in Sweden they seems to prefer Bean Goose.”

Not only do young birds benefit from associating with their parents, but the adult birds are also likely to benefit from associations with their offspring. Black & Owen (1989a) found that an association with goslings may increase a parent’s chances of future breeding. Goslings can also contribute to the survival of other family members by helping with vigilance and in chasing off intruding geese. Parent birds that allow young to remain within the family for longer periods gain an advantage in being able to feed for longer bouts whilst other members of the family are vigilant.

As part of a programme to save the Hawaiian Goose *Branta sandvicensis* from extinction, over 2,000 captive-reared birds were released into the wild, mainly in groups comprising goslings only. Marshall & Black (1992) found several behavioural differences between parent-reared goslings and those raised without parents. The most significant finds were that goslings reared with parents were dominant over goslings reared without parents, and that parent-reared goslings avoided predators, whereas goslings without parents approached a potential predator. The authors suggest that goslings reared with parents are better able to cope when released into the wild. Goslings reared without parents tended also to be less vigilant. Vigilance is an important part of parental investment (Lazarus & Inglis 1978, Black & Owen 1989a). If goslings reared without parents are less vigilant then they are likely to be at risk from predation, and will also become poorer parents as they have not acquired skills necessary to protect both themselves, their mate, nest, eggs or goslings. Without the presence of adults, the goslings are unable to learn social and feeding skills from adult (parent) birds (Marshall & Black 1992).

To summarise the release programme for Hawaiian Geese, Marshall & Black (1992) wrote the following “*Reintroductions that have failed have frequently involved releases of inexperienced captive-bred birds (Fyfe 1978, Wittemann & Pimm 1991). Reintroduction is an expensive and labour-intensive procedure (Cade 1986, Kleiman 1989). It is vital that resources are capitalized on by only releasing birds which are able to cope with conditions in the wild*”.

Further, Marshall & Black (1992) recommend that “*In future, managers should provide goslings with as much “parental experience” as possible in order to equip them with appropriate skills to cope once released in the wild*”. Twenty years later, well-meaning managers continue to release birds with little or no “parental experience” whatsoever, as illustrated by the release of geese that have been removed from their parents at an early stage, prior to them attaining their first (juvenile) plumage. This raises a question about the ethics of releasing Lesser White-fronted Geese into the wild without the accompaniment of their own parents. In this context, we would suggest that the release of captive-reared Lesser White-fronted Goose goslings is an option likely to fail as the birds are unlikely to be in an optimal condition to cope with conditions in the wild. Such geese have not learned all of the necessary life-skills in order to cope in an environment in which they are unfamiliar. Nor have such geese the ability to learn from their cohorts, as these have been reared in an identical way and have not acquired all the skills, which could be shared with other flock members such that they learn.

In some years, the Swedish reintroduction project have released mainly (or possibly even only) males. The reason behind this is as follows (directly translated from *Projekt Fjällgås* report for the 2013 season): “*We made a decision to release 8 young males (4 first calendar-year and 4 second calendar-year) from Nordens Ark in the hope that they will join up with the breeding geese and follow them on migration. Once they select a partner during the winter/spring then we hope that they follow the female to the mountains and nest there. Male geese normally show a lower level of unfaithfulness compared to females and it is the female that leads the male to the breeding area*”. The current Swedish project has (in some years at least) released predominately young male geese. These are likely to disperse in widely different directions after release as has been proven by tracking of satellite-tagged Lesser White-fronted Geese. These birds are also less likely to return to the natal area. The return rate between summer 2010 and spring 2011 was 14 of 17 individuals (Andersson & Holmqvist 2011). The disappearance of three birds between autumn 2010 and 2011 was assumed to be as a result that these three birds were dead. Yet 16 of these were recorded in the Netherlands, so it is equally likely that these birds did not return to the natal area. This is a typical trait observed in male geese. Male geese that are allowed to wander in this way in search of a mate can travel widely, as has been shown from observations of birds released in Sweden. The risk of male geese released in Sweden turning up in the Fennoscandian population is today considered to be very high indeed, while also straying females from the recent releases also can turn up basically anywhere. Two individuals, of which at least one female, have already turned up at the important staging area for the wild Fennoscandian population at Valdak Marshes, one in spring 2015, the other in autumn that same year.

In studies of nest philopatry, it has been shown that it is the female goose that determines where a pair will settle to breed, and that females exhibit a high degree of site faithfulness. Young male geese have a higher dispersal rate than females, and female geese have a higher level of nest philopatry than male geese. Female geese have a much greater philopatry to the natal area (i.e. the original birth site) than male geese (Cooke et al. 1975, Lessels 1985, Loonen et al. 1998, Prop et al. 1984, van der Jeugd & Larsson 1999, van der Jeugd et al. 2002). Release of male Lesser White-fronted Geese into the wild in Sweden is likely to lead to dispersal rather than to birds returning to the natal area, such as has been shown for other goose species (Nilsson & Persson 2001).

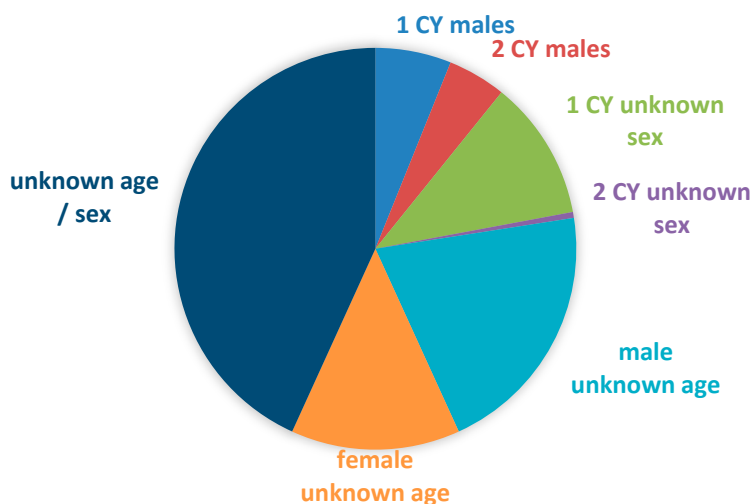
Survival of the released birds is low. In 2013, only one of the original 17 LWFG released in 2010 was observed in the wild, two of the 35 from releases in 2011, and 3 of the 28 released in 2012 (Liljebäck et al. 2013).

Releasing an overabundance of a single sex into the wild leads to an imbalance in the proportion of a given sex within a population. By releasing mainly male geese into a population where the proportion of males to females is assumed equal, then there will be an overweight of males (**Figure 49**). In 2011, all birds released in Sweden were males (Andersson & Holmqvist 2011), and at least at one release site in 2013, all 8 released at that particular site were males. If only males are released, they will have difficulties of finding a suitable female partner (as there will be none in the flock). This leads to a strong imbalance of sexes and it is impossible for same-sex pairs to produce any offspring.

If one releases a large number of captive-reared birds into the wild following a season with little production of young in the reintroduced free-flying population in Sweden, it is even more difficult for the released male birds to find a partner as there will be fewer, or perhaps even no, available potential partners. If we look at the numbers released in the Swedish mountains and/or at Hudiksvall (**Figure 21**) compared to the number of young produced by the reintroduced free-flying Lesser White-fronted Geese, relatively large numbers of male Lesser White-fronted Geese reared in captivity are released even when few young are produced by the reintroduced population. In 2011, a total of 35 goslings (from 14 successful pairs) were produced, and a total of 10 male captive-reared

Lesser White-fronted Geese (seven 1st calendar year plus three 2nd calendar year) were released (Andersson & Holmqvist 2011). It was a poor breeding season in 2012 (3 young produced by the free-flying population), and 28 captive-bred birds (sex not specified) were released (Liljebäck et al. 2012) despite difficulties in finding suitable release sites. It was also a poor breeding season in 2013, and in addition there was a high mortality rate in the mountains that year (approximately 30% of the adult Lesser White-fronted Geese were predated by White-tailed Eagles). A total of 50 captive-reared Lesser White-fronted Geese were released in 2013 (42 in the mountains and an additional 8 males at Lillfjärden, Hudiksvall; Liljebäck et al. 2013). This shows that the number of male captive-reared Lesser White-Gronted Geese released into the wild in Sweden in order to strengthen the feral/free-flying population is disproportionate to the number of young produced by the feral/free-flying population.

Studies have shown that individual geese have a preference for choosing mates from birds with which they are previously familiar. Additionally, first-time pairings (before any divorce or loss of mate due to death of partner) tend to be with same-aged birds (Black & Owen 1995). There are several advantages to being paired with a familiar partner, not least that they are likely to have improved chances of reproductive success since both pair members will have already have built up a base of experience in a particular breeding area (Choudhury & Black 1994). An example which may be the norm rather than the exception was of a female Barnacle Goose that lost its mate. This female waited 23 months before finding a new mate, despite the availability of over 1,000 younger potential mates. She eventually paired to her new mate, a male with whom she had shared the same brood-rearing area with when they were both goslings. **Releasing of only males in some seasons does not necessarily mean that they might easily find mates if mainly (or only) females were to be released the following season, as the potential mates will be unfamiliar individuals, and there is no guarantee that these would pair up.**



**Figure 49.** Age and sex distribution of Lesser White-fronted Geese released in Sweden 2010-2014. Data on age and sex ratios is not available for all seasons.

## 5.8 Culling of released Lesser White-fronted Geese in Sweden and Norway

In Norway, two incidences of culling of released Lesser White-fronted Geese have been carried out by personnel from the Norwegian State Inspectorate (SNO) in Porsanger in Finnmark, following permissions issued by the Norwegian Environment Agency in 2012 (ref.: 2012/3746 ART-VI-JAA) and 2015 (ref.: 2015/3921) respectively. The reason in both cases was that these individuals, who were not using traditional migration routes, but were migrating to Western Europe, could attract birds from the wild population to areas in either Sweden or the Netherlands/Germany. This could lead to serious negative consequences for the wild Fennoscandian Lesser White-fronted Goose population, with loss of the unique and natural migration routes and subsequent loss of staging and wintering populations for countries such as Hungary and Greece, who are host countries for the Fennoscandian population for a large part of the year. The decision by the Norwegian Environment Agency has support in both the adopted Norwegian national action plan and the International Single Species Action Plan who consider the Swedish release project to be a threat to the wild Fennoscandian population.

The first bird (black neckband with white inscription A16, ring no.: CA21169, released in Finnmark, Norway 26th August 2010, see **chapter 4.5**), was culled together with its partner on 23rd May 2012. [measurements: wing 356 mm, weight 1880 g., bill 32.9 mm, blaze 27.0 mm, head+bill 83.7 mm, bill nail 11.3 mm, tarsus 72.9 mm]. The ringed bird was released at the Valdak Marshes in Porsanger in autumn 2010 (see **chapter 4.5**). It was sexed as a male by personnel at “Nordens Ark”, Sweden, but was paired and behaved like a female when observed at the Valdak Marshes in spring prior to the culling. The accompanying male (adult, 3cy+ [measurements: wing 388 mm, weight 1780 g., bill 35.0 mm, blaze 34.1 mm, Head+bill 88.9 mm, bill nail 11.5 mm, tarsus 70.1 mm) was also culled when it was confirmed that it could not be found in the archives of individually identified Lesser White-fronted Geese from any of the staging or wintering sites the same year or from the archives of birds from previous years, thereby confirming suspicions that this was not a bird originating from the wild Fennoscandian population.

On 13th May 2015, a Swedish Lesser White-fronted Goose with blue colour ring with a white letter P on left tarsus and yellow ring above steel ring on right tarsus (“Blue P”, ring no. 9181709 Riksmuseet Stockholm, released in Sweden 12th July 2013) was culled on a farm field by personnel from the Norwegian State Inspectorate. [measurements: wing 362mm, weight 1630 g., bill 32.5 mm, blaze 22.1 mm, head+bill 84.2 mm, bill height 20.3 mm, bill nail 10.7 mm, tarsus 63.2 mm].



The Swedish released bird “Blue P” in association with a Greylag Goose at the north side of Stabbursnes River 10th May 2015. Photo: Tomas Aarvak



The Swedish released bird “Blue P” was culled on 13th May 2015 because it used a human-modified migration route to the Netherlands and as such represented a considerable threat to the wild birds using traditional routes to the wintering areas in Greece. Note also that the bird was using agricultural land together with Bean Geese and Greylag Geese despite the close proximity of the Valdak Marshes, just 2 km away. However, the individual was also observed at the Valdak Marshes before the wild Lesser White-fronted Geese arrived. These marshes are the most important spring staging site in Fennoscandia. Photo: Tomas Aarvak

In Sweden, the problem with male Lesser White-fronted Geese becoming imprinted upon Barnacle Geese has partly been resolved with three birds which were paired to Barnacle Geese being culled in 2007. Several attempts have been made to cull the last two males of those five, which are imprinted upon Barnacle Geese. The last report of any of these was in late 2013 according to Niklas Liljebäck in a memo to BirdLife International in 2015. In addition to the three Lesser White-fronted Geese culled in 2007, an additional two males following Barnacle Goose flocks were culled in 2005 and 2009 respectively, bringing the total up to five culled Lesser White-fronted Geese in Sweden. There were strong negative reactions by the Swedish Association for Hunting and Wildlife Management on the culling of the one bird in 2015 in Norway (e.g. on the web pages of the organisation). However, this must be considered as an overreaction as there has been no negative reactions from the Swedish Association for Hunting and Wildlife Management to the culling of several released Lesser White-fronted Geese with undesired behaviour within Sweden.

Also evident first generation hybrids between Lesser White-fronted Goose x Barnacle Goose have been culled in Sweden. The extent of this culling practice in Sweden is not known to us.



## 6. THE LESSER WHITE-FRONTED GOOSE SINGLE SPECIES ACTION PLAN

Following the continued decline of the species, steps were taken to develop internationally agreed framework plans for the conservation of the Lesser White-fronted Goose: first in the form of an EU Action Plan (1996-1999) which was then superseded by an International Action Plan adopted under the African-Eurasian Migratory Waterbird Agreement (AEWA) in 2008. A brief description of the various stages of the international action-planning process under AEWA (2005-2016) – including decisions taken and recommendations provided - is presented below. The focus thereby is in particular on how the reintroduced Swedish Lesser White-fronted Goose population was taken into account following the discovery of alien genes in the Swedish captive stock in 1999/2000 and the resulting moratorium issued on further releases by the Swedish authorities.

### 6.1 International Single Species Action Plan Workshop in Lammi, Finland, April 2005

A workshop was held in Lammi, Finland in April 2005, in order to provide basic information for the International Single Species Action Plan (ISSAP). At the workshop, both stakeholders in favour of the ongoing reintroduction projects as well as experts critical to the reintroductions were represented. Because a compromise solution for the genetic and reintroduction issues was not reached during the meeting, the compilers of the Action Plan decided to submit a dossier on the issue for an independent review by the Scientific Council of the Convention on Migratory Species (CMS), with a request that the Scientific Council should provide advice on the future of reintroduction projects for Lesser White-fronted Geese.

### 6.2 Conclusions and recommendations from CMS Scientific Council in November 2005

As a follow-up of the decisions from the Lammi workshop (see **chapter 6.1**), a dossier was transmitted by BirdLife International to the CMS Secretariat in July 2005. The stakeholders in favour of the continuation of the existing reintroduction projects as well as in favour of embarking on new projects, argued that the dossier did not fully represent the situation at hand, and were therefore encouraged to provide the Scientific Council with additional information. Their contributions were taken into account by the Scientific Council in preparing its conclusions and recommendations, which were finalised and adopted at the 13th Meeting of the CMS Scientific Council in Nairobi, Kenya, on 18th November 2005 (including additional comments by Dr. Robert C. Lacy).

**The CMS Scientific Council's main conclusions were as follows:**

*“4. We consider that every effort should be made to conserve the Fennoscandian birds down their traditional migration routes into southeastern Europe and the Caspian/Central Asian region. We recognise that this is a major challenge. We endorse the current LIFE project that aims to safeguard the birds and their habitats along the western route. It is our opinion that all appropriate efforts should also be made to conserve the wild populations of the species in its other flyways.*

*5. We consider that doubts do remain about the genetic make-up of the existing free-flying birds, originally introduced into the wild in Fennoscandia, and which winter in the Netherlands. It does seem to us that not all, but a large part, of the scientific community will never be completely satisfied concerning the level of genetic contamination from the Greater White-fronted Goose *Anser albifrons* and other species, which many will regard as impossible*

to eliminate. Despite genuine efforts to improve the genetic purity of existing captive flocks we consider that these flocks are not to be regarded as potential sources for release to the wild.

6. Given the possibility that the above-mentioned free-flying birds, or their descendants, may pose a risk to the genetic make-up of the wild Fennoscandian population, the Scientific Council is of the opinion that **these birds should be caught or otherwise removed from the wild**. We do not say this lightly, nor underestimate the practical and other difficulties involved. We recommend that a feasibility study be undertaken as a matter of urgency.

7. We believe that there is nothing against establishing a group in captivity of purebred Lesser Whitefronts from the wild, western Russian stock, and it may well prove valuable to have such a group in the future. However, **we do not believe that it is appropriate to release such birds to the wild now or in the immediate future**.

8. For the present, we **do not support the introduction of Lesser Whitefronts into flyways where they do not occur naturally**. We have borne in mind the powerful argument concerning the improved safety of birds in these flyways, as well as practical considerations, such as current proposals that could quickly be put into effect. However, we consider that modifying the natural behaviour of Lesser White-fronts in this respect, as well as unknown ecological effects in the chosen new flyways, and other such considerations, make this technique inappropriate until such time as it may become essential, particularly when major disruption or destruction occurs of key components of the natural flyways. We do not believe that to be the case at present. We give due weight to arguments about the continuing decline of the very small Fennoscandian population, and to the estimates of how long it may continue to be viable, but we are not persuaded that such a fact alone is enough to justify radical action.”

As indicated above, the CMS Scientific Council also took into account additional comments submitted by Dr. Lacy, who was commissioned by the stakeholders in favour of continuing the existing reintroduction project. These comments proposed a replenishment or “dilution” approach to the introgression of alien genes, whereby pure-bred birds (i.e. individuals without alien genes) could be introduced into the population carrying alien genes. However, these comments did not alter the conclusions of the Scientific Council, but were rather included as an annex to their report.

### 6.3 AEWA Secretariat negotiating mission in 2007

**Even though all the range states to the ISSAP had agreed to ask the CMS Scientific Council for recommendations on the conflicting issues to be adhered to going forward, Sweden and Germany did not accept the conclusions of the Scientific Council.** The preliminary negotiations concerning the contentious section of the draft International Single Species Action Plan (July 2006 version) thus failed to reach a consensus amongst the range states. In January 2007, the AEWA Secretariat thus undertook a series of consultations with representatives of the governments of Finland, Germany, Norway and Sweden, with the aim to reach a compromise on a way forward for the contentious part of the draft Action Plan (AEWA 2007). The following were the verbatim conclusions of the negotiation mission, as drafted by the AEWA Secretariat and supported by the Parties (governments) concerned. These conclusions constituted the basis for dealing with issues of captive breeding, reintroduction and supplementing (‘supplementation’) of the Fennoscandian population in the framework of the AEWA ISSAP:

*“1. The parties agree that the main priority for the conservation of the LWfG is the preservation of the wild populations breeding in Fennoscandia and Russia and that the work on the SSAP and any decisions should follow the code of transparency and accountability so that they can be subject to scientific scrutiny at any time. The parties will be considering support for conservation on the ground along their flyways. Particular attention shall be paid to mortality due to hunting and urgent targeted measures should be implemented to reduce the magnitude of this threat, the success of which shall be promptly and regularly reviewed and evaluated. Supplementation with captive-bred birds should be considered if other conservation measures are not as quickly efficient as needed and should populations continue to decline. As with any other captive breeding, reintroduction or supplementation initiatives this project will be subject to consideration by the Committee for LWfG captive breeding, reintroduction and supplementation in Fennoscandia (see conclusion 3 below).*

**The efficiency of conservation measures is to be assessed by the International LWfG Working Group.**

*2. The parties agree that an International LWfG Working Group should be established, consisting of governmental representatives of all Range States, who would be free to bring in their own experts and use their support. The group will be chaired by the AEWA Secretariat (efficient chairmanship would be possible only if additional support staff (coordinator for the ISSAP) and supplementary budget are made available to the Secretariat) and will operate in accordance with ToR developed by the AEWA Secretariat, approved by the Range states and endorsed by the AEWA Technical Committee.*

*3. The parties agree on the establishment of a Committee for LWfG captive breeding, reintroduction and supplementation in Fennoscandia, consisting of governmental representatives of Sweden, Finland, and Norway, who would be free to bring in their own experts and use their support. The Committee will be chaired by the AEWA Secretariat (efficient chairmanship would be possible only if additional support staff (coordinator for the ISSAP) and supplementary budget are made available to the Secretariat) **and will operate in accordance with Terms of Reference developed by the AEWA Secretariat, approved by the three states and endorsed by the AEWA Technical Committee.***

*4. The parties agree that a captive stock of wild Fennoscandian birds should be established, subject to the conclusions of a feasibility study. The long-term future of all captive breeding programmes will be reviewed by the Committee for LWfG captive breeding, reintroduction and supplementation in Fennoscandia.*

*5. The parties agree that the Swedish captive breeding programme could carry on as long as it is based on wild birds only. The long-term future of all captive breeding programmes will be reviewed by the Committee for LWfG captive breeding, reintroduction and supplementation in Fennoscandia.*

*6. The parties agree that the current free-flying flock, breeding in Sweden and wintering in the Netherlands, will remain in the wild, subject to genetic screening and refinement, i.e. removal of apparent hybrids, which will be undertaken following the conclusion of a feasibility study. Further on the dilution with purebred birds is considered a principally viable option. The long-term future of all reintroduction and supplementation programmes will be reviewed by the Committee for LWfG captive breeding, reintroduction and supplementation in Fennoscandia taking full account of, amongst others, the success of conservation actions, including revival of the wild Fennoscandian population, and other pertinent factors. Decisions regarding the Swedish free-flying population should also take into account the conclusions of the independent review and evaluation of available LWfG genetic studies (see conclusion 8 below).*

7. The parties agree that the implementation of the pilot experimental project of the NGO 'Aktion Zwerggans' will be postponed by three years. As with any other captive breeding, supplementation or reintroduction initiatives this project will be subject to consideration by the Committee for LWfG captive breeding, reintroduction and supplementation in Fennoscandia.

8. The parties agree that a review and evaluation of the existing genetic LWfG studies by an independent expert(s) with proper scientific expertise and experience (ideally in molecular DNA analysis of birds, conservation genetics and statistical proficiency) should be undertaken. This work will be commissioned by the AEWA Secretariat to an independent expert(s) selected by the Secretariat too. The conclusions of this independent evaluation will be submitted to the Committee for LWfG captive breeding, reintroduction and supplementation in Fennoscandia and the International LWfG Working Group for their consideration."

## **6.4 The Committee for Captive Breeding, Reintroduction and Supplementation of Lesser White-fronted Geese in Fennoscandia (RECAP)**

Long-standing major differences of opinion exist amongst the Lesser White-fronted Goose range states as well as other stakeholders in Europe on how captive breeding, reintroduction and supplementation of Lesser White-fronted Geese should best be approached. The disagreement, in particular on which actions should be undertaken with regard to the Swedish reintroduced Lesser White-fronted Goose population, have constituted a major obstacle for the conservation work on the wild populations of Lesser White-fronted Geese. Therefore, the AEWA negotiation mission in 2007 reached the agreement that a separate committee was to be established (as a sub-set to the future AEWA Lesser White-fronted Goose International Working Group, which was convened in 2009) to discuss the issues related to captive breeding, reintroduction and supplementation of Lesser White-fronted Goose in Fennoscandia. This is outlined in point 3 of the agreement from the negotiating mission (see **chapter 6.3**). The Committee for Captive Breeding, Reintroduction and Supplementation of Lesser White-fronted Geese in Fennoscandia (RECAP Committee) was subsequently convened by the AEWA Secretariat in 2008 to discuss possible contentious issues and to review any future reintroduction and supplementation projects. Sweden, Norway and Finland were full Committee members. In addition, representatives from Germany had an observer status within the Committee (AEWA 2011b). The AEWA Secretariat chaired the Committee.

The important task envisaged for the RECAP Committee was to achieve enhanced international cooperation for the protection of the Lesser White-fronted Goose by providing technical advice and joint recommendations to guide activities for a sustainable and viable breeding population in Fennoscandia. The focus of the RECAP Committee with regard to the Fennoscandian breeding population of Lesser White-fronted Geese was to recommend actions for breeding in captivity and release into the wild (AEWA 2008a, b).

The RECAP Committee had its first meeting in Bonn in May 2008, and input from the Committee meeting was taken into account in the current AEWA ISSAP (Jones et al. 2008).

From the Terms of Reference for the RECAP committee (AEWA 2007):

**"The overall goal of the Committee is to conserve and restore the wild Fennoscandian population of Lesser White-fronted Geese to a favourable conservation status.**

*In accordance with the objectives of “Results Area 4” of the LWfG International Single Species Action Plan, the Committee’s objectives are:*

***1 - No introgression of DNA from other goose species into the wild population occurs as a result of past and further releases.***

***2 - Alien DNA introgression from birds released in the past is minimised.***

*3 - The members to the Committee, supported by thematic expert advice and coordination between countries, are effectively guiding the implementation in Fennoscandia of ‘Result Area 4’ of the International Single Species Action Plan for the Lesser White-fronted Goose.”*

#### **6.4.1 1st meeting of the RECAP Committee in 2008**

Delegations from the four countries Norway, Finland, Sweden and Germany, as well as their scientific and conservation experts came together in Bonn, Germany on 7th-8th May 2008 to establish the Lesser White-fronted Goose RECAP Committee.

From the minutes of the first meeting (AEWA 2008c): *“The Committee’s purpose is to guide the future of the small Fennoscandian population of this globally threatened species. It has been long declared that saving the remaining circa 25 breeding pairs of wild Lesser White-fronted Geese in Fennoscandia is common sense and that, consequently, this population should be at the heart of all related conservation efforts. However, opinions still widely diverge on the questions (i) whether the wild population should be supplemented by releasing specimen bred in captivity; and (ii) if, and under which preconditions, should captive-bred birds be introduced on new flyways.*

*The terms of reference and procedures for the Committee were finalised by AEWA based on input received from participating government officials and their invited experts. Overall guidance will be provided by the International Single Species Action Plan for the Conservation of the Lesser White-fronted Goose. The draft Plan has been revised under the auspices of AEWA and is currently being considered by the 22 Principal Range States to the species.”*

It was decided that the next meeting should be held in November that same year, and that the RECAP Committee would then focus its attention on an independent scientific review of the status of knowledge on the genetics of Lesser White-fronted Geese amongst other tasks agreed during the 1st meeting (AEWA 2008c).

#### **6.4.2 2nd meeting of the RECAP Committee in 2009**

The RECAP Committee held its second meeting at the zoo *Nordens Ark* in Sweden on the 7th - 8th of September 2009. The Swedish Environment Protection Agency (SEPA), the Norwegian Directorate for Nature Management and the Finnish Ministry of the Environment participated in the meeting. Also experts from the Wildfowl and Wetlands Trust (WWT), Birdlife Norway, the Swedish Association for Hunting and Wildlife Management, the County Administrative Board of Norrbotten (Sweden), the University of Lund (Sweden), the University of Oulu (Finland), Nordens Ark and the AEWA Secretariat joined this 2nd meeting. Representatives from the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and the German Federal Agency for Nature Conservation (BfN) also attended as observers.

From the minutes of the 2nd meeting (AEWA 2009a, b): *“Following the presentation of the Swedish feasibility study on the possibilities of refining the Swedish free-flying flock of Lesser White-fronted Geese, which winters in the Netherlands, the Committee decided that some birds should be captured for genetic testing to look for traces of hybridization with other goose species. Based on the results of these tests, the RECAP Committee will decide how to proceed with the supplementation programme in Sweden. Committee members made final comments on the draft Terms of Reference for an independent scientific review of Lesser White-fronted Goose genetics and the final amended version is expected to be adopted within the next weeks. It is hoped that the review will, amongst other issues, help clarify the conditions under which further reintroduction or supplementation activities could be carried out. In addition, the Committee decided on some new activities, such as a set of guidelines on best practices of breeding Lesser White-fronted Geese for release into the wild to be compiled by WWT and Nordens Ark. An independent scientific review on Lesser White-fronted Goose flyway literature will also be commissioned.”* (AEWA 2009a, b).

### **6.4.3 3rd meeting of the RECAP Committee in 2010**

The RECAP Committee held its third meeting at the UN Campus in Bonn, Germany on 7th-8th October 2010. Representatives from Finland, Germany, Norway and Sweden provided updates on their country's latest activities on the issue of Lesser White-fronted Goose reintroduction, captive breeding and supplementation, as well as updates on other national Lesser White-fronted Goose conservation activities.

Topics on the agenda also included an independent review on Lesser White-fronted Goose genetics (the Amato summary, see **chapter 8.2**) as well as a presentation by the Wetlands and Wildfowl Trust (WWT) of their feasibility study for a Lesser White-fronted Goose reintroduction/supplementation project in Norway (see **chapter 8.6**). The Terms of Reference (ToR) for an independent review on Lesser White-fronted Goose flyways was also discussed and approved by the group (see **chapter 6.4**).

The RECAP Committee also reviewed a project proposal by the German NGO Aktion Zwerggans for the implementation of two test-flights in the scope of the Lesser White-fronted Goose microlight project (AEWA 2010a).

From the minutes of the 3rd RECAP committee meeting (AEWA 2011a): *“Amato review: Sweden agreed with the conclusions made by Amato, but thought the conclusions should also mention that a low level of hybridization between wild populations of Lesser White-fronted Geese and Greater White-fronted Geese cannot be ruled out with the genetic data due to insufficient sample sizes.*

*The Secretariat commented that the issue of habitat preference is very interesting for the overall conservation of the species and should be kept in mind. Sweden added that the draft Swedish National Action Plan for the species includes activities which strive to restore or manage areas for the Lesser White-fronted Goose in its original habitat. In this respect, climate change poses a challenge as to how habitats can in future be managed in order to ensure that Lesser White-fronted Geese will find suitable habitats in the face of climate change. All RECAP Committee countries agreed with the conclusions and recommendations of the review.*

*Action Zwerggans: Sweden explained under which restrictions Aktion Zwerggans has been granted permission by the Swedish Environmental Protection Agency (SEPA) to conduct their proposed pilot project (Doc. LWfG RECAP 3.8.2). One of the main criteria is that the birds to be used must be of pure genetic origin. Sweden stressed that the SEPA does not own the captive breeding birds at “Nordens Ark”. They are property of the Swedish Association for Hunting and Wildlife Management who will*

*have to give their permission as to how the birds – if any – are used. Sweden sees the Aktion Zwerggans project as an experiment through which more information for the conservation of the LWfG can be derived. Valuable new insights could be gained regarding local re-introduction, alternative sites, and whether or not captive-reared young survive better when following an ultra-light aircraft than when trying to associate with and follow wild conspecifics during migration etc. Decision: No decision was reached on the Aktion Zwerggans project proposal.*

*Sweden announced that it had requested the addition of a new item to the International Working Group (IWG) agenda concerning erroneous information about the Swedish population contained in the International Single Species Action Plan. Sweden explained that the original Swedish population was never reported as extinct, meaning that the Swedish Lesser White-fronted Goose project was in fact a supplementation, not a reintroduction. Eight independent observers saw birds in the area where the captive bred birds and foster parents were released. Edited texts to this effect were sent to the Secretariat during the drafting of the SSAP, but they were not taken into consideration. The Secretariat replied that whilst there may well have been a few wild birds remnant of the wild population present, the question is whether it is enough that some birds were seen in the release area for the release to be considered a deliberate supplementation. Sweden responded that in the late 1970s there were no guidelines with definitions of “re-introduction” vs. “supplementation”. In 1979 and 1981, unringed adults with young were seen by independent observers in the release area. The IUCN guidelines make no distinction in the definitions (supplementation/reintroduction) if a flyway has been changed. As described for supplementation in the IUCN guidelines, Sweden had a local regional population in place since starting to release the colour-ringed captive-reared birds and foster parents in 1981. Therefore, the SSAP text is simply not correct. The Secretariat responded that the SSAP was adopted by the AEWA Meetings of Parties (MOP) – including by Sweden – and that it cannot be changed just like that. The Chair suggested that Sweden send all the relevant information to the UNEP/AEWA Secretariat, upon which the Secretariat will come back with a proposal. Changes to the goals, actions etc. in the SSAP would have to go through the whole Action Plan revision process and ultimately be adopted by the MOP. Sweden replied that changes to the terminology and the background information about Lesser White-fronted Geese in Sweden might be enough to cover Sweden’s concerns. Sweden will check the SSAP and inform the Secretariat of the extent of changes it deems necessary. The Secretariat suggested that this item should be kept as an information point on the agenda of the international meeting, and not be opened for discussion there. The issue should instead be discussed within the RECAP Committee” (AEWA 2011a).*

#### **6.4.4 4th meeting of the RECAP Committee in 2011**

The RECAP Committee held its fourth meeting on 16th June 2011 at the UN Campus in Bonn, Germany. Governmental representatives from Finland, Norway and Sweden as well as from the observer country Germany participated. One of the main agenda items was the presentation of an independent review on Lesser White-fronted Goose flyways in Europe prepared by the British Trust for Ornithology (BTO) (see **chapter 8.1**). The review was commissioned by the AEWA Secretariat on behalf of the RECAP Committee in an attempt to shed more light on the claims from the stakeholders supporting continued reintroduction activities that there has been an historical Western European flyway of the Lesser White-fronted Goose before the dramatic decline of the species starting in the 1950s.

From the minutes of the 4th meeting (AEWA 2011c, d): *“The BTO representatives Andy Musgrove and John Marchant started off the meeting with a presentation of the review, including the main conclusion that there is little evidence that Lesser White-fronted Geese were migrating along a so-called “Atlantic flyway” from the breeding areas in northern Sweden to the south over western parts*

*of Germany and the Netherlands, although the possibility that such a migration route had existed in the past, before European ornithology had developed sufficiently to record it, could not be completely ruled out. Whilst the Committee agreed with the conclusions of the review, Sweden requested that BTO in addition look at web-based data on Lesser White-fronted Goose sightings to complement the information derived from published data and to see if this additional information would perhaps alter some of the conclusions of the review. Sweden also presented a request that background information on the Swedish LWfG population in the International Single Species Action Plan (SSAP) which it considers to be incorrect should be revised as soon as possible. The request in particular concerns changing the labelling of the Swedish population to supplemented instead of reintroduced.*

*Following a discussion, Committee members agreed that any revision of the SSAP will have to be undertaken by a decision-making body of the Agreement. Sweden was requested by the Chair to submit its proposal for amendments in writing to the next AEWA Technical Committee Meeting in September 2011, from which it can be passed on for a decision to the AEWA Standing Committee in November and the fifth Meeting of the Parties to AEWA in May 2012, if necessary”.*

Other topics on the agenda included national reports on the current situation of the Lesser White-fronted Goose in each country, as well as an update on the ongoing implementation of the ISSAP (AEWA 2011c, d).

#### **6.4.5 5th meeting of the RECAP Committee in 2013**

The 5th Meeting of the RECAP Committee took place on 12th February 2013, at the UN Campus in Bonn. Governmental representatives from Finland, Germany, Norway and Sweden participated as well as national experts from BirdLife Norway, the Swedish Association for Hunting and Wildlife Management and the University of Oulu, Finland. The main purpose of the meeting was to discuss outstanding contentious Lesser White-fronted Goose conservation issues being dealt with under the RECAP Committee in preparation for the revision of the AEWA International Single Species Action Plan for the species, which was set to take place that year (2013).

*From the minutes of the 5th meeting (AEWA 2013): “Topics discussed included Lesser White-fronted Goose flyways in Europe, a possible re-definition of the Lesser White-fronted Goose population breeding in Sweden on the basis of advice provided by the IUCN Reintroduction Specialist Group, as well as the conservation focus of the revised Single Species Action Plan for the Lesser White-fronted Goose. In addition, participants took part in a brainstorming exercise to produce an updated Action Framework concerning tackling the possible presence of alien genes within the population breeding in Sweden. Finland, Norway and Sweden also provided participants with updates on their ongoing national conservation efforts for the Lesser White-fronted Goose.*

*Decisions taken at the meeting concerning Lesser White-fronted Goose issues being dealt with by the committee will be reflected in the revised draft of the Single Species Action Plan, which is foreseen to be distributed to all range states for comments and national coordination this spring”.*

#### **6.4.6 Evaluation of the function of the RECAP Committee**

When the Terms of Reference for the RECAP Committee were discussed and adopted, Sweden opposed giving the Committee any decision-making role with regard to future Lesser White-fronted Goose reintroduction/supplementation projects, thus denying the Committee the possibility to exert any real influence from the outset. As such, the Committee was diminished to a forum for the



member countries to update each other on their various activities and to seek expert guidance (confer **chapter 6.4.1**). That said, the existence of the Committee did initially provide an accepted forum for the range states in question to discuss contentious issues, which in turn allowed the wider Lesser White-fronted Goose conservation community to start moving ahead with the implementation of urgent conservation action for the species as identified in the 2008 AEWA ISSAP.

It should be noted that Sweden (as well as the observer country Germany) has consistently only agreed to acknowledge independent scientific expert guidance sought within the framework of the RECAP Committee which supported their own claims. Thus, they have accepted the summary of Amato (2010), but not the British Trust for Ornithology (BTO) review on European flyways of Lesser White-fronted Geese (Marchant & Musgrove 2011). This led to increased tension amongst the RECAP range states and confirmed the impression that Sweden was merely using the RECAP Committee as a forum to pursue their own objectives as opposed to actually addressing or seeking solutions with regard to the concerns of the other countries.

The minutes of the five meetings of the RECAP Committee (**chapters 6.4.1 – 6.4.5**) confirm that the topics of discussion as well as the tasks carried out were mainly linked to requests from Sweden, which in turn were directed towards finding support for their position that the Swedish population is a wild naturally occurring population with a natural migration route and with negligible deviations in ecological traits as compared with the original wild Fennoscandian population.

Due to the repeated complaints from Sweden concerning the international status of the Swedish reintroduced population, the working capacity of the Committee members, their national experts as well as the AEWA Lesser White-fronted Goose International Working Group as well as the AEWA Secretariat was increasingly focused on the commissioning of reviews on these subjects as well as with the recurring need to correct erroneous statements made by Sweden considering the characteristics and history of the Swedish reintroduced population. Over time, this situation again blocked much of the international work on the conservation of the threatened wild populations of the species. Thus, little time or capacity was available for the important work on fulfilling the RECAP Committee Terms of Reference (see **chapter 6.4**) and the overall goal of conserving and restoring the wild Fennoscandian population of Lesser White-fronted Geese to a favourable conservation status – which from the outset was agreed to be the main focus of the work.

Despite many years of consultations at government level within the RECAP Committee and the issuance of much independent expert advice from various experts and organisations, the Committee was by 2014 unable to reach an agreement on the main contentious issues regarding the status, possible threat and future of the Swedish Lesser White-fronted Goose population. Following bilateral negotiations on the draft revised AEWA International Single Species Action Plan for the Lesser White-fronted Goose between Sweden and Norway during 2014 and 2015, both countries decided that the contentious issues regarding the conservation of the species could in future be dealt with bilaterally. Sweden and Norway informed the AEWA Secretariat of their wish to dissolve the Committee and following confirmation from Sweden, the Committee formally ceased to exist in August 2015.

## 7. STATUS OF THE SWEDISH REINTRODUCED POPULATION IN THE INTERNATIONAL SSAP AND THE ONGOING REVISION PROCESS

The International Single Species Action Plan (ISSAP) for the Conservation of the Lesser White-fronted Goose adopted under AEWA in 2008 provides the agreed international framework for all conservation activities and cooperation for the species within the AEWA region.

In the current International SSAP (Jones et al. 2008), the Swedish reintroduced population is described as follows: *“A fourth subpopulation has been created by the release of captive-bred birds within the former range of the Fennoscandian population in Sweden and by the establishment of a human modified flyway”*. Furthermore, the current International SSAP defines that the main focus of the ISSAP is on the wild populations of Lesser White-fronted Geese, and one of the eight principles for implementation of the ISSAP is that *“The main priority for the conservation of the Lesser White-fronted Goose is the maintenance of the wild populations breeding in Fennoscandia and Russia.”* The ISSAP also states that *“The Action Plan also takes into account the population derived from captive-bred birds and used for restocking in Swedish Lapland, migrating to winter in the Netherlands. According to previous agreements between the Fennoscandian Range States and in line with AEWA’s mission, the main focus of this plan is the conservation of the wild populations (AEWA 2007).”*

One of the concrete conservation actions in the current International SSAP (Jones et al. 2008) is that *“Any future release of captive bred birds involves only individuals reared from wild-caught stock. Apparent hybrid geese are removed from existing free-flying introduced flock, subject to findings of a feasibility study”*.

At the 2nd meeting of the AEWA Lesser White-fronted Goose International Working Group at Lake Kerkini, in Greece in November 2012, the working group launched the process of updating the existing ISSAP (in accordance with the timetable foreseen in the 2008 ISSAP). During the period July 2013-July 2015, three consultation drafts of an updated ISSAP have been circulated by the AEWA Secretariat, of which two were circulated to all range states, and one was circulated to the Committee for Captive Breeding, Reintroduction and Supplementation of Lesser White-fronted Geese in Fennoscandia (RECAP Committee) only. The third consultation draft has been circulated twice, both in June 2015 and in May 2016.

### 7.1 Status of the Swedish reintroduced population in the first ISSAP consultation draft (July 2013)

In July 2013, the first draft revised ISSAP was circulated to the principal range states of the AEWA Lesser White-fronted Goose International Working Group. The description of the status of the Swedish Lesser White-fronted Goose population in this first ISSAP consultation draft was a result of numerous compromises reached at consecutive meetings of the RECAP Committee (see **chapter 6.4**). These compromises progressively altered the descriptions from the status described in the current ISSAP (Jones et al. 2008) towards a description of the population more similar to the one used in the Swedish National Action Plan (Naturvårdsverket 2011).

In the first ISSAP update consultation draft, four Lesser White-fronted Goose populations were recognised and the Swedish population was listed together with the three wild populations: *“Swedish population (reinforced by the release of captive-bred birds within the former range of the*

*Fennoscandian population in Sweden and by the establishment of a human-mediated flyway to wintering grounds in the Netherlands”.*

In this consultation draft of the ISSAP update, Sweden was listed as one of the 22 “Principal Range States” that have the major responsibility for its implementation. The “*Reinforced Swedish population*” was described in detail under the headings “*Trend and estimate*” and “*Distribution throughout annual cycle*”. In the description of threats: the “*Possible presence of alien genes in the Swedish population*” was listed as a low threat with the comment “*past releases of captive-bred birds in Sweden were found to contain birds with alien genetic make-up. An independent expert review commissioned by the Committee on Captive Breeding, Reintroduction and Supplementation of Lesser White-fronted Geese in Fennoscandia in 2010, assessed the risk presented by the occurrence of alien genes in the Swedish population to other Lesser White-fronted Goose populations to be low (Amato 2010)*”.

The goal of the draft ISSAP is to increase the population size and stop the species’ range contraction within the ten-year lifespan of the plan. To meet this goal, five results were outlined. One of the five main results desired in this first draft update ISSAP was “*The Swedish population is brought to a closer-to-natural-state genetic make-up*” and this was listed as “*High priority*”.

Under the section on “*Result description*” the text reads as follows: “*Possible prevalence of alien genes in the Swedish reinforced population is decreased*”, and under “Action description”: “*Continue the Swedish captive breeding programme with Russian birds (High priority)*”.

The main differences between the 2008 and the first ISSAP consultation draft regarding the Swedish reintroduction project were:

- Suggested new action in this consultation draft: Continue releases of captive bred birds from the Swedish captive breeding programme – **High priority**.
- The Swedish reintroduced free-flying population was no longer referred to as not being wild, and was referred to as the “*Swedish population*”.
- In the description of the Swedish population in the first consultation draft, no reference was made to the historical fact that the migration routes of the population are man-made by imprinting released Lesser White-fronted Geese on Barnacle Geese.
- In the first consultation draft, all actions to conserve the wild Fennoscandian Lesser White-fronted Goose population would also apply for the Swedish reintroduced population, it is not stated anywhere that the main focus should be on the wild populations.
- The Swedish reintroduced population was not referred to as reintroduced but as restocked/reinforced.
- No actions were suggested for catching/screening/refinement of the Swedish reintroduced population (following the conclusion of Amato (2010)), since it was considered not feasible to carry out (conclusion from SEPA’s commissioned feasibility study; Ottvall (2008)).
- The risk of genetic introgression was described as a low threat to the conservation of the Swedish reintroduced population. The risk of genetic introgression from the Swedish reintroduced population was not described as a potential threat factor to the wild Fennoscandian population.
- Continuing the Swedish reintroduction programme, despite all the ecological problems and the possible threats this population may pose to the Fennoscandian wild population was ranked as “*High priority*” in this first consultation draft of the ISSAP update.
- In the first consultation draft, descriptions of the Swedish reintroduced population as a potential threat to the wild Fennoscandian population were left out, and the corresponding actions were therefore removed.

The possible result of such an ISSAP could be an increase in the Swedish population. A parallel growth in the original Fennoscandian population (as has been the case in recent years), would increase the chance of these two populations meeting in the wild, which is considered to be a threat to the wild Fennoscandian population (as described in the current ISSAP (Jones et al. 2008). These suggested changes from the existing ISSAP were not accepted by some of the range states and concerns were raised in particular by Norway and Finland as the suggested changes were considered to be contradictory to the overall aim described in the 2008 ISSAP. In addition, both countries stressed that the threats from the Swedish population to the Fennoscandian population are real and should still be stated as such in any updated plan.

The original timetable was to finalise the ISSAP draft for preliminary adoption at the AEWA Standing Committee meeting in September 2013. Despite the efforts of the AEWA Secretariat to reach a conclusion on how to treat the issue of the Swedish reintroduced Lesser White-fronted Goose population in the draft, it became clear that this would not be possible, and the document was therefore cancelled from the Standing Committee agenda for that meeting.

## **7.2 Status of the Swedish reintroduced population in the 2nd ISSAP consultation draft (April 2014)**

On 11th April 2014, a 2nd revised draft of the updated Lesser White-fronted Goose ISSAP was circulated to the range states in the RECAP Committee. This 2nd draft was based on the comments provided by all range states in the AEWA Lesser White-fronted Goose International Working Group on the first draft distributed in July 2013.

In the 2nd draft the three wild/original populations were recognised and listed. In addition, the draft *“takes note of a fourth population reinforced by the release of captive-bred birds within the former range of the Fennoscandian population in Sweden and by the establishment of a human-mediated flyway to wintering grounds in the Netherlands (Swedish population)”*.

In the 2nd draft, Sweden was listed as one of the 22 “Principal Range States” in the Action Plan that have the major responsibility for its implementation. The *“Reinforced Swedish population”* was described in detail under the headings *“Trend and estimate”* and *“Distribution throughout annual cycle”*.

Possible presence of alien genes in the Swedish population was described as a low (medium) threat to other Lesser White-fronted Goose populations: *“Possible negative ecological (and genetic) effects resulting from potential overlap of Swedish and Fennoscandian populations (listed as a medium threat)”*. Furthermore, the negative effects are described as follows: *“Possible negative effects on the Fennoscandian population may include the loss of the original migration route, changed habitat preferences, hybridisation with other goose species as well as less viable individuals which could lead to lower breeding success and increased adult mortality”*.

An additional result was also listed, which was also included in the first draft: *“The Swedish population is brought to a closer-to-natural-state behavioural, ecological and genetic make-up”*. The described action to achieve that result was: *“Continue releases of captive bred birds from the Swedish captive breeding programme”* (or alternatively *“Discontinue releases of captive bred birds from the Swedish captive breeding programme”*).

In an e-mail to the RECAP Committee dated 26th April 2014, the Swedish Environmental Protection Agency (SEPA) concluded that they could not in any way accept or endorse the ISSAP in its present state. SEPA considered the 2nd draft to put forward suggestions that in their view could be a violation of the statutes of the EU Birds Directive. SEPA pinpoints that *“the revised text not only discourages a favorable conservation status for the Swedish population, but also in fact proposes actions that would result in a reduction of the population”*.

### **7.3 Status of the Swedish reintroduced population in the 3rd ISSAP consultation draft (June 2015)**

As no compromise was reached within the RECAP Committee on the remaining contentious issues, the governments of Norway and Sweden commenced bilateral talks during the summer of 2014 until February 2015 in an attempt to reach an agreement. On the basis of the bilateral negotiations a 3rd revised draft was prepared by the AEWA Secretariat and submitted to the AEWA Technical Committee in March 2015. The Technical Committee provided substantive comments on the draft and requested that several passages be further clarified in order to avoid misunderstandings in future.

Taking into account the advice from the AEWA Technical Committee as well as further deliberations with Norway and Sweden, the AEWA Secretariat circulated the 3rd revised draft to the AEWA Lesser White-fronted Goose International Working Group on 7th July 2015. The goal was at that time that the revised draft ISSAP could be adopted at the upcoming Meeting of the AEWA Parties (MOP6) in November 2015. The text regarding the Swedish Lesser White-fronted Goose population had now been amended at the request of Sweden. The Swedish population remained described as a population separate to the Fennoscandian population, but only the Fennoscandian and Western Main populations were listed as populations covered by AEWA and the draft ISSAP only contained actions to be implemented for the Fennoscandian and Western main birds.

In this 3rd draft, the Lesser White-fronted Goose populations were described in the following way: *“Four populations can be identified, three of which constitute components of the species traditional flyways”*. The Swedish population is presented as a bullet point together with the three original wild populations in the following way: *“Swedish population (reinforced by the release of captive-bred birds within the former breeding range of the Fennoscandian population in Sweden, migrating to wintering grounds in the Netherlands along a human-mediated flyway)”*.

As highlighted above only the Fennoscandian and the Western main populations (as the two populations listed under AEWA) were covered in the 3rd draft of the ISSAP, so the Swedish population, as well as the Eastern main population, were not covered. Sweden was not listed as one of the 20 “Principal Range States” in the Action Plan that have the major responsibility for its implementation. Possible negative effects due to interaction with released and/or escaped Lesser White-fronted Geese were again (as in the current ISSAP, Jones et al. 2008) described as a threat of medium importance.

The 3rd revised draft describes the *“Possible negative effects due to interaction with released and/or escaped Lesser White-fronted Geese”* as a medium threat, and one of the desired results in this draft ISSAP is that *“Contact between released and/or escaped birds and native Lesser White-fronted Geese is avoided”*. Maintaining genetic integrity and native flyways was added as an objective in this draft with the indicator: *“No pairing and/or breeding between native and released/escaped Lesser White-fronted Geese has been observed”*. Suggested actions to achieve this objective were to: *“Undertake*

*regular monitoring and reporting of released and escaped Lesser White-fronted Geese (medium priority)” and to “Undertake measures to ensure that the contact between released and/or escaped birds and native Lesser White-fronted Geese is avoided (Medium-High priority)”.*

Thus, the 3rd revised draft of the ISSAP considered potential interactions with released or escaped Lesser White-fronted Geese as a risk that could lead to diminished genetic integrity and altered behaviour of native birds and their offspring, as well as cause birds to diverge from their native flyways. This description of the threat and the conservation action was justified by the description of the following scenario: *“as the Fennoscandian population increases, it is expected that individuals will recolonise old breeding grounds both in Norway, Finland and Sweden, leading to an increased probability that the two populations will meet and interact. Should the Swedish reinforced population also increase and expand its range; an overlap becomes even more likely”*. In this respect, the 3rd revised draft also reflected concerns regarding *“the second layer of hybridization taking place within the Swedish population, where Lesser White-fronted Geese have been observed breeding with Barnacle Geese and producing viable offspring, which in turn have bred with both Lesser White-fronted and Barnacle Geese”*.

In a letter dated 17th August 2015 (Case number: NV-07901-11) *“Concerning the draft International Single Species Action Plan for Lesser White-fronted Goose”*, SEPA again rejects the present draft of the ISSAP. The reason for this was that *“the present version contains both new texts regarding the genetic threat posed by the Swedish population as well as new objectives concerning the same alleged threat. Also, actions that in previous versions concerned the Swedish population have been moved to other tables, rather than being omitted”*. As a compromise, Sweden suggested that the Swedish population should just be included under the Fennoscandian population and that this would solve all the controversy.

Having, yet again, failed to reach an agreement the Lesser White-fronted Goose ISSAP update issue had to be cancelled from the agenda of the AEWAs MOP6 in November 2015. Both the 2nd and the 3rd revised drafts of the updated ISSAP have been rejected by SEPA. The process of updating the ISSAP for the conservation of the Lesser White-fronted Goose has effectively been halted several times due to SEPA’s objections to the ISSAP’s description of the potential threat posed by the Swedish Lesser White-fronted Goose population to the original wild Fennoscandian Lesser White-fronted Goose population, as well as the actions that need to be taken to reduce that threat. Sweden has thus repeatedly declined to take into account the legitimate concerns of the range states hosting the Fennoscandian population as well as the basic need to apply the precautionary principle when dealing with a population with such a vulnerable status.

It should also be noted that the repeated objections of SEPA have caused a substantial delay in finalizing the much needed update of the ISSAP, and one of the direct consequences is that it is currently no longer possible to widen the scope of the Action Plan to include the Eastern main population (China, Japan, Mongolia, South Korea) as was originally decided at the 2nd Meeting of the AEWAs Lesser White-fronted Goose International Working Group in Kerkin in November 2012. The future work on updating the ISSAP remains uncertain (see **chapter 7.4** below), but the AEWAs Standing Committee confirmed in 2015 that until a new revised ISSAP for the Lesser White-fronted Goose is adopted by the AEWAs MOP, the current ISSAP (Jones et al. 2008) remains valid for implementation.

## **7.4 Suggested changes on the status of the Swedish reintroduced population in the 3rd ISSAP consultation draft (May 2016)**

The AEWA Lesser White-fronted Goose International Working Group came together in Trondheim, Norway for its third face-to-face meeting from 12th-14th April 2016, hosted by the Norwegian Environment Agency at their premises.

Amongst other issues the Working Group also agreed on how to move forward with the revision of the 2008 ISSAP for the Lesser White-fronted Goose.

Three main options on how to proceed were outlined in the meeting documents (LWfG IWG 3.4):

1. A final one-off attempt (subject to a tight deadline) is made to have all populations of Lesser Whitefronted Geese included in the revised Action Plan, with a clear understanding that the priority under AEWA and the focus of the revised Plan shall remain on the AEWA-listed populations, which are already targeted for conservation action under the current Action Plan (Fennoscandian and Western main populations) as well as on the Eastern main population. Such a revised Action Plan would also necessarily take into account and address any possible threats to these populations in an agreed form; -
2. The scope of the Action Plan includes only the AEWA-listed populations, which are already targeted and prioritised for conservation action under the current Action Plan (Fennoscandian and Western main populations) as well as the Eastern main population; -
3. No revision is undertaken at this time and the 2008 Action Plan remains valid for implementation

Representatives from Sweden stated that option 1 was the only acceptable option for them, while representatives from Norway, Finland, Greece and Romania expressed concerns that option 1 again would lead to no agreements on conflicting issues and would further delay the update process. Instead of voting over the options it was decided that a last attempt would be undertaken to reach agreement on the conflicting issues within a very strict time limit (June 2016). If the range states failed to reach an agreement on how the Swedish population should be described and handled in the updated ISSAP, the automatic “fall-back” option would be option 2. Range States were requested to submit their comments on the latest draft revised plan, which had been circulated previously in July 2015 to the AEWA Secretariat by mid-May 2016. If necessary, the AEWA Secretariat also offered to host a face-to-face meeting in June 2016 at the UN campus in Bonn to discuss any proposed compromise solutions.

The AEWA Secretariat received substantive comments on the 3rd draft (of July 2015) from Sweden supported by the Netherlands and Germany. The main ideas of the suggested changes to the ISSAP were to again include the Swedish population as a part of the ISSAP with the objective of strengthening the Swedish population and its flyway and that no action needs to be initiated in terms of screening wild birds for evidence of hybrid genes or in removing birds from the ecosystem. The AEWA Secretariat subsequently requested the government representatives from the range states of the Fennoscandian for their views on the suggestions for revision presented by Sweden. The governments of Estonia, Finland, Greece, Hungary and Norway (supported by expert comments from Lithuania) all replied that they could not agree to include the Swedish population in the revised Action Plan in the form proposed by Sweden. In summary their general position was that the main focus of any revised Action Plan should clearly be on the conservation of the AEWA-listed populations (Fennoscandian and Western main) and that the concerns regarding the possible threat posed by the Swedish population to the Fennoscandian population needed to be sufficiently taken

into account (also so as not to undermine the conservation efforts undertaken during the past decade(s) in many of these countries). The more detailed comments submitted by Norway and Finland are referenced below.

In the response from Norway in letter sent by e-mail to the AEWA Secretariat on the 26th May 2016, the main message was as follows: *“We recognize the fact that Norway and Sweden are separated in our views on the importance of conserving not only the species but also the traditional flyways, and consequently behavioral traits of the species. This situation has been stable the last twenty years. We firmly believe that occurrence of birds originating from captive stock has the potential of seriously compromising our efforts to conserve the traditional flyway. Thus, a revision of the ISSAP should address the clear and present danger to the Fennoscandian population by birds without any site fidelity and connection to the traditional flyway. The ISSAP should also address the risk of these birds randomly establish new sites for every part of their life-cycle. The main idea of the suggested changes to the ISSAP is to include the Swedish manipulated flyway birds as a part of the ISSAP. A project that has not been widely accepted as viable and as mentioned also regarded as a threat to the original wild population”.*

The main message in the response from Finland (sent in an e-mail to the AEWA Secretariat on the 25th May 2016) to the suggested changes from Sweden was as follows: *“Finland shares the position of Norway regarding the suggested changes to the draft LWfG ISSAP. Finland has been working in long term, in very close co-operation with Norway, in order to conserve the wild Fennoscandian population of the LWfG. Finally, the persistent international conservation efforts seem to take effect as in spring 2016 the number of spring staging LWfG in Finland exceeded 100 individuals, for the first time since 1963. In this situation, there is no reason to include actions for strengthening the Swedish reintroduced population and its flyway (as a back-up plan if the conservation of the wild Fennoscandian population would fail) in the LWfG ISSAP.*

*Finnish position is that the reintroduced Swedish LWfG population is not be considered as a target population of the conservation objectives of the revised LWfG ISSAP, but to be described as a manipulated flyway population which poses a potential threat for the wild Fennoscandian population of the LWfG. In the suggested changes (May 2016) there is also partly misleading statements, e.g. related to recruitment of the wild Fennoscandian population, and the possible negative effects due to interaction with released and/or escaped LWfG”.*

Norway suggested, as a compromise, that the descriptive texts referring to the Swedish population could be removed from the revised Plan, and that all information regarding the Swedish population with a description of the ongoing activities could rather be included in a separate information chapter or annex instead. Following the agreement in Trondheim as well as consultations with the Chair of the International Working Group, the AEWA Secretariat suggested to convene a one-day face-to-face meeting to discuss this suggested option (or other possible options) for including the Swedish population in the revised Action Plan in a way that would be acceptable to all range states.

The ongoing diverging views amongst the EU member states led to an involvement of the EU Commission and on the 1st June 2016 an email from Nicola Notaro (Head of Unit, DG Environment - Unit B3 – Nature) with the following content was distributed to the NADEG (formerly known as the Ornis Committee) members:

*“As you know a revised International Single Species Action Plan for the Conservation of the Lesser White-fronted Goose (*Anser erythropus*) in the Western Palearctic region is under preparation and this work is led by the AEWA Secretariat.*



*I have been made aware that the experts of the AEWA Lesser White-fronted Goose International Working Group are currently discussing the revised plan and particularly the question on whether the Swedish population, which migrates to Germany and the Netherlands, would also be covered by the revised plan. The previous international plan prepared with support under the LIFE fund did include this population. This discussion appears to involve several EU Member States experts (in copy here) and Norway and is proving to be controversial. While from the Commission's side we very much favour and foster the involvement of experts from all Member States in discussions under multilateral environmental agreements such as AEWA, there is also a legal duty for all our Member States based on the EU Treaty - to coordinate their views and reach unity in the external representation of the EU when policy/political decisions are to be taken under those agreements. As the current discussion involves such a policy decision I am writing to you to ensure a co-ordinated joint EU view on this issue. I am addressing all 12 Member States included as principle range States in the draft Plan.*

*The Commission has informed the AEWA Secretariat that the Commission view is that, whereas priority should be given to the natural flyway, the Western flyway originating from the Swedish population should be recognised as well. This means that the Swedish population should form part of the revised Action Plan.*

*I would like to hereby ask you for your agreement to this position. Please provide Marita Arvela with your reaction by the 8th of June close of play. No reaction will be considered as agreement”.*

The contents in the letter from the EU Commission were followed by an immediate strong and clear response from the Finnish NADEG Committee member Heikki Korpelainen on the 3rd June 2016 with the following statement:

*“Thank you for your question and I appreciate your efforts for reaching an agreement on the issue. However, Finland is not able to support the Commission’s view. The discussion on this difficult issue really has been controversial years ago. There is no change in Finland's position in this issue.*

*The Swedish population has created a risk for the wild population and in the worst case it can jeopardise all the efforts put on the protection of the wild Fennoscandian population. The risk is now even more evident when the wild population is showing good progress due to concerted conservation efforts among the range states and when on the other hand restocking of Swedish population has been reinitiated. The issue has been long discussed at the scientific level and I'm sure the Commission is well aware of the main points of these severe concerns. Just to clarify our position I repeat here the main arguments:*

*- The genetic structure of the Swedish population originating from captive-bred birds is a mixture of western and eastern types, with introgression of genes from other species, Greater white-fronted goose and Greylag goose. The use of Barnacle goose as foster parents has led to hybridization also between these two species. Also second-generation hybrids have been recorded. Therefore, the Swedish population forms a direct and severe genetic threat to the wild Fennoscandian population in result of contacts either in the breeding grounds or along the migration routes. The problem has not been solved with the latest attempts to use the Russian origins for the captive-bred birds.*

*- The manipulation of the migration route of the "man-made" Swedish population has led to wintering areas and habitats, which are not the traditional ones for this species. Birds have even been seen staging and moulting in city parks with the Barnacle geese increasing the risk for hybridization between these species. The possible risk that the traditional migration route of the wild population would be disturbed by the influence of the Swedish geese should be taken seriously.*

*In brief, I want to emphasize that the conservation efforts made for the protection of a critically endangered, but still existing population, which is showing promising signs of recovering, should not be put in risk by a manipulated and introduced population, the genetics, behavior and ecology of which differ from the wild population. The action plan should be kept as it was previously; recognizing the Swedish population as a threat to the wild population”.*

The message from Finland was supported by the other range states of the Fennoscandian population within the EU, following which a face-to-face meeting of the concerned EU member states has been convened by the Commission and is currently scheduled to take place in November 2016. At the meeting an attempt will be made to reach a coordinated EU position regarding the inclusion of the Swedish population in a future updated ISSAP.

Following the involvement of the EU Commission and the convening of the internal EU meeting in November, the AEWA Secretariat cancelled the plans for a negotiation meeting in Bonn. The agreement reached in Trondheim amongst all the range states present (including the Netherlands and Sweden) on the next steps regarding the revision of the Action Plan has in fact, been put on hold. Despite the effort to move forward on the issue of the revision of the International Action Plan by only concentrating on the LWfG populations listed under AEWA, the issue of the Swedish population has again managed to stall the process once again.

## 8. ADDITIONAL REVIEWS AND EXPERT OPINIONS

### 8.1 Review of publications on historical western European flyways of Lesser White-fronted Goose

Following the existence of conflicting views of Lesser White-fronted goose stakeholders on the previous existence of Lesser White-fronted Goose flyways within Western Europe, an independent expert review regarding the probability that the man-made migration route used by the Swedish reintroduced Lesser White-fronted Goose population was a traditional, natural migration route for the wild Fennoscandian Lesser White-fronted Goose population was commissioned by the RECAP Committee. The UNEP/AEWA Secretariat terms of reference for the work adopted by the RECAP Committee specifically requested critical reviews of the scientific papers by Kampe-Persson (2008), Mooij & Heinicke (2008) and Mooij et al. (2008). The review work was carried out by the British Trust for Ornithology (BTO) (Marchant & Musgrove 2011), and their main conclusions were as follows (important points from the Executive summary):

*4 An important question now posed by the RECAP Committee is whether the western migration route ('Atlantic flyway') used by the Swedish population is a natural one, either recreated or augmented by the Swedish releases, as has been claimed in some recent literature, or an artificial one. This report reviews this question with the aim of giving advice to the Committee.*

*5 The review finds little evidence that such a migration route existed before the Swedish releases began, although it might have done so, dying out before European ornithology had developed sufficiently to record it. This is in contrast to a recently published paper which states unequivocally that the traditional migration routes of the Scandinavian population were well separated from those of the North Fennoscandian population.*

*6 The case for the western migration route being a natural one seems to rest largely on the several hundred records of LWfG that exist for western European countries prior to 1981, rather than on evidence of how those birds reached western Europe. The main alternative explanation for the presence of these birds, which we support, is that they were diverted from their Central European migration route by being caught up with Greater White-fronted and Bean Geese moving southwest towards western Europe.*

*7 In Britain and perhaps some other western European countries outside the normal range of the current Swedish population, the large majority of LWfG now being recorded can almost certainly be accounted for by escapes from captivity. The first known British record of LWfG assigned to the escape category was in 1976, thus predating Swedish releases, but small numbers of escapes might have been present in Europe much earlier.*

*8 We feel that the question of whether the western migration route is a natural one or not should not be an overriding issue. The boundaries between natural and unnatural for goose movements and distribution are being blurred irrevocably by the presence of large and growing numbers of introduced and escaped geese in Europe.*

**9** *Every effort should be taken to increase the supply of captive-bred Russian birds suitable for release. While the supply of captive-bred LWfG is limited, they should be released where they have the best chance of joining a breeding population. The RECAP Committee needs to consider all its options carefully.*

These conclusions have, however, been interpreted by the stakeholders of continued reintroduction of Lesser White-fronted Geese as meaning there is a good possibility/probability that the human-modified migration route to the Netherlands is a natural one, and they have used this as an argument for further reintroductions using the method that is currently employed in Sweden. There is, however, no evidence, nor any clues that such a migration route has ever existed naturally. Similarly, evidence confirms that there have never been wintering areas for any original wild population of the species in the Netherlands neither in historical times nor in geological perspectives. See **chapter 3.2** for a thorough scrutiny of this issue.

## **8.2 Independent review on genetics**

The work on a new and independent review on the genetics of the Swedish reintroduced Lesser White-fronted Goose population was commissioned to Prof. G. Amato by the AEWA Secretariat in 2009, again based on the Terms of Reference adopted by the RECAP Committee. Unfortunately, due to scheduling conflicts, Amato never completed the commissioned work, but he produced an executive summary that concluded as follows:

*“At this point, starting new captive breeding populations from wild caught individuals – especially from the Fennoscandian subpopulation presents too great a risk to the demographic health of these declining populations. While there are methods to minimize the impact, the potential disturbance is not worth the risk. The exception might be very limited additions from the wild for the Western Main population. These individuals could be added to a satellite population of the Nordens Ark birds. Even a very few individuals, added over time would prevent selection for domestication and would help meet genetic retention goals for a captive bred population that would be available for multi-generational supplementation of the wild populations.*

*The captive populations of LWfG, other than the Western Main/Nordens Ark, should not be used for reintroductions. The free ranging LWfG subpopulation in Sweden, however, does not pose a significant threat to the recovery of the other subpopulations. For this reason no action needs to be initiated in terms of screening wild birds for evidence of hybrid genes or in removing birds from the ecosystem where they currently fill an ecological role. If additions are made to this population from captive individuals of the Western Main/Nordens Ark birds it will reduce even further any concerns about the initial release of birds with introgressed genes since this will help “swamp them out” with LWfG genotypes.*

*The Fennoscandian subpopulation in Norway is highly threatened by continuing low recruitment, and is highly vulnerable to stochastic disasters. As one of three geographically separated subpopulations, its loss would be a significant loss, and possibly endanger the LWfG species. Genetic data supports the hypothesis that these subpopulations have maintained connectivity in recent evolutionary history. For all of these reasons, a synthesis of conservation genetic research and theory would argue for the population augmentation of this subpopulation with individuals from the Western Main/Nordens Ark captive population”.*

It is worth noting that Amato (2010) discussed the usefulness of using genetically pure birds to supplement the "wild population" in Fennoscandia in the original meaning of wild, i.e. the Fennoscandian Lesser White-fronted Goose population. In our view, the assumption that the release of new "pure" birds would swamp the existing hybrids in the Swedish population, although perhaps possible in theory, is extremely unlikely to occur in the wild. There are several explanations for this improbability, both as an effect of behavioural mechanisms through natural selection (and sexual selection), but also genetically (see **chapter 5.5**).

Particularly in light of the current release methods being used, it seems unlikely that:

- a) the released birds will survive to any extent (the survival rate to date is reported as very low);
- b) if they do survive, -that they actually follow the flock of Swedish free-flying Lesser-White-fronted Geese;
- c) if they follow the flock, that they find a suitable mate as the Swedish releases since 2010 have been mainly of males (see **chapter 5.7** for a detailed discussion on this) and in addition due to selective mating (of familiar ind.) which would favour birds from some age cohort and subpopulation;

In addition, the Swedish reintroduced population has, contrary to original wild Lesser White-fronted Geese seen in Fennoscandia and Russia, made the transition to feed on agricultural habitats/ farmland especially during winter in the Netherlands and Germany, a trait not shared by original wild Lesser White-fronted Geese (see **chapter 5.6.2** for details). Amato (2010) did not, however, consider (and possibly was not aware of) this aspect or other ecological problems (such as reduced viability, hybridization with Barnacle Geese and deviations in natural behavior) concerning the Swedish free-flying population at the time of producing the summary of his review.

### **8.3 Article on "documented" hybridisation of Lesser White-fronted Goose and Greater White-fronted Goose in the wild**

In an attempt to trivialize the potential ecological problems caused by the hybrid individuals within the free-flying Swedish Lesser White-fronted Goose population, the stakeholders in favour of continued reintroductions published an article with the overall objective to prove that hybridisation between Lesser White-fronted and Greater White-fronted Geese occur in the wild (Nijman et al. 2010). The study located two presumed cases (two museum specimens) of hybrids between these species (Lesser White-fronted x Greater White-fronted Goose). The two samples mentioned in the study (museum specimens with references ZMA 19267 and BMNH 1936.2.18.1) could just as equally have been escapees from zoos or waterfowl parks in western Europe rather than wild geese. The fact that these two samples are collected in the Netherlands and in Great Britain makes it even more likely that these birds are of captive rather than wild origin. In Britain, more than 50% of all records of Lesser White-fronted Geese are presumed to be of feral/captive origin (see also **chapter 3.1.2**). The authors argued that the specimens were collected before the Swedish reintroduction project started. However, western Europe has, at least since the 1850s, experienced large amounts of both deliberate releases and unintentional escapes from zoos, wildfowl parks and other private collections, and hybrids between Lesser White-fronted Geese and Greater White-fronted Geese are known to have occurred in zoos at least since 1926 (see **chapter 4.8**, Nagy 1950).

A valid proof of hybridisation between these two species in the wild would be documentation of a mixed pair actually breeding together and producing viable young, or by conducting a genetic analyses of wild populations (of both species) within their normal distribution range.

In the discussion, the authors concluded that *“hybridisation between the two species occur naturally regardless of stocking programs. This perhaps happens infrequently, because 4% (2/47) of A. erythropus..... in the collections of the ZMA, BMNH and Naturalis are hybrids”*. We further question the scientific validity of this statement, as samples were not randomly selected from museum collections. Rather, apparent hybrids were selected first, thus increasing the proportion of hybrid individuals in the study. In order to make a valid analysis, all skins in European museums should have been included. These amount to at least 300 specimens (own unpublished data), of which the largest collections with native wild birds are located at the Natural History Museum in London (21 skins + 2 heads), Natural History Museum Gothenburg (24 skins + 2 mounted birds), Moscow State University Museum (30 skins), Zoological Museum in St. Petersburg (65 skins), Swedish Museum of Natural History, Stockholm (11 skins + 2 mounted birds), Natural History Museum, Oslo (4 skins + 8 mounted birds) and the Zoological Museum, Copenhagen (11 skins). In addition, it should be noted that hybrids have also been considered interesting to collect for museums, and they have therefore been very overrepresented in museum collections throughout Europe.

In addition, the authors claim to have measured 26 skins from the three museums they refer to (Zoological Museum Amsterdam, Leiden and Natural History Museum in Tring). These three collections held 8, 18 and 23 specimens respectively, but in the case of the specimens from the museum in Amsterdam none should have been used in the analyses since three were of captive origin, two were only heads and the three remaining specimens were immatures, not adults. In Tring, the 23 specimens consisted of 17 adults that could have been used, of which the remainder were juveniles/immatures and heads. In Leiden it is more difficult to assess the specimens, but at least 8 were pulli/immatures. At worst, probably only three of the specimens were of wild origin. Summing up the possible adults available, there were only 20 suitable specimens in total in these collections (see also see **chapter 5.5**).

Lastly, the mixed origin of the museum specimens – which were collected from Western Europe to the eastern fringe of the distribution in Asia (Burma, China and Japan) - would render such a small sample analyses impossible to test statistically, and therefore useless. This is because the sexes differ in size and there is a cline in morphology with increasing size from west to east in the Lesser White-fronted Goose, as is also the case for Bean Goose and Greater White-fronted Goose (Ely et al. 2005, Ruokonen et al. 2008).

**In conclusion, due to the considerable methodological weaknesses, the article (Nijman et al. 2010) fails to prove that hybridisation has any relevance for wild Lesser White-fronted Goose populations and cannot be used as a guidance for management decisions for the reintroduced Swedish population.**

Genetic research on wild populations of Lesser White-fronted and Greater White-fronted Geese clearly shows that hybridisation between these two species is not frequent and no incidences were recorded in studies containing more than 100 individual samples from original wild populations, and more importantly it has not lead to introgression. This is very different from the unfortunate situation documented within the Swedish reintroduced population, where a minimum of 36% of the sampled birds were contaminated with alien genes (Ruokonen 2001, Ruokonen et al. 2004, 2007, 2010).

It is important to note that this does not exclude the possibility that Lesser White-fronted and Greater White-fronted Geese might occasionally interbreed also in the wild, but so far, there is no proof of this. Kampe-Persson (2007) lists several cases of likely hybrids between these two species. The issue of hybridisation between the Lesser White-fronted Goose and Greater White-fronted Goose is further discussed in detail in **chapter 4.9**.

## 8.4 Additional advice from the IUCN Committee on reintroductions

In the Swedish National Action Plan (Naturvårdsverket 2011), the Swedish reintroduced population is described as a reinforcement of the existing wild Fennoscandian Lesser White-fronted Goose population, due to the claim that some wild Fennoscandian Lesser White-fronted Geese still existed in the reintroduction area when the releases started in the early 1980s. This view was opposed by the Fennoscandian Lesser White-fronted Goose conservation project, and the RECAP committee therefore asked the IUCN Committee on reintroduction for advice regarding the question whether to consider the Swedish population as a reintroduced or a reinforced/restocked population.

The IUCN committee on reintroductions agreed to define the Swedish reintroduced population as a reinforced/restocked population on the basis of the information provided by the AEWA Secretariat on behalf of the RECAP Committee (AEWA 2012, but see also AEWA 2011e). In order to make such a definition, not only the question as to whether there still were some wild Lesser White-fronted Goose left in the release area in the Arjeplog mountains in northern Sweden should have been considered, but also that the new, reintroduced population was manipulated to change several ecological traits compared to the wild Fennoscandian population. We consider that the IUCN Committee on reintroduction failed to evaluate this question, since important ecological and behavioural differences between the two populations in question were not subject to the evaluation. For a more thorough scrutiny of this question, refer to **chapter 5.3**.

## 8.5 Feasibility study for catching and refinement of the Swedish population

Following the recommendation of the CMS Scientific Council (see **chapter 6.2**) and the agreement reached by the AEWA negotiation mission (see **chapter 6.3**), the Swedish Environment Protection Agency (SEPA) agreed to undertake a feasibility study as to how the Swedish free-flying, reintroduced population could be caught and refined. This feasibility study was commissioned by SEPA and carried out by Richard Ottvall at the University of Lund, Sweden (Ottvall 2008). The report concludes that it is not “worth the effort” to follow the actions laid out in the existing International SSAP:

*“The only known moulting site is at Lillfjärden, Hudiksvall where only few individuals have stayed in recent years during the moulting period (2008: 5 ind., 2007: 18 ind. and 2006: 5 ind.). From these figures probably less than 10% of the Swedish population can be caught at Lillfjärden during moult. This means that most catching efforts have to be directed towards staging localities. It is very difficult to assess the proportion of the population that can be caught at the staging sites, but it is probably correlated with the amount of efforts.*

*From this study I conclude that to capture Swedish Lesser White-fronted Geese for genetic screening and refinement by removal of apparent hybrids is a pointless action and not feasible. This conclusion is based on the fact that present genetic markers are not efficient in detecting hybrid ancestry among individuals in the Swedish free-flying population. I endorse the genetic experts that argue that the best-available technology will not exclude carriers of alien (GWfG) genes. It is possible to develop further genetic markers, another 40 or so microsatellites, in a well-equipped lab to a cost of at least 1 million SEK. This work will probably take about a year to finish. Most likely, such an effort will still not guarantee by 100% certainty that carriers of alien genes will be detected by genetic screening.*

*It might be possible to capture a large fraction of the free-flying flock, but the amount of efforts and costs are difficult to predict. The catching efforts have to be implemented at several localities by using various catching techniques. Moreover, catching attempts will most likely have to carry on for several years until a fair number of birds have been caught. If geese are to be kept in captivity until the*

*outcome of DNA analyses is presented, I argue that a new facility for the geese has to be built. The total cost of keeping birds in captivity could well be 2-3 million SEK and to that costs of capture attempts of at least 500,000 SEK should be added. In total, I estimate that 3-5 million SEK is needed to cover all costs of actions. It is, however, doubtful whether the refinement process will be successful with all these actions". (Ottvall 2008).*

The conclusion is quite surprising, because catching of moulting Lesser White-fronted Geese from the Swedish reintroduced population e.g. in the city park in Hudiksvall would probably be easy as compared to catching of wild Lesser White-fronted Geese. Such catching efforts of wild Lesser White-fronted Geese have been carried out successfully in Fennoscandia as well as in Russia, both at spring and autumn staging sites, as well as in breeding and moulting areas. The relative tameness of Lesser White-fronted Geese at Hudiksvall, where they are accustomed to people and allow close approach, makes it possible to capture individuals with a hand-held hoop-net. Furthermore, we do not consider the estimated cost of 1 million Swedish Krona (SEK) for developing suitable genetic markers as a good argument for not taking the responsibility and carrying out the actions described in the AEWA ISSAP. The current activities of annual releases of Lesser White-fronted Geese in Sweden is surely also a costly activity.

Sweden decided at an early stage to continue their release project despite concerns and criticism about the genetic composition of the free-flying population. Taking into account the precautionary principle and the potential threat that this population poses to the original wild Fennoscandian population which is only slowly recovering, we consider it an obligation for the Swedish reintroduction project to implement the necessary actions to catch and refine the free-flying population created as outlined in the AEWA ISSAP. At the time of writing (late October 2016), attempts have been made to capture the Swedish Lesser White-fronted Geese on several occasions from 2010 onwards.

A total of 16 moulting Lesser White-fronted Geese were caught at a site in Sweden on 10th July 2010 (*Projekt Fjällgås* 2013). At that time there were 31 birds at the same moulting site. In other words, just over 50% of the birds moulting at a single site in Sweden were captured and ringed on that date, and the total caught was around 32% of the total Swedish population at the time. The second attempt to catch geese from the population was made in the Netherlands in March 2014, and the third attempt was made at Lillfjärden, Hudiksvall in Sweden in September 2014 (German Goose Research 2016a). These last two attempts failed, the attempt at Hudiksvall at least was unsuccessful due to problems with the catching equipment. A fourth attempt, made at Hudiksvall in spring 2015 was successful, with three adults being captured and subsequently fitted with satellite transmitters (*Projekt Fjällgås* 2016). In late April 2016, two further successful catches of Lesser White-fronted Geese were made at Hudiksvall. The first of these two catches was specifically aimed at recapturing a female bird experiencing problems with its satellite transmitter, whereas the second of these catches resulted in the capture of a new female which was fitted with a new satellite tag (German Geese Research 2016b).

Numbers of Lesser White-fronted Geese recorded in Hälsingland district, which includes Hudiksvall, have varied with up to a little over 100 geese present in some years (**Figure 50**). Numbers of birds in subsequent spring seasons are always lower than that of the preceding autumn. A similar pattern is found in the Uppland district, which is also much used by Lesser White-fronted Geese, with up to 70 individuals (**Figure 45**). Possible explanations for this include natural mortality, or that migration is staggered and not all individuals are picked up during counting in spring. Perhaps most surprising is the fact that numbers of Lesser White-fronted Geese at Hudiksvall and elsewhere in Hälsingland have been in decline since 2012 (**Figure 44**), despite the fact that more birds are being released. The same



trend is also shown for the maximum counts in Uppland district, where the birds are mainly observed around Hjalstaviken (**Figure 51**).

There are several methods available to capture Lesser White-fronted Geese at Lillfjärden. The first Lesser White-fronted Geese return to the area to moult in late June. During the moult period these birds are completely flightless. Flightless geese seek the safety of water as a response to avoid predation. Birds can be rounded up by pushing them gently with boats or canoes to shore and enclosing them in a coral-type trap. With luck, one can successfully round up all the Lesser White-fronted Geese present in one single catch. This method is much used to catch large numbers of moulting geese (Ogilvie 1978).

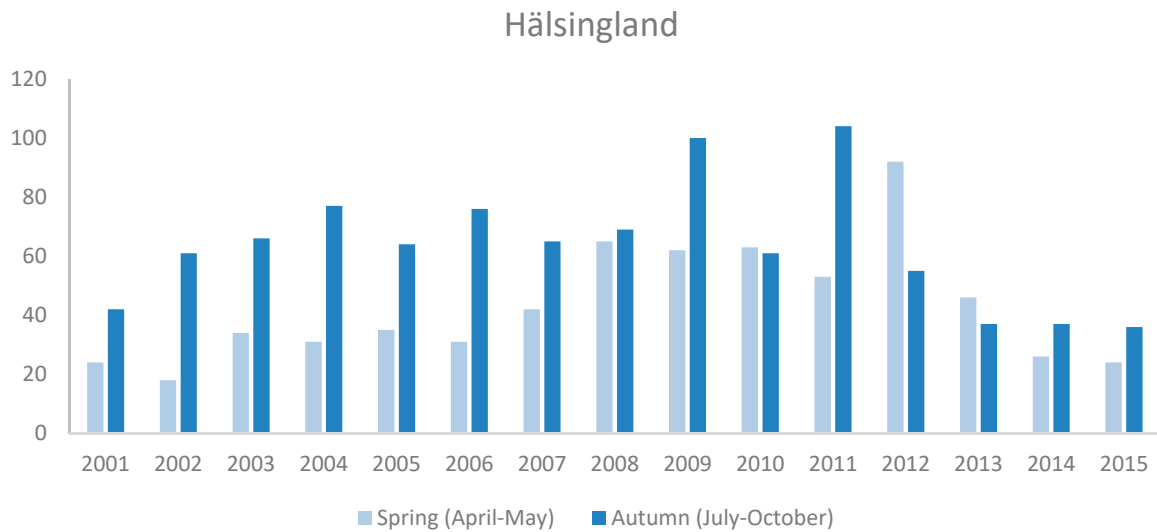
Numbers of moulting Lesser White-fronted Geese at Hudiksvall do, however, vary with 0, 1, 29 and 28 moulting individuals reported in summers 2011-2014 respectively (Liljeback et al. 2012, 2013, 2014). In 2015, there were 34 individuals present at Hudiksvall on 29th July, all of whom had primary and secondary feathers at a growth stage indicating that they had probably all moulted there (own obs.). According to the Swedish Species Observation System (Artportalen 2016) there were up to 28 individuals moulting in 2015, which is slightly under that observed on 29th July.

Alternative methods that could be used to capture birds include the use of a whoosh-type net or perhaps cannon net – these two net-types can also be effective for catching free-flying birds at feeding or resting sites. There may also be other sites where it is possible to attempt to catch Lesser White-fronted Geese in Sweden.

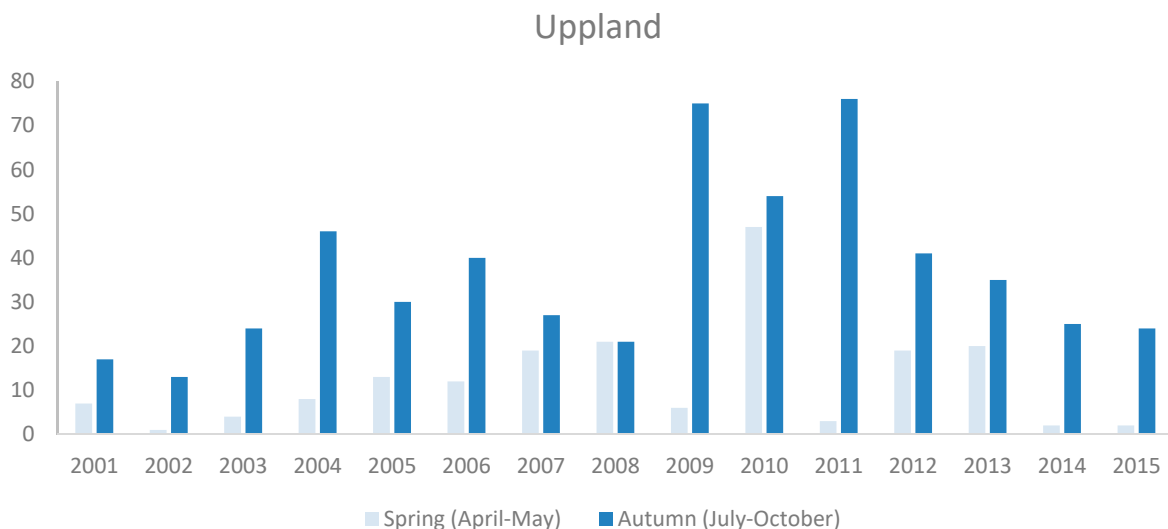
There is a pressing need to capture the Swedish Lesser White-fronted Geese for screening to examine the genetic make-up of the birds at large. Although the birds released since 2010 are genetically pure and are from a stock captured in the wild in Russia, there are still many birds at large from previous releases. There are also serious doubts that the individuals released after 2010 have actually bred with the existing free-flying population, thus any dilution effect has probably not occurred. These early releases included birds with haplotypes from Greater White-fronted Geese (see **chapter 5.5** in this report).

Birds caught should to be screened for Greater White-fronted Goose haplotypes. Ideally, these individuals should not be released into the wild after capture, regardless as to whether they have confirmed genes from Greater White-fronted Geese or not. This is because these birds (at least from releases from 2010 onwards) have no regular, natural migration route and spread in all directions, thereby posing genuine threats to the wild Fennoscandian population (see **chapter 5.2.4** for details on the effects of releasing birds without a traditional migration route).

It is highly improbable that one can catch all the Lesser White-fronted Geese circulating in Sweden in one single season. Indeed, not all the Swedish Lesser White-fronted Geese use Hudiksvall, either to moult or to stage on route to wintering areas. However, with maximum annual numbers at Hudiksvall between 37 and 104 individuals at one time in the period 2010-2015 (data from Artportalen.se 2016) then there is a potential to capture a large proportion of all Lesser White-fronted Geese that are currently in circulation from Swedish releases. Whether or not the Swedish fieldworkers see any incentive in this is a matter of conjecture, but efforts to capture the free-flying Lesser White-fronted Geese are essential to prevent the risk of these birds mixing with wild Fennoscandian birds. If the Swedish fieldworkers are unwilling to capture these birds, then catching could be carried out by other professional personnel.



**Figure 50.** Maximum numbers of Lesser White-fronted Geese reported in spring (April-May, pale blue columns) and autumn (July-October, dark blue columns) in Hälsingland district in Sweden 2001-2015. Most of the counts are from Hudiksvall. Source: Artportalen 2016.



**Figure 51.** Maximum numbers of Lesser White-fronted Geese reported in spring (April-May, pale blue columns) and autumn (July-October, dark blue columns) in Uppland district in Sweden 2001-2015. Most of the counts are from Hjälstadviken. Source: Artportalen 2016.

## 8.6 Feasibility study for a supplementation in Norway

In 2009, the Norwegian nature conservation authorities commissioned a feasibility study for a re-introduction/supplementation programme for Lesser White-fronted Goose in Norway (Lee et al. 2010). The report outlines ten feasibility criteria for a successful reintroduction/supplementation programme, and it concluded that a supplementation of the Lesser White-fronted Goose population breeding in Norway can only be considered feasible assuming the identified problems with regard to obtaining a source of birds and release technique can be overcome:

*“A re-introduction programme for LWfG in Norway (following extirpation of the species in the wild) sufficiently fulfilled seven of the ten feasibility criteria. The criterion regarding causes of decline was not fulfilled, and criteria regarding knowledge of a suitable release techniques and stakeholder support were only partially fulfilled. Accordingly, these factors may present significant difficulties. Evidence suggests that if the original causes of decline have not been eliminated or sufficiently reduced, it would critically limit the success of a re-introduction programme. It may be difficult to gain support for a re-introduction that would require human-led release to establish migratory habit, and while human-led release is likely a suitable release technique, the technique has had limited success establishing migratory habit in geese and is unproven for LWfG. The report concludes that a re-introduction of LWfG in Norway cannot be considered feasible until further evidence is provided concerning the elimination of or sufficient reduction in the original causes of decline, and then only assuming the identified problem with regard to stakeholder support and release technique can be overcome” (Lee et al. 2010).*

With this background, the Norwegian Environment Agency started a pilot project with releases of captive bred Lesser White-fronted Geese supplied from “Nordens Ark” in Sweden. The project released a total of 11 Lesser White-fronted Geese in 2010 and 2011. See **chapter 4.5** for more details.

## **8.7 Swedish National Action Plan for Lesser White-fronted Goose**

The process of preparing a National Action Plan for Lesser White-fronted Geese in Sweden started already in 2004, and was coordinated by the Environmental department of the County Governor of Norrbotten in Sweden. On 8th February 2005, the first draft was circulated as a working document for a hearing held in Luleå in Norrbotten County in Sweden on 15th February that same year. On 15th December 2005, the draft was revised according to the views of SEPA as well as to the conclusions and recommendations of the CMS Scientific Council (see **chapter 6.2** for details). On 30th March 2006, the draft was further revised, and on 7th October 2006 the final revision was made. On 11th and 12th December 2006, a second hearing meeting was held in Älvsbyn, Norrbotten, and on the 19th November that same year, a second official draft of the Swedish NAP was circulated as a consultation document for the final hearing process. This document contained a background description of the history of the Lesser White-fronted Goose in Sweden that was in line with the understanding of the other range states hosting the original wild Fennoscandian population. This draft also described several conservation actions for the original wild Fennoscandian Lesser White-fronted Goose population which would have been in line with the AEWISSAP which was being negotiated at that time and which was adopted in 2008. The Swedish draft NAP was the result of a comprehensive and broad process involving stakeholders from both Sweden and neighbouring countries and was founded on acknowledged research, available knowledge and literature on the species (Naturvårdsverket 2006).

In this hearing document, the goals were outlined as follows (translated from Swedish):

- Clarification of the occurrence and possible breeding of the Fennoscandian population by 2007 at latest.
- Knowledge of the distribution of the reintroduced birds by 2008 at latest.
- Destruction of geese in captivity in Sweden revealed to carry genes of Greater White-fronted or Greylag Geese by 2007 at latest.

- Commencement of the creation of a new stock for captive breeding which is built up firstly of Norwegian birds and secondly of western Russian birds, by 2007 at latest.
- Determine which sites in Sweden ought to be subjected to protection, restoration or habitat management by 2007 at latest.
- Reach a consensus as to how the results of genetic studies ought to be implemented in conservation work and which measures ought to be taken as recommended by the Scientific Council by 2008 at latest.
- Identify potential sites for biotope protection, release pens etc. for reintroducing Lesser White-fronted Geese with a suitable genetic background (see above) by 2008 at latest.
- The negative trend for Fennoscandian population has turned by 2008 at latest.
- The necessary measures or actions for sites that ought to be protected, restored or managed should be in place by 2010 at latest.
- The Swedish breeding population numbers 25 pairs by 2010 at latest.

#### Long-term aims

- Hunting of Lesser White-fronted Geese is no longer a threat by 2015 at latest.
- The population of Lesser White-fronted Geese in Sweden has achieved a favourable conservation status with a breeding population of at least 200 pairs by 2025 at latest.
- Lesser White-fronted Geese in Sweden are part of a growing distributional range together with other populations of Lesser White-fronted Geese, by 2025 at latest.

#### Suggested actions:

- Annual monitoring of staging Lesser White-fronted Geese, including via the Species Reporting System (Artportalen).
- Annual counting of Lesser White-fronted Geese in the release area in Norrbotten, Västerbotten.
- Inventory of Lesser White-fronted Geese in known breeding areas with recent indications of breeding.
- Documentation of the Swedish Association for Hunting and Wildlife Management's Lesser White-fronted Goose project.
- Import of wild Russian birds for breeding.
- Import of wild Norwegian birds for breeding.
- Holding of breeding birds in captivity – Öster Malma
- Establishment of breeding facilities – "Nordens Ark"
- Holding of breeding birds in captivity – "Nordens Ark"
- Selection, restoration and management of staging and moulting sites along flyways.
- Investigate the prospects for survival of the Fennoscandian population and its expansion to Sweden.
- Investigate the prospects of survival for the reintroduced population.
- Investigate various release methods.
- Investigate the legal, practical, economic and ethical consequences of capturing and/or destroying the Swedish reintroduced population in accordance to the recommendation of the Scientific Council.
- Compile knowledge on the ecological requirements of the Lesser White-fronted Goose.
- Protection of important sites for Lesser White-fronted Geese.

- Communication to the authorities in countries with staging or wintering Lesser White-fronted Geese.
- Participation in international work on Lesser White-fronted Geese.
- Final report on genetic studies carried out in Sweden.
- Annual meeting with Nordic bodies working on Lesser White-fronted Geese (Sweden, Norway, Finland).
- Destruction of hybrids.
- Information to hunters in Sweden.
- Create a website on work on Lesser White-fronted Geese.

Unfortunately, for reasons unknown, this NAP process stopped. Then, nearly four years later, on the 5th October 2010, a new draft was circulated as a consultation document by SEPA. This draft document had little in common with the previous draft from 2006, and in 2011 the Swedish authorities published the National Action Plan (NAP) for the Lesser White-fronted Goose in Sweden (Naturvårdsverket 2011). Despite critical comments and concerns expressed both by the BirdLife partner in Norway, the national nature conservation authorities both in Norway and Finland as well as the AEWA Secretariat (in particular regarding the discrepancies with the 2008 ISSAP), none of the expressed worries or critical comments contributed to any amendment of the draft, and it was finally published with very few changes in May 2011.

As indicated above, the current Swedish National SAP is not in line with the AEWA ISSAP which constitutes the agreed international conservation framework for the species, and the actions outlined therein mainly concern the Swedish reintroduced population, but without distinguishing between original wild and reintroduced populations in the description of the species.

The Swedish NAP uses the decreasing trend of the original wild Fennoscandian population as a justification for the continuation of the reintroduction following the method currently being used. The main goal of the NAP is the growth and expansion of the Swedish reintroduced population, and no actions are outlined to prevent the Swedish population from mixing with the wild Fennoscandian population. In fact, in direct contradiction to the concerns and goals of the other range states to the Fennoscandian population and the ISSAP, SEPA seems to be strongly in favour of the two populations mixing in the wild, apparently with no regard for the possible threats this poses to the original wild Fennoscandian population.

The Swedish NAP uses the high hunting mortality along the migration routes of the wild Fennoscandian Lesser White-fronted Geese as an argument in favour of continuing activities to increase the population that uses the human-modified migration route and wintering areas. On the other hand, the Swedish NAP also states that if the hunting problems can be solved, the choice of the human-modified migration route may be reversed. The latest results from the conservation actions for the Fennoscandian population show that the hunting problem can be mitigated. In addition to the enhanced management of hunting and poaching along the migration routes, the securing of egg clutches of the breeding Lesser White-fronted Geese in Norway has been shown to be a key factor to alleviate the hunting problem. The Lesser White-fronted Geese moulting in the Fennoscandian breeding areas (with their broods) will not choose the easterly (and dangerous) migration route (see **chapter 3.1** for a detailed explanation), but instead migrate to Greece via Hortobágy in Hungary (which is a fully protected area) (Ecsedi et al. 2009). On this migration route there is only one stopover site in Russia (the protected area - Shoyna Zakasnik) on the Kanin Peninsula that was established after the Fennoscandian Lesser White-fronted Goose population was tracked to this area by satellite telemetry in 1995 (Aarvak et al. 1998). This site holds significant numbers of the Fennoscandian population for a short period in autumn (Tolvanen 1996), and hunting is not currently

considered to be a problem at this site. We therefore would like to see this fact taken into account in the further process of updating both the Swedish NAP as well as the ISSAP.

Throughout the document, the authors of the Swedish NAP have rewritten the common knowledge about Lesser White-fronted Geese and presented definitions as well as facts that are in direct contradiction to what has been agreed by the other range states in the AEWA Lesser White-fronted Goose International Working Group. While it is true that the original Swedish Lesser White-fronted Goose population was part of the wild Fennoscandian population, the present Swedish reintroduced population can by no means be defined as belonging to the original wild population (see **chapter 5.3**). The fact that (and if so, contrary to the statements of the Swedish project itself in the 1980s and early 1990s) some few individuals of wild Fennoscandian Lesser White-fronted Geese remained in the reintroduction area in the early 1980s, it does not change the fact that the present Swedish free-flying population is a separate reintroduced one, as discussed in more detail in **chapters 4.1, 5.1, 0** and 5.4.

The Swedish National Action Plan (NAP) – and to a certain degree also the 1st consultation draft of the AEWA ISSAP circulated to range states in 2013 (see **chapter 7.1**) – redefined the Swedish free-flying reintroduced population as reinforced, instead of reintroduced. We consider this conception to be an erroneous interpretation of scientific facts, in order to improve the acceptability of the reintroduction of Lesser White-fronted Geese in Sweden. The Swedish reintroduction project which took place in the 1980s and 1990s was confronted by the Norwegian Lesser White-fronted Goose conservation project, because wild Fennoscandian Lesser White-fronted Goose still bred on the Norwegian side close to the mountain area of Lesser White-fronted Goose releases in Sweden (Svaipa Nature Reserve in the Arjeplog mountains). When the worries were expressed that a small part of the Fennoscandian population at the time still could be breeding close to the reintroduction area, thus posing the risk of being “swamped up” in the reintroduced population, *Projekt Fjällgås* provided assurances that the reintroduction was carried out in an area where wild Lesser White-fronted Geese were extinct. Regardless of the political motivation of redefining the reintroduction as a supplementation, it is undisputable that the Swedish population is fundamentally different from the original wild Fennoscandian population regarding the genetics, population demographics, migration route and behaviour during migration and moulting. Even the habitat preferences and the feeding ecology of the Swedish reintroduced birds are different to the original wild populations of Lesser White-fronted Geese (see **chapter 5.6.2** for details). The Swedish reintroduced population does not show the typical characteristic of wild populations of Lesser White-fronted Geese, namely that of being a habitat specialist during migration and wintering, and thus it is the only *Anser*-species dependent on natural low growth steppe and saltmarsh habitat.

It is also noteworthy that the Swedish National Action Plan has omitted all references to the publications from the early phases of *Projekt Fjällgås*, where it was scientifically well documented and clearly described that the project was a reintroduction. It was clear from the start that the sole idea of using Barnacle Geese as foster parents was to alter the migration route away from the species’ traditional (natural) distribution area.

There are some further interesting points to be aware of considering the Swedish Lesser White-fronted Goose NAP:

- The Swedish Lesser White-fronted Goose NAP includes no data showing the development in the Swedish reintroduced free-flying population, but describes in detail the status of the original wild Fennoscandian population.
- The Swedish Lesser White-fronted Goose NAP presents no information about the high hybridisation rate between the reintroduced Lesser White-fronted Goose population and

Barnacle Goose, which in the period 2004-2014, hybrids in numbers accounted for 14.6% of the total Swedish Lesser White-fronted Goose population (see **chapter 5.2.6** for details).

- The Swedish Lesser White-fronted Goose NAP presents a thorough argumentation for the existence of a natural Lesser White-fronted Goose migration route to the Netherlands, although this is evidently not true (see **chapter 3.2** for details).
- In the chapter on experiments with ultra-light aircraft in 1999, the Swedish Lesser White-fronted Goose NAP states that (page 31): *“Most birds were re-caught when they returned to the locality where they were released, though a small number avoided being caught and remained free”*. This is not the truth, as only 12 birds (40%) were re-caught and the majority remained free (see **chapter 4.3** for details).

The Swedish NAP also states that Swedish authorities do not consider the past introgression of Greater White-fronted Goose genes into the reintroduced population as a major problem. In our opinion, the Swedish Lesser White-fronted Goose NAP in its current form is to be considered only as a political statement presenting suitable data and leaving out undesirable data, with the aim to justify the existing reintroduction project and to trivialize the impact of the documented problems with the Swedish reintroduced population. By making its own definitions and hiding essential facts, the Swedish NAP contributes in blocking international efforts in saving the original wild Fennoscandian Lesser White-fronted Goose from extinction.

## 9. CONCLUSION AND RECOMMENDATIONS

The negative consequences of releasing captive-bred birds into the wild can be considerable. There are several forms of release in current use, and the definitions of these are summarised in this current report. Birds may be released for conservation, for ornamental or for economic purposes. Here we have examined the consequences of releases of Lesser White-fronted Geese into the wild. There have been many releases since the first ones took place in 1981, and a number of different methods have been used.

The intention of all of the release projects has been to increase the number of Lesser White-fronted Geese in a given area, or to re-establish a breeding population where it has disappeared. Some of these release projects have involved manipulation of the migration route and wintering areas for the geese, and some planned projects that have not been started at the time of writing have also intentions to manipulate both the routes that the Lesser White-fronted Geese fly, their staging areas and their wintering areas. The intention of altering which areas are used by geese has been to take the released birds to areas which are considered safer than those used by their wild conspecifics. However, the former as well as the current (and planned) release projects do not solve the issue of safeguarding the existing wild Fennoscandian population of Lesser White-fronted Geese. On the contrary, releases of Lesser White-fronted Geese have instead presented new elements, which may threaten the very survival of the remaining wild population of Lesser White-fronted Goose in Fennoscandia. By implementing measures to help safeguard the small population of breeding Lesser White-fronted Goose in Fennoscandia, such as safeguarding of sites used and by improving breeding conditions and adult survival using predator control, then the wild Fennoscandian population is currently on the increase and is slowly reoccupying areas with its former range where it has been absent for many years.

Former and current release projects threaten the existing wild population in many ways. Released birds are occurring within the range of the wild Fennoscandian population. The negative effects posed by these released birds upon the wild population include:

- Birds from previous release projects and which carry genetic material from other goose species (Greater White-fronted and Greylag Geese) were never culled, and these birds and/or their descendants are currently at large. There is a real risk of genetic regression following contact between wild Lesser White-fronted Geese and birds of poor genetic make-up. Continued releases of birds into the Swedish reintroduced population does not have only the effect of hopefully diluting the amount of alien genes in the population, but has also the intention of increasing the Swedish reintroduced population.
- Released birds with a deviant behaviour and with a different migration route compared to wild birds may follow the wild birds, or alternatively the wild birds may follow the released birds. Such change in site usage would result in the wild population using sites that are not within the natural flyway for the wild birds. An exodus of birds from the wild population following emigration to the sites used by the released birds could be detrimental to the wild population.

There are a number of ethical issues to releasing Lesser White-fronted Geese into the wild, not least to releases of birds without any parents or foster parents. These negative effects include:

- Birds that are released lack the social skills necessary for survival in the wild that they would learn from their parents.
- Birds that are released without parents disperse in all directions from their release sites, and therefore are a serious risk if they enter the wild population.



The conclusions of this critical review are that releasing Lesser White-fronted Geese is not a solution to the problems faced by the wild population, but that such releases is an additional burden upon the wild population. The best way to safeguard the existing wild population of Lesser White-fronted Geese and to ensure it attains a more favourable conservation status is to continue the management regime currently in place in areas where the wild Fennoscandian population occur (breeding, staging and wintering sites). Releasing Lesser White-fronted Geese does not help to safeguard the wild population, but rather there is very good evidence that the release projects are jeopardizing the continued existence of the Lesser White-fronted Geese as a wild bird breeding in Fennoscandia and staging and wintering in traditional areas.

As the Fennoscandian population is currently increasing at an annual rate of 15%, then there is a good chance that the species may naturally recolonise the former breeding areas in Sweden and Finland. The desired scenario included in both the Norwegian and the Finnish national action plans for the Lesser White-fronted Goose is that the species will recolonise its former breeding areas within the scope of the next ten years. The unfortunate consequences of the wild birds coming into contact with the released birds in terms of altered behaviour, altered site usage, change in habitat use, genetic introgression and reduced viability are serious threats to the existence of the remnant wild population of Lesser White-fronted Geese.

Changes have been proposed to alter the status of the Swedish population in the current draft International Single Species Action Plan for the Lesser White-fronted Goose. Such a change of status would pave the way for more birds to be released. If the releases are stopped now, then the majority, and perhaps all, of the released Lesser White-fronted Geese in Sweden would gradually disappear as we have shown in this report that they have a low annual survival, that mortality of the released birds is high, and that the return rate to the natal area is low. By stopping releases of birds immediately, then the risk of the wild population coming into contact with the released birds can be greatly reduced and perhaps even eliminated.

The Fennoscandian Lesser White-fronted Goose conservation project considers an increase in the size of the Swedish reintroduced population as an increased potential threat to the wild Fennoscandian population. It will therefore incur a major contradiction to continue actions to increase the Swedish reintroduced population side by side with actions for the wild populations in the International Single Species Action Plan (ISSAP).

If adopted in 2016, a possible renewed ISSAP would be operable for 10 years. The Norwegian National Action Plan for the species has as a goal to reach 1,000 individuals within the same timescale. An International SSAP that is not clear in addressing the genetic and ecological problems and possible threats from the Swedish reintroduced population will be an obstacle, rather than a means to reach the conservation goals.

In the opinion of the Fennoscandian Lesser White-fronted Goose project, there are two acceptable options to move on with the work on the ISSAP as we can see it from the:

1. Address the genetic and ecological problems of the reintroduced populations in an updated ISSAP in a similar way as in the 2008 ISSAP.
2. Limit the focus of an updated ISSAP to original wild Lesser White-fronted Goose populations only.

A third option would be not to update the action part of the ISSAP at all, unless unanimous views can be reached. However, Sweden is not following the current ISSAP either so there does not seem to be any reason to continue with a plan that includes the Swedish reintroduced population. There are no

guarantees that Sweden will in fact follow a new action plan which has not been modified specifically to meet their goals. The input from Sweden in the process of updating the ISSAP has delayed the update process for several years. As the current ISSAP from 2008 is still valid unless replaced by an updated plan, this would be an option to consider. In that way we can avoid a further process, where Sweden is involved and which probably would further delay the update process. It is important to stop this practice, which for many years has taken up much of the time of both management authorities and research/conservation projects which are working towards the goal that the wild Fennoscandian population of Lesser White-fronted Geese can again recolonise its former haunts – both in Finland, Sweden and Norway.

## **10. ACKNOWLEDGEMENTS**

We appreciate the help of a large number of persons and organisations in helping to provide information used in the compilation of this current report. Without their help, the information presented would have been less complete.

Hisko de Vries helped with an extract of all Lesser White-fronted Goose observations for the Netherlands recorded at Waarneming.nl (<http://waarneming.nl>) and Kees Koffijberg (Sovon Vogelonderzoek Nederland) helped with recent estimates of the wintering population in the country. Gerald Driessens (Natuurpunt) helped with interpretation of results from the Belgian bird database (<http://waarnemingen.be>). Timme Nyegaard (BirdLife Denmark) extracted observation data from the Danish national database “DOFbasen” (<http://dofbasen.dk>), Nigel Hudson (secretary of the British Birds Rarities Committee) supplied the complete dataset of the Rarities Committee, while Peter C. Lack provided all Lesser White-fronted Goose data stored by the British Trust for Ornithology (BTO). Additional information on occurrences in the United Kingdom were provided by Alan Leitch and Sean Nixon. Petteri Tolvanen (WWF Finland), Juha Markkola (Finnish Lesser White-fronted Goose working group) and Aki Arkiomaa (BirdLife Finland) helped with information about the past national release program as well as translation and details about the illegal releases and three court cases in Finland. Petteri Tolvanen also provided valuable comments on an early draft of the report and David Bogyo (Hortobagy National Park Directorate) helped with overview of the number of observed escapees or reintroduced birds observed in Hungary. Data on numbers of registered Lesser White-fronted Geese in captivity was kindly supplied by Erika Fronk (International Species Information System, currently known as Species 360).

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## Appendix A - Letter from Hans Meltofte, ICBP, dated 23.12.1988

ICBP-Danmark  
att. Jon Fjeldså  
Zoologisk Museum  
Universitetsparken 15  
DK-2100 København Ø

23.12.1988

Til ICBP-Norge, -Sverige og -Finland  
samt styremedlemmerne af Skandinavisk Ornitologisk Union

Kære venner,

På SOU's sidste møde i København den 22. oktober d.å. besluttedes det at søge at få startet et fællesnordisk projekt for udredning af årsagerne til dværggåsens nedgang i Nordskandinavien med henblik på at kunne få gang i beskyttelsen af den oprindelige bestand. Dette skal ikke ses som et angreb på det nuværende svenske "Projekt fjellgås", men tvært imod så vidt muligt foregå i samarbejde med dette. Dog håber flere af os, at man vil udskyde udsætningen af flere opdrættede dværggæs indtil det har vist sig, om vi kan redde den naturlige bestand.

Som medlem af forretningsudvalget i ICBP's europæiske sektion har jeg overvejet at forelægge det vedlagte resolutionsforslag ved sektionens møde i Tyrkiet nu til maj. Jeg vil derfor være meget interesseret i synspunkter på resolutionen - både positive og negative - for om muligt at kunne forelægge den i bred enighed.

mange hilsner  
og ønsket om et godt nytår

*Hans.*  
Hans Meltofte

Proposal

The ICBP conference of the European continental section held in Adana, Turkey, 16-20 May 1989

- expresses its appreciation for the great concern and efforts the Swedish Hunters Association is showing to save the dwindling population of Lesser White-fronted Geese in northern Scandinavia,
- at the same time is concerned by the fact that no comprehensive studies has been initiated to establish the key factors responsible for the decline,
- also sees some risk that the artificial population raised by Barnacle Goose foster-parents and thereby induced to migrate to North-west Europe in winter - if successful - will compete with the remaining wild population and thereby put them under further pressure,
- recommends that a study on the problems of the Scandinavian population of Lesser White-fronted Geese is made throughout its annual cycle, and in cooperation between all organisations and institutions concerned with and responsible for the safeguarding of this highly endangered population,
- and further recommends that all possible efforts to save the natural population is made before further introductions of artificially reared birds are carried out,
- wants to point out that the artificial rearing and reintroduction of a new population can not be considered an urgent matter, as long as many Lesser White-fronted Geese breed in bird parks in Europe,
- and finally wants to offer the full support and help of ICBP to save the Scandinavian population of Lesser White-fronted Geese in cooperation with all interested parties whether on the breeding grounds, at the staging areas in eastern Europe or on the badly known wintering grounds somewhere around the Black Sea.

## Appendix B - Letter from Danish Ornithological Society dated 16.11.2005

**KOPI**  
**TIL ORIENTERING**

Naturvårdsverket  
Blekholmsterrassen 36  
S-106 48 Stockholm  
Sverige

16. november 2005

**Udsætningsprogram og ændring af trækrute for Fjällgås (*Anser erythropus*) i Sverige**

Dansk Ornitologisk Forening (DOF) er blevet bekendt med at Naturvårdsverket har givet tilladelse til endnu et nyt udsætningsprogram for Fjällgås (*Anser erythropus*) i Sverige. Projektet indebærer udsætning af 25 gæs i 2006 og eventuelt også i 2007. Gæssene skal have indlært en helt ny og for denne art helt unaturlig trækrute over Danmark og Tyskland til Nederlandene.

DOF vender sig kraftigt imod dette projekt. Foreningen har stor sympati for gode initiativer der kan hjælpe den naturlige bestand af Fjällgås i Skandinavien, men DOF mener ikke at det nu tilladte projekt er egnet hertil. Med en eventuel ny population af SW-trækkende Fjällgås vil der med stor sandsynlighed kunne ske en udkonkurrering af den meget sårbare, lille bestand af rigtige Fjällgæs med naturligt trækmønster mod sydøst til vinterkvarterer i Sydøsteuropa og Asien.

I Danmark er der bred enighed blandt alle interesseorganisationer i Vildtforvaltningsrådet (under Miljøministeren og Skov- og Naturstyrelsen) om at ophjælpning af truede arter kun i undtagelsesfald bør ske ved reintroduktionsprojekter, og aldrig således at det ændrer arternes naturlige adfærd eller trækmønstre. Vildtforvaltningsrådets natursyn kan læses her: <http://www.skovognatur.dk/Emne/Jagt/Vildtforvaltning/Vildtforvaltningsraadet/Dokumenter/Natursyn.htm>

Det er DOF's klare opfattelse at udsætningsprogrammer der konkret berører andre landes naturforhold og fuglebestande, kun bør gennemføres hvis det er forhandlet og aftalt med de berørte landes myndigheder. DOF vil derfor gerne henstille til Naturvårdsverket, at der snarest muligt gennemføres en høringsproces der involverer alle de lande og parter der berøres af det aktuelle projekt. Det gælder ikke mindst de danske naturmyndigheder der må forventes at blive berørt enten ved flyvningen med gæssene fra Sverige til Nederlandene eller når de udsatte Fjällgås i de kommende år selv skal finde vej til og fra udsætningsområdet i Sverige.

Med venlig hilsen  
**Dansk Ornitologisk Forening**  
**BirdLife Danmark**

*Christian Hjorth*

Christian Hjorth  
Formand

*Knud N. Flensted*

Knud N. Flensted  
Biolog

Cc:  
Skov- og Naturstyrelsen, Haraldsgade 53, 2100 København Ø  
Sveriges Ornitologiska Förening, Ekhagsvägen 3, S104 05 Stockholm, Sverige

**Dansk Ornitologisk Forening**



Vesterbrogade 138-140 • DK-1620 København V • Telefon 3331 4404 • E-mail: [dof@dof.dk](mailto:dof@dof.dk) • [www.dof.dk](http://www.dof.dk)  
Danske Bank, reg. nr. 4180 konto 4180 634932 • CVR nr. 33 97 26 28

**BirdLife**  
INTERNATIONAL

## Appendix C - Letter from Norwegian Directorate for nature management dated 30.04.2004



Directorate for **Nature Management**

**The Swedish Environmental Protection Agency**

Your ref.:

Our ref.:  
04/2272 ARTS-AM-ME  
File Key:  
444.24

Date:  
30.04.2004

### NORWEGIAN POSITIONS CONCERNING CONSERVATION OF THE LESSER WHITE-FRONTED GOOSE

The Norwegian Directorate for Nature Management (DN) expresses concern with regard to the present situation for the conservation of the Fennoscandian population of Lesser white-fronted goose *Anser erythropus*. DN regrets that we still have not achieved a joint understanding that could pave the way for common priorities to secure the survival of the endangered population.

For several years there has been uncertainty and concern about genetic aspects of the Swedish reintroduction project as well as the Finnish captive stocks of Lesser white-fronted goose. As it has been documented that the genotype of these birds represents a blend of different populations and also another species (White-fronted goose *Anser albifrons*), we fear that this could have unintended and serious consequences on the wild population.

These findings highlight the need for a sound knowledge basis, thorough assessments of risks and consequences and international/regional consensus on principles and practice prior to introduction programmes. Norway supports the International Action Plan developed for the European Commission in 1996, and consider this as a common European platform for conservation work in addition to internationally developed principles for protecting endangered species/populations and translocation/reintroduction of species.

In view of the present situation and with respect to the on-going debate on conservation strategies and actions, DN maintains a restrictive attitude to reintroduction schemes and manipulation of populations of this migratory species, and we request the Swedish Environmental Protection Agency (EPA) to take adequate measures to avoid that the introduced population will represent a threat to the remaining wild population.

As the Lesser white-fronted goose is regarded as a priority species in EU, the forthcoming discussions on priorities of conservation projects could be of vital importance to effectively safeguard the wild population in Europe. Since both BirdLife International and EPA have expressed their views, and there exist parallel conservation initiatives, we consider it important that the involved bodies clarify their positions on central aspects.

Postal address:  
N-7485 Trondheim

Phone:  
+47 73 580 500  
Fax:  
+47 73 580 501

Videoconf:  
+47 73 905 140

Internet:  
www.dirnat.no  
E-mail:  
Postmottak@dirnat.no

Executive officer:  
Morten Ekker  
Phone:  
+47 73 58 07 30

We refer to your letters of 04.02.2000 to the Norwegian Directorate for Nature Management (DN) and 22.10.2003 to the European Commission (regarding LIFE projects for the conservation of Lesser white-fronted goose), and to other correspondence and contact on the issue.

### **Background**

The situation for the Fennoscandian population of the Lesser white-fronted goose *Anser erythropus* has been very worrying for many decades. Considering the population that presumably inhabited the Fennoscandian mountain areas at the beginning of the 20th century, the current population of between 30 and 40 pairs constitutes a dramatic decrease. As a result of this development, the species is at present considered as the most endangered breeding bird species in Norway, and in the Nordic countries in general. The population level has shown a slight decrease through the last decade. The conservation status of the western and eastern main populations of Lesser white-fronted geese is not as critical (3 800-6 100 pairs/20 000-25 000 individuals in autumn).

During the last decade, Norwegian authorities, in close co-operation with among others the Norwegian Ornithological Society (NOF), have made considerable efforts to improve the population status of the Lesser white-fronted goose. Through individual satellite transmitter tagging and monitoring, migration routes and mortality factors have been documented. This has contributed substantially to focusing the conservation efforts along the migration routes.

Migratory species involve considerably larger conservation challenges than sedentary species. The Lesser white-fronted goose has long-stretched and complex migration routes, involving a number of states with different management regimes. This represents a comprehensive challenge and can directly be related to the development of the population. On this background, an International Action Plan for Lesser white-fronted goose was developed in 1996 for the European Commission (Madsen, 1996<sup>1</sup>). At the same time, Norway developed a National Action Plan (DN, 1996<sup>2</sup>). These plans each give specific guidance for conservation measures and represent the basis for the Norwegian conservation efforts.

Even though there are still considerable challenges in research and conservation, linked to for instance the population's habitat use during the breeding season in Norway and the rest of Fennoscandia, the major challenge relates to the population's migration routes and wintering areas. Through the "Fennoscandian Lesser White-fronted Goose conservation project", NOF and WWF-Finland have co-operated closely to improve the knowledge base and take action along the two main migration routes. This joint effort has also formed basis for the present EU LIFE Nature 04 proposal on securing the European migration route from Fennoscandia via Russia, the Baltic countries and Hungary to the wintering areas in Greece; a project which also DN will take part in. By securing this migration route, the western population component will have safe conditions throughout the annual cycle, and hence a sound basis for natural population growth.

<sup>1</sup> Madsen, J 1996. International Action Plan for the Lesser White-fronted Goose (*Anser erythropus*).

<sup>2</sup> DN 1996. National Action Plan for Goose Management (in Norwegian). DN-Report 1996-2.

As for the threats linked to the Fennoscandian population we have at an increasing extent become aware of worrying aspects by the release of artificially bred Lesser white-fronted geese in Swedish mountain areas, bordering to Norway, in areas which have been and can still be utilised by wild Lesser white-fronted geese. These concerns are primarily built on recent documentation of the genetic composition of the breeders and the released birds (e.g. Tegelström *et al.* 2001<sup>3</sup>) and the consequences we fear this could imply for the wild population.

### **Conservation initiatives**

As a consequence of the status and development of the Fennoscandian population, Sweden, Finland and Norway have led the way in the work on protecting the Lesser white-fronted goose populations. We have followed with interest the Swedish and Finnish initiatives to protect the Fennoscandian population through breeding and reintroduction/reinforcement. We have also noted that the Swedish model of reintroduction (including imprinting on Barnacle geese *Branta leucopsis* and change of the migration route to new wintering areas in Europe) has yielded methodological results that may benefit the conservation work. The Finnish approach has not been as successful and was for various reasons (e.g. genetic composition of the breeding population) abandoned in 1998.

We view the Swedish pioneer work, initiated by the Swedish Association for Hunting and Wildlife Management in 1981, as successful in the sense that it as a full-scale experiment has contributed to methodological development for reintroduction of a species threatened by extinction. Such methods can under certain conditions be suitable in restoration work, but have also controversial aspects.

Introduction/reintroduction of migratory species may have unintended negative consequences for biodiversity in other countries. Therefore, one of the main challenges with national measures concerning species or populations that regularly move across country borders, and thus are considered multinational conservation responsibilities, is the need for international agreement on the measures. These aspects of international administration and responsibility are also focused in several international documents/ guidelines on reintroduction, e.g. "IUCN Position Statement on Translocation of Living Organisms"<sup>4</sup>.

International consensus and roles of responsibility are basic requirements and key issues in both the Swedish and the German initiative "Aktion Zwerggans", as both these in our view have potential for negative influence on the wild Fennoscandian population. We can neither see that these initiatives are along the lines of the International Action Plan, the

<sup>3</sup> Tegelström, H., Ruokonen, M., & Löfgren, S. 2001. The Genetic status of the captive Lesser White-fronted Geese used for breeding and reintroduction in Sweden and Finland. In Tolvanen, P., Oien, I.J. & Ruokolainen, K. (Eds). Fennoscandian Lesser White-fronted Goose conservation project. Annual report 2000. – WWF Finland Report 13 & Norwegian Ornithological Society, NOF Rapportserie Report no. 1-2001: 37-39.

<sup>4</sup> IUCN/SSC (1987) IUCN Position Statement on Translocation of Living Organisms: Introductions, Re-introductions and Re-stocking

recommendations on reintroduction in the Bern convention<sup>5</sup>, the IUCN criteria for reintroductions<sup>6</sup>, nor in other ways build on necessary international clarification and support.

The "Aktion Zwerggans" is based on the same main principles as the Swedish project with respect to reintroduction and manipulation of migration routes. Upon request from the German Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (21.01.2003) to use Swedish mountain areas as reintroduction/breeding areas for a new artificial population, Swedish authorities applies, however, in its rejection (21.02.2003) partly equivalent arguments as e.g. Norway has put forward against the Swedish scheme. From the Norwegian side we are satisfied with the decision that has been made by EPA in this case, and hope that the same line of arguments will be applied also when evaluating the Swedish reintroduction project.

In the German project the lack of natural breeding sites for the new population on national grounds necessitates co-operation with other countries. Breeding localities may be perceived as critical in such a case, but for migrating species also staging and wintering sites may represent equally critical challenges. Since both projects aim to establish new populations and include manipulation of the migration routes, they will per definition constitute both reintroduction and introduction (to countries in Western Europe where Lesser white-fronted geese never have been present as a regular wintering species) with the implications this has according to existing recommendations and guidelines.

Norwegian as well as Danish scientific groups have for years been concerned about the potential consequences of the Swedish project (e.g. Norderhaug 1984<sup>7</sup>), a worry that has been reinforced as a result of the new information concerning genetic aspects. National and international bird conservation communities (e.g. BirdLife International) also share and express this concern.

In Norway we have based our conservation efforts of the Lesser white-fronted goose around the objective of protecting the existing wild population along the lines of the International Action Plan. We consider the action plan to represent a good and agreed platform, which should be successful if there is sufficient international support for the measures. We also agree with the UNEP-WCMC<sup>8</sup> in their focus on CMS as an important instrument to protect the species effectively along the different flyways.

According to our action plan and our understanding of both the International Action Plan, the recommendation No. 58 of the Bern Convention, and the IUCN guidelines for reintroduction, we have taken a restrictive position on reintroduction as a measure of conservation at this stage. Referring to the International Action Plan that opens for reintroduction as an alternative

<sup>5</sup> The Bern Convention/Standing Committee "Recommendation No. 58 (adopted on 5 December 1997) on the reintroduction of organisms belonging to wild species and on restocking and reinforcing populations of such organisms in the environment".

<sup>6</sup> IUCN/SSC (1995) Guidelines for Re-introduction

<sup>7</sup> Norderhaug, M. 1984: Captive breeding and reintroduction of northern geese. Nor. Polarinst. Skr. 181: 161-164.

<sup>8</sup> UNEP-World Conservation Monitoring Centre 2003. Report on the status and perspective of the Lesser White-fronted Goose *Anser erythropus*. CMS/ScC12/Doc.5/Attach 2.

to the extinction of the species<sup>9</sup>, we also think that such reintroduction has several controversial aspects and that it is a kind of measure that only should be considered if the Fennoscandian population is considered extinct or if it very clearly will be without possibilities to recover naturally. These circumstances are also addressed and discussed in the WCMC-report to the Scientific Committee of CMS.

We understand EPAs desire to have Lesser white-fronted geese as regular breeding birds in Sweden. However, the Lesser white-fronted goose still exists within parts of its natural distribution area in Fennoscandia, and the fact that the Fennoscandian population at present only has known breeding sites within Norwegian territory may be due to temporary coincidences and deficient knowledge about the breeding distribution. The Finnish working group on Lesser white-fronted goose has observed a bird with breeding-type behaviour in Northern Sweden as late as 1998<sup>10</sup>, as well as single birds in Finnish Lapland almost annually, and it is very likely that the remaining population regularly utilises bordering mountain areas in Sweden and Finland during breeding and moulting periods.

The key role of northern Fennoscandia as breeding and rearing areas for the remaining population underlines the importance of Sweden, Finland and Norway appreciating this as a common population for which we have a joint responsibility to protect. This comprise national maintenance of both existing and previously utilised Lesser white-fronted goose habitats in this area, and prevention of factors that may affect the population negatively. By defining the Lesser white-fronted goose as extinct in Sweden and on that basis implement or continue reintroduction actions, unforeseen impacts may arise that turn out to weaken the possibilities to protect the original population.

#### **Concern about genetic composition and consequences of reintroduction**

From an isolated perspective it could be argued to be an internal national matter when Swedish authorities permits reintroduction of a new population of Lesser white-fronted goose within Swedish territory. However, in our view problems arise when this population starts utilising habitats of the wild population, and potentially or factually interferes with the wild population that we attempt to protect in co-operation with other countries along the migration route and in the wintering areas. The Norwegian areas (Rana, Hatfjelldal, Borgefjell) that border on the Swedish reintroduction area (Svaipa) have been, and probably still are, used by a southern offshoot of the Fennoscandian population. These areas will therefore be retained as intact recruiting or expansion areas for the core population in Finnmark. As late as in 2003 a pair of Lesser white-fronted geese that probably belongs to the original Fennoscandian population was observed on the Norwegian side of this region (Borgefjell). We do not know very well the status of this segment of the population, but potentially both habitat competition, transfer of diseases and hybridisation with individuals from the Swedish reintroduced

<sup>9</sup> *"Reintroduction and restocking may be accepted as an alternative way to minimise the risk of extinction of the species but should be applied only when other efforts to conserve the wild population appear to fail and the IUCN criteria for reintroductions are met".*

<sup>10</sup> Pääläinen, J. & Timonen, S. 1999: Field work in Lapland. In: Tolvanen, P., Øien, I.J. & Ruokolainen, K. (eds.): Fennoscandian Lesser White-fronted Goose conservation project -Annual report 1998. - WWF Finland report No 10 & NOF Rapportserie Report No 1-1999: 35-36.



population may be relevant threat factors. During recent years Swedish reintroduced birds have regularly been observed on the Norwegian side, not far from these sites.

The conclusions from the project that shall clarify the genetic status of the birds in the Swedish breeding and reintroduction programme are not yet finalized. However, the present documentation demonstrate that the reintroduction birds represent a genetic mixture of different populations as well as at least three different mitochondrial-DNA lineages of White-fronted geese *Anser albifrons*. This implies that these individuals in the context of conservation biology may be viewed as a "novel form". Hybridisation will change the genetic composition of the wild population and may also cause outbreeding depression that may have severe consequences for the wild population. In other species it has been shown that such hybridisation gives i.a. reduced fitness in offspring that can be detrimental to the wild population<sup>11</sup>. Furthermore we know that the Swedish breeding stock has been subject to outbreaks of disease (Andersson 2004<sup>12</sup>), increasing the risk for transfer of infections to wild individuals.

The combination of genetic introgression (mixing), possible outbreeding depression, human influence and imprint/manipulation of migration routes may also affect the predictability of the introduced birds' movements during the breeding season, mating behaviour and so forth, and hence cause increased risk for mix-up of the populations and subsequently negative influence of the wild population.

#### **International framework and national implications**

In the Convention of Biological Diversity (CBD) the genetic level is included as a responsibility for conserving biodiversity. This is also implicit in a number of other international nature conservation conventions that both Norway and Sweden have ratified. The Bern convention, the Bonn convention and also the EU wild birds' directive all have additional specific requirements to member states when it comes to threatened species and reintroduction actions.

The Stockholm Declaration on the Human Environment (1972), Principle 21, nails down that "*States have the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other states or of areas beyond the limits of national jurisdiction*". This principle has also been raised in the IUCN Position Statement on Translocation of Living Organisms, when referring to international administration – which is a key issue when it comes to such measures applied to migrating species and populations.

The Bonn Convention Recommendation no. 58 and the IUCN guidelines for reintroduction represent the most material framework descriptions for reintroduction of species to date. We cannot see that the Swedish reintroduction programme falls within this framework, as it is

<sup>11</sup> McGinnity, P. et al. (2003): Fitness reduction and potential extinction of wild populations of Atlantic salmon, *Salmo salar*, as a result of interactions with escaped farm salmon. Proc. R. Soc. Lond. B.

<sup>12</sup> Andersson, Å. 2004: The reintroduction of the Lesser White-fronted Goose in Swedish Lapland – a summary for 2000-2003. In: Aarvak & Timonen. (Eds.): Fennoscandian Lesser White-fronted Goose Conservation Project Annual Report 2004, In press.

also presupposed in the International Action Plan for Lesser white-fronted goose (cf. footnote 9).

The precautionary principle and demand for thorough analysis, risk assessment and scientific follow-up are included in all international framework documents describing and limiting translocation activities. All these documents have, however, in common that they were developed in the 1990's, many years after the Swedish reintroduction programme was initiated. This makes it understandable that the programme does not meet current demands and criteria.

Taking into account the reintroduction moratorium from EPA (taking effect in 1999) Swedish authorities now stand at a crossroads where it would be natural to evaluate the introduction programme on a more general basis, not only with respect to genetic issues, but also in the light of international framework conditions, hereunder risk assessment and so forth. From the Norwegian side we are prepared to continue the discussions, but we think it can be appropriate that the principal aspects will be thoroughly examined and clarified by an internationally competent body. Also in order to develop and strengthen the international understanding and acceptance linked to this complex issue.

#### **Urgent steps to conserve the Fennoscandian population**

The question of genetic definition and conservation of populations has become a key issue in this case. According to Ruokonen *et al.* (2003) the genetic analysis indicates that the Fennoscandian population is a genetic distinct unit that is separated from both the Siberian breeding population and Lesser white-fronted geese that breed in the European part of Russia. According to the CBD, these populations should hence be separate management units.

In the letter to the European Commission (22.10.2003) EPA refers to the Swedish introduced population as the only breeding Lesser white-fronted goose population within the EU. On this background it is claimed: "*Sweden has a great responsibility to maintain and to increase the population size*". These statements may however have consequences beyond Swedish borders, and for Norway we fear a population increase and the potential impact of a strong introduced population in these areas that could expand further and eventually "absorb" individuals from the wild population in Fennoscandia. In the longer term, this may contribute to ruin the Fennoscandian population of Lesser white-fronted geese as we know it today. Recent data from Sweden indicates that the breeding area of the population is about to expand even without new supplies of birds during the latest three years (Andersson 2004).

Until a joint international policy exists, and if possible a genetic analysis of the entire introduced population, the Norwegian position is that it is unwise to continue the introduction of Lesser white-fronted geese, even if one should gain access to birds from Russia (representing pure breeding material). Although culling of captive individuals with known undesired genotype has been initiated from the Swedish side, as well as a preliminary cease of introduction awaiting the conclusions from the genetic analysis, we think there is need for more comprehensive actions to avoid the wild population being subject to further threats.

Direktoratet for **naturforvaltning**

We are aware of the marginal status of the Fennoscandian population of Lesser white-fronted goose, and the problem that small populations easily can be exposed to episodes/disasters which suddenly can wipe out the population. Hence, we are prepared to discuss an adequate way to secure a genetic basis for a possible future joint reintroduction effort if that should prove necessary. Unpublished data from the resting areas in Hungary indicate however that the Fennoscandian population could be over the most critical stage. In 2003 almost all of the birds recorded during the post breeding migration in Finnmark were observed in resting areas in Hungary, and the same group was observed in Greece in January 2004 almost without loss of individuals. Earlier it has been assumed that only approximately half the population utilises the western/European migration route, but if the data from this year represent a more permanent change of the population's migration route it signals a potential population increase in the years to come - if this flyway can be protected effectively. Further securing of the population and habitat improvements along the western migration route through a wide European initiative could then be crucial to protect the Fennoscandian population of Lesser white-fronted goose.

The preconditions to achieve positive results in conservation work on both the Fennoscandian population and the main populations breeding in Russia have changed substantially during later years, also due to the political opening towards Russia and other countries with key roles in the conservation work. We think that all parties that are responsible or interested see the necessity for a holistic effort to protect viable wild populations of the Lesser white-fronted goose, but we recognize that there are still quite substantial differences in the views on how to achieve this objective. Faced with this challenge it is in our view vital to devote modern conservation biology principles as a basis, and to follow international guidelines if reintroduction/ reinforcement is found to be necessary.

We wish to see EPA as a strong co-player in a future wide co-operation to conserve and rebuild the Fennoscandian population of Lesser white-fronted goose, and ask that our concerns will be carefully considered as part of an evaluation of the Swedish reintroduction programme.

Yours Sincerely

Janne Solli  
Director General

Yngve Svarte

Direktoratet for **naturforvaltning**

**C.c.**

European Commission, B1049, Brussels, BELGIUM (Att. Bruno Julien, DG ENV/D.1; Bernard Brookes, DG ENV/D.1; Nicholas Hanley, DG ENV/B.2)

Ministry of Environment, Postboks 8013 Dep, 0030 Oslo

Ministry of Environment, Tegelbacken 2, 103 33 Stockholm, SWEDEN

Ministry of Environment, Kasarmikatu 25, P.O. Box 35, FIN-00023, Government, Helsinki, FINLAND  
(Att. Pertti Rassi; Esko Jaakkola; Matti Osara)

Ministry of Environment, Nature Conservation and Nuclear Security, Bonn, Heinrich-v, Stephan-Str 1, 53 175 Bonn, GERMANY

Ministry of Agriculture, Nature Mgmt & Fisheries, The Hague, THE NETHERLANDS

Bern Convention, Council of Europe, Secretariat General, F-67075 Strasbourg Cedex, FRANCE

CMS Secretariat, UN-Premises, Martin-Luther-King-Str. 8, D-53175 Bonn, GERMANY

AEWA, African-Eurasian Migratory Water Bird Agreement, UN-Premises, Martin-Luther-King-Str. 8, D-53175 Bonn, GERMANY

BirdLife International, European divisjon, Wageningen, Droevendaalsesteeg, 3a PO Box 127, NL-6700 Wageningen, THE NETHERLANDS

IUCN Species Survival Commission, Rue Mauverney 28, CH-1196 Gland, SWITZERLAND

Wetlands International, PO Box 471 6700 AL Wageningen, THE NETHERLANDS

Wetlands International - Goose Specialist Group, att: Bart Ebbing, Internationaal Natuurbeheer, Centrum voor Ecosystemen, Alterra, Postbus 47, 6700 AA Wageningen, THE NETHERLANDS

CAFF, Conservation of Arctic Flora and Fauna, att: Kent Wohl, U.S. Fish and Wildlife Service, Anchorage, Alaska 99503 U.S.A.

WWF Finland, Lintulahdenkatu 10, 00500 Helsinki, FINLAND

WWF Norway, Kr. Augustsgt. 7a, Postboks 6784 St. Olavs plass, 0130 Oslo

WWF Sweden, Ulriksdals slott, 17081 Solna, SWEDEN

BirdLife Suomi Finland ry., P.O.Box 1285, FIN-00101 Helsinki, FINLAND

Norwegian Ornithological Society, Sandgata 30B, N-7012 Trondheim

Swedish Ornithological Society, Ekhagsvägen 3, 104 05 Stockholm, SWEDEN

Direktoratet for **naturforvaltning**

Projekt Zwerggans, att. Wolfgang Scholze, 2nd Co-Chairman, Deutscher Aero Club, Referat Umwelt & Natur, Hermann-Blenk-Str. 28, D-38108 Braunschweig, GERMANY

Swedish Lesser white-fronted goose project, att. Åke Andersson, Ringgatan 39C, SE-75217 Uppsala, SWEDEN

Swedish Hunters Association, Öster-Malma - 611 91 Nyköping, SWEDEN

Danmarks Miljøundersøgelser att. Jesper Madsen, Afdelingen for Arktisk Miljø, DMU Postboks 358, Frederiksborgvej 399, 4000 Roskilde, DENMARK

## Appendix D – Dutch Council of State ruling of 17th March 2004

LWfGoose HAC Ruling of 17 March 2004.doc

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**LJN number: AO5747 Case number: 200305428/1**

Source: Council of State, The Hague

Date of judgment: 17 March 2004

Date of publication: 17 March 2004

Type of case: administrative law - administrative law (other)

Type of proceedings: first instance - panel of three State Councillors

200305428/1.

Date of judgment: 17 March 2004

### ADMINISTRATIVE JURISDICTION DIVISION

Judgment in the case between:

“Stichting De Faunabescherming”, a foundation with its registered office in Amstelveen, The Netherlands, Appellant,

and

the Minister of Agriculture, Nature and Food Quality, Defendant.

#### 1. Course of the Proceedings

In a decision rendered on 21 March 2003, the Defendant refused to designate the area specified by the Appellant in the application, namely “De Abtskolk-De Putten”, as a “Special Protection Area” (hereinafter “SPA”) within the meaning of Article 4(1) and (2) of Directive 79/409/EEC of the Council of the European Communities of 2 April 1979 on the Conservation of Wild Birds (OJEC 1979, L 103; hereinafter “Birds Directive”).

In a decision rendered on 7 July 2003, the Defendant declared that the objection filed to that decision was unfounded.

In a letter dated 14 August 2003, the Appellant lodged an appeal against this decision with the Council of State, which received the appeal on 15 August 2003.

In a letter dated 24 October 2003, the Defendant submitted a statement of defence.

The Division dealt with the case at its session on 13 January 2003, at which there appeared the Appellant, represented by A.M. Nijboer and B. Arentz, lawyers practising in Amsterdam, and the Defendant, represented by H.D. Strookman and J.A.W.M. Ponten, officials of the Ministry.

#### 2. Grounds for the Judgment

2.1. In the challenged decision, the Defendant ruled the objections raised by the Appellant to be unfounded and persisted in its refusal to designate the area concerned as an SPA. In the Defendant’s view, the area specified by the Appellant, namely “De Abtskolk-De Putten”, does not qualify as an SPA for the lesser white-fronted goose.

The Defendant stated in support of its decision that the lesser white-fronted geese that winter in the Netherlands come mainly from a reintroduction programme taking place in Sweden, meaning that they do not form part of a population naturally occurring in the wild. In the Defendant’s view, the fact that lesser white-fronted geese are now regularly to be found in the Netherlands is solely the result of the said reintroduction programme, one of the effects of which has been to alter the birds’ migration route.

The Defendant also stated that there are indications that the material initially used for the reintroduction programme had involved genetic crossbreeding with a closely related

species of goose, namely the greater white-fronted goose.

2.2. The Appellant is unable to accept that decision. Where the Defendant's assertion regarding the undesirability of the introduction (or reintroduction) of the lesser white-fronted goose and the artificial alteration of the birds' migration routes are concerned, the Appellant argues that the background to the presence of the lesser white-fronted goose [in the Netherlands] is irrelevant. The Appellant argues that the mere fact that lesser white-fronted geese winter in the Netherlands requires the Defendant to assess whether an SPA should be designated for them. The Appellant also disputes the assertion that the lesser white-fronted geese to be found in the Netherlands do not belong to a population naturally occurring in the wild. It considers that the Netherlands is part of the natural range of the species concerned. Where the genetic impurity referred to by the Defendant is concerned, the Appellant argues that it is uncertain whether that such impurity is in fact involved. The Appellant also considers it impossible to determine the extent of the genetic purity of lesser white-fronted geese.

2.2.1. The area outlined by the Appellant is bounded, broadly, by the Hondsbossche Zeewering, Petten, the Noord-Hollands Kanaal, the Westfriese Zeedijk, and Camperduin, and amounts to some 800 hectares. It is used by farmers as pasture, and contains a number of artificial lakes.

2.3. Pursuant to Article 1(1) of the Birds Directive, that Directive relates to the conservation of all species of naturally occurring birds in the wild state in the European territory of the Member States. It covers the protection, management, and control of these species and lays down rules for their exploitation.

Pursuant to Article 3(1) of the Birds Directive, Member States shall take the requisite measures to preserve, maintain or re-establish a sufficient diversity and area of habitats for all species of naturally occurring birds in the wild state in the European territory of the Member States.

Pursuant to Article 4(1) of the Birds Directive, the species mentioned in Annex I to the Directive shall be the subject of special conservation measures by the Member States concerning their habitat; Member States shall classify in particular the most suitable territories in number and size as Special Protection Areas (hereinafter "SPAs") for the conservation of these species.

Pursuant to Article 27(1) of the 1998 Nature Conservation Act (*Natuurbeschermingswet 1998*), the Minister of Agriculture, Nature Management and Fisheries shall designate areas for the implementation of treaties or other international obligations regarding nature and landscape conservation, insofar as such treaties or obligations so require.

2.3.1. The Division notes that in its Judgment of 8 February 1996 in the Vergy case (C 149/94, European Court Reports 1996 p. I-00299) the Court of Justice of the European Communities (hereinafter "the Court") ruled that the Birds Directive did not apply to birds born and reared in captivity. In the same case, the Court also ruled that the Birds Directive obligates a Member State to ensure the protection of a species of naturally occurring birds in the wild state in the European territory of the Member States to which the Treaty applies, even when the natural habitat of the species in question does not occur in the Member State concerned. In so ruling, the Court considered that the Birds Directive is intended to provide protection for wild birds throughout the Community, irrespective of the areas they stay in or pass through.

In its judgment of 19 May 1998 in the case of the Commission of the European Communities versus the Kingdom of the Netherlands (Case C 3/96, European Court Reports 1998, p. I-3031), the Court ruled that Article 4(1) of the Birds Directive obligates Member States to classify as Special Protection Areas the most suitable territories in

number and size for the conservation of species mentioned in Annex I, an obligation which it is not possible to avoid by adopting other special conservation measures. It follows, after all, from that provision that as soon as birds belonging to the species indicated occur in the territory of a Member State, that Member State must designate Special Protection Areas for them. In selecting and demarcating an SPA, no account may be taken of the economic requirements mentioned in Article 2 of the Directive.

The Member States do have a certain margin of discretion in selecting and demarcating an SPA, but – as the Court already found – it is certain ornithological criteria specified in the Directive that apply to the designation of such areas. This means that the Member States' margin of discretion in choosing the most suitable territories does not concern the appropriateness of classifying as Special Protection Areas the territories which appear the most suitable according to ornithological criteria, but only the application of those criteria for identifying the most suitable territories for conservation of the species listed in Annex I to the Directive.

The Court therefore finds that the Member States are consequently under an obligation to designate as SPAs all areas which appear, according to ornithological criteria, to be the most suitable for conserving the species concerned.

2.3.2. In selecting the Special Protection Areas, the Defendant applies ornithological criteria. An area is selected as an SPA in the context of the Birds Directive if it complies with a number of criteria. Once it has been selected, its boundaries are defined. In designating areas as SPAs, the following selection criteria are applied:

1. Annex I to the Birds Directive lists the species of birds that are in need of special protection (hereinafter "Annex I species"). The list was last updated in 1997 and currently comprises 181 species. From the areas where official bird counts indicate the occurrence of an Annex I species, the five areas were selected with the greatest numbers of that species, unless fewer than two breeding pairs or five individual specimens occur in the area concerned. Areas that are among the five most important areas for the species have been designated as SPAs.

2. An area also qualifies for designation as an SPA if at least 1% of the biogeographic population of a species or subspecies of a (migratory) waterbird regularly broods, moults, feeds, and/or rests there. This applies both to migratory waterbirds listed in Annex I to the Birds Directive and to migratory waterbirds not listed in that Annex.

3. For selected areas, the restriction applies that the area concerned is only designated an SPA if, insofar as no designation orders for water are concerned, it includes at least 100 hectares which have been assigned formal nature conservation status. The intention is that only the most suitable bird areas of a certain size should be designated.

2.3.3. As appears from Annex 1B to Annex 1 (Selection criteria and method of demarcation) Part 1 (General) of the Memorandum in Response to the Birds Directive (*Nota van Antwoord Vogelrichtlijn*), the Defendant, when selecting or demarcating Special Protection Areas for designation, did not include the lesser white-fronted goose or a number of other species listed in Annex I to the Birds Directive that regularly occur in the Netherlands. As the reason for excluding the lesser white-fronted goose, Annex 1B states that the birds concerned are primarily reintroduced specimens and their offspring.

2.3.4. The lesser white-fronted goose (*Anser erythropus*) is included in Annex I to the Birds Directive.

It follows from Article 1(1) of the Directive, taken in conjunction with Article 4(1) and Annex I to the Directive, that the lesser white-fronted goose is a species of naturally occurring birds in the wild state in the European territory of the Member States to which



the Treaty applies.

Given the documentation, the Division finds that the lesser white-fronted geese deriving from the Swedish reintroduction programme cannot be classified as birds born and reared in captivity. This means that these specimens are also subject to the provisions of the Birds Directive.

It follows from the case law of the Court referred to above that Article 4(1) of the Birds Directive does not allow the Member States to make a policy decision to the effect that no Special Protection Areas should be designated for the lesser white-fronted goose. That provision does not allow for a distinction to be made according to the level of genetic purity of the birds concerned. Nor can the alteration by human intervention of the migratory route of the lesser white-fronted goose constitute a reason not to designate an SPA for that species.

In view of the above considerations, the Division finds that the fact that the lesser white-fronted goose is listed in Annex I to the Birds Directive requires an assessment to be made as to whether an SPA should be designated for that species. Since the Defendant did not include the lesser white-fronted goose in the survey carried out with a view to designating Special Protection Areas, it is not possible to determine whether the area concerned in the present case is in fact one of the five most important areas or one of the "1% areas". It follows, therefore, that the challenged decision was rendered contrary to the duty of due care that must be observed in preparing a decision.

2.4. As appears from the documents and the proceedings at the hearing, the Defendant based the challenged decision, alternatively, on the view that the area referred to by the Appellant does not qualify for designation as an SPA because it does not comply with the requirement that it include a continuous area of at least 100 hectares which have been assigned formal nature conservation status.

2.4.1. In respect of that criterion and its application, the Appellant advances the following arguments. It argues that the area concerned does indeed include a continuous area of at least 100 hectares which have been assigned formal nature conservation status. It also argues that the applicable policy merely requires there to be 100 hectares which have been assigned formal nature conservation status and that those hectares are not required to constitute a continuous area. Moreover, that criterion cannot prevent the designation of areas if only a restricted number of areas qualify for SPA status, as in the case of the lesser white-fronted goose. The Appellant also disputes that accepting that the 100-hectare requirement had not been met would, of itself, mean that the area was unsuitable for designation as an SPA.

2.4.2. The Division finds that the 100-hectare requirement was applied as an extra assessment criterion for selecting the "terrestrial" areas. Areas can qualify for designation as an SPA if they meet the first two selection criteria referred to in 2.3.2. Areas that qualify for designation as an SPA in the light of the first or second criterion must therefore, in principle, be designated as such. It is, after all, ornithological criteria that are decisive.

However, the third criterion requires that terrestrial areas that qualify in principle for designation must include a 100-hectare area that has been assigned formal nature conservation status. In this connection, "formal nature conservation status" is defined as areas that have the status of protected nature reserve (*beschermd natuurmonument*) or state nature reserve (*staatsnatuurmonument*) under the Nature Conservation Act and areas owned and managed by the State Forest Service (*Staatsbosbeheer*) or by the organisations covered by the scheme for subsidies to private organisations managing areas of land (*Regeling subsidies particuliere terreinbeherende organisaties*). According to the Defendant, this makes it possible to exclude areas from designation as SPAs that

are not “the most suitable”, for example sand tips, temporary construction sites, and traffic junctions.

In this context, the Division finds that, contrary to what the Appellant argues, the basic principle of the Defendant’s policy is that one must be dealing with a continuous area of at least 100 hectares that has been assigned formal nature conservation status (Memorandum in Response to the Birds Directive, Part 1, General, p. 59).

As the Division previously ruled, for example in its judgment of 19 March 2003 regarding the designation of the Haringvliet SPA (case number 200201933/1; [www.raadvanstate.nl](http://www.raadvanstate.nl) and JM 2003/70), the 100-hectare criterion is intended to exclude areas from designation as an SPA if their preservation can definitely not be guaranteed, despite the presence there of the protected species of birds concerned. In this context, the Division found that the intention was to comply with the term “most suitable territories in number and size” used in Article 4 of the Birds Directive in connection with the designation of an SPA. In the judgment referred to, the Division found that the method selected by the Defendant to actually implement the provisions of Article 4 of the Birds Directive was not unreasonable, namely specifying a third criterion for the selection of areas for designation as SPAs.

2.4.3. As regards the application of the 100-hectare criterion in the present case, the Division finds as follows.

The documents show that within the area specified by the Appellant, there are a number of sub-areas that have been assigned formal nature conservation status and that together make up an area of some 114 hectares. The largest of those sub-areas is one of approximately 74 hectares.

The documents and the proceedings at the hearing also show that the lesser white-fronted goose occurs only in a very small number of areas in the Netherlands. The Appellant has stated, without this being disputed, that in addition to the area currently at issue, two other areas are involved. Assuming that to be the case, the first criterion for designating an area as an SPA has been met, namely that it is one of the five most important areas for a particular species of bird. To that extent, there is no need to determine an order of priority, by applying the 100-hectare criterion, for areas that qualify for designation.

Under these circumstances, and taking into account that it has not been shown that it will be impossible to conserve the ornithological features of the area specified by the Appellant in a sustainable manner, the Division finds that in this case the Defendant could not reasonably adopt the position that the absence of 100 hectares of continuous area with formal nature conservation status meant that the area should not qualify for designation as an SPA.

2.5. The appeal is held to be well-founded, meaning that the contested decision must be set aside due to its being contrary to Articles 3:2 and 3:4(2) of the General Administrative Law Act (*Algemene wet bestuursrecht*).

2.6. The Defendant must be ordered to pay the costs of the present appeal proceedings in the manner specified below.

Given that the contested decision is now entirely set aside, the Defendant must render a new decision on the Appellant’s request for reimbursement of the costs it incurred during the objection phase.

3. Decision

LWfGoose HAC Ruling of 17 March 2004.doc

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The Administrative Jurisdiction Division of the Council of State,

Rendering judgment in the name of the Queen,

I. declares the appeal to be well-founded;

II. sets aside the decision rendered by the Minister of Agriculture, Nature and Food Quality on 7 July 2003;

III. orders the Minister of Agriculture, Nature and Food Quality to pay the costs of the appeal proceedings incurred by the Appellant in the amount of EUR 644, which sum consists entirely of the fee paid for professional legal assistance rendered by a third party; the said sum shall be paid to the Appellant by the State of the Netherlands (Ministry of Agriculture, Nature and Food Quality);

IV. orders the State of the Netherlands (Ministry of Agriculture, Nature and Food Quality) to reimburse the Appellant for the court registry fees (EUR 232) which it was required to pay in respect of the adjudication of its appeal.

Thus determined by R.J. Hoekstra (President) and R.H. Lauwaars and A. Kosto (Panel Members) in the presence of R.F.J. Bindels (Officer of State).

(signature) Hoekstra (signature) Bindels  
President Officer of State

Thus announced in public on 17 March 2004.

85-400.

## Appendix E – Dutch Council of State ruling of 29th December 2004

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### Judgment

Case number: *200408181/1*  
 Date of publication: *Wednesday 29 December 2004*  
 Versus: *the Minister of Agriculture, Nature and Food Quality*  
 Type of proceedings: *First instance - panel of three State Councillors*  
 Area of law: *Chamber 1 – Spatial Planning – Nature Conservation Act*

200408181/1.  
 Date of judgment: 29 December 2004

#### ADMINISTRATIVE JURISDICTION DIVISION

Judgment in the case between:

“Stichting De Faunabescherming”, a foundation with its registered office in Amstelveen, The Netherlands, Appellant,

and

the Minister of Agriculture, Nature and Food Quality, Defendant.

#### 1. Course of the Proceedings

In a decision rendered on 21 March 2003, the Defendant refused to designate the area specified by the Appellant in the application, namely “De Abtskolk-De Putten”, as a “Special Protection Area” (hereinafter “SPA”) within the meaning of Article 4(1) and (2) of Directive 79/409/EEC of the Council of the European Communities of 2 April 1979 on the Conservation of Wild Birds (OJEC 1979, L 103; hereinafter “Birds Directive”).

In a decision rendered on 7 July 2003, the Defendant declared that the objection filed to that decision was unfounded.

In a letter dated 14 August 2003, the Appellant lodged an appeal against this decision with the Council of State, which received the appeal on 15 August 2003.

In a ruling rendered on 17 March 2004 ([200305428/1](#)) the Division declared the appeal to be well-founded and set aside the decision rendered on 7 July 2003.

In a decision rendered on 7 September 2004, the Defendant once more declared that the objection filed by the Appellant against the decision rendered on 21 March 2003 was unfounded.

In a fax received by the Council of State on 6 October 2004, the Appellant lodged an appeal against the decision rendered on 7 September 2004.

The Division dealt with the case at its session on 16 November 2004, at which there appeared the Appellant, represented by A.M. Nijboer, a lawyer practising in Amsterdam, and the Defendant, represented by H.D. Strookman and E.R. Osieck, officials of the Ministry.

#### 2. Grounds for the Judgment

2.1. The Appellant argues that in rendering the challenged decision, the Defendant wrongly ignored the judgment rendered by the Division on 17 March 2004 ([200305428/1](#)). In the view of the Appellant, the Defendant should now have designated

the “De Abtskolk-De Putten” area as an SPA within the meaning of the Birds Directive because of the presence there of the lesser white-fronted goose (*Anser erythropus*). In that connection, the Appellant submitted that the area concerned met the criterion of being one of the five most important areas. The Appellant also requested the Division to rule that the Defendant should, after all, designate that area as an SPA within two weeks, or should decide on the objection, such being subject to the imposition of a penalty for non-compliance of EUR 5,000 for each day that the Defendant failed to comply with the judgment.

2.2. In its judgment of 17 March 2004, the Division took grounds including the following:

“The Division notes that in its Judgment of 8 February 1996 in the Vergy case (C 149/94, European Court Reports 1996 p. I-00299) the Court of Justice of the European Communities (hereinafter “the Court”) ruled that the Birds Directive did not apply to birds born and reared in captivity. In the same case, the Court also ruled that the Birds Directive obligates a Member State to ensure the protection of a species of naturally occurring birds in the wild state in the European territory of the Member States to which the Treaty applies, even when the natural habitat of the species in question does not occur in the Member State concerned. In so ruling, the Court considered that the Birds Directive is intended to provide protection for wild birds throughout the Community, irrespective of the areas they stay in or pass through.

In its judgment of 19 May 1998 in the case of the Commission of the European Communities versus the Kingdom of the Netherlands (Case C 3/96, European Court Reports 1998, p. I-3031), the Court ruled that Article 4(1) of the Birds Directive obligates Member States to classify as Special Protection Areas the most suitable territories in number and size for the conservation of species mentioned in Annex I, an obligation which it is not possible to avoid by adopting other special conservation measures. It follows, after all, from that provision that as soon as birds belonging to the species indicated occur in the territory of a Member State, that Member State must designate Special Protection Areas for them. In selecting and demarcating an SPA, no account may be taken of the economic requirements mentioned in Article 2 of the Directive.

The Member States do have a certain margin of discretion in selecting and demarcating an SPA, but – as the Court already found – it is certain ornithological criteria specified in the Directive that apply to the designation of such areas. This means that the Member States’ margin of discretion in choosing the most suitable territories does not concern the appropriateness of classifying as Special Protection Areas the territories which appear the most suitable according to ornithological criteria, but only the application of those criteria for identifying the most suitable territories for conservation of the species listed in Annex I to the Directive.

The Court therefore finds that the Member States are consequently under an obligation to designate as SPAs all areas which appear, according to ornithological criteria, to be the most suitable for conserving the species concerned.”

“It follows from Article 1(1) of the Directive, taken in conjunction with Article 4(1) and Annex I to the Directive, that the lesser white-fronted goose is a species of naturally occurring birds in the wild state in the European territory of the Member States to which the Treaty applies.

Given the documentation, the Division finds that the lesser white-fronted geese deriving from the Swedish reintroduction programme cannot be classified as birds born and reared in captivity. This means that these specimens are also subject to the provisions of the Birds Directive.

It follows from the case law of the Court referred to above that Article 4(1) of the Birds

Directive does not allow the Member States to make a policy decision to the effect that no Special Protection Areas should be designated for the lesser white-fronted goose. That provision does not allow for a distinction to be made according to the level of genetic purity of the birds concerned. Nor can the alteration by human intervention of the migratory route of the lesser white-fronted goose constitute a reason not to designate an SPA for that species.

In view of the above considerations, the Division finds that the fact that the lesser white-fronted goose is listed in Annex I to the Birds Directive requires an assessment to be made as to whether an SPA should be designated for that species. Since the Defendant did not include the lesser white-fronted goose in the survey carried out with a view to designating Special Protection Areas, it is not possible to determine whether the area concerned in the present case is in fact one of the five most important areas or one of the "1% areas". It follows, therefore, that the challenged decision was rendered contrary to the duty of due care that must be observed in preparing a decision."

2.3 The Division finds that the Defendant did not base the decision currently contested on a survey and study of the lesser white-fronted goose. The arguments adduced by the Defendant regarding the background to the reintroduction of the lesser white-fronted goose and the genetic purity of the specimens that occur in the Netherlands each year do not justify its having failed to carry out a survey and study. The Division refers in this connection to the grounds for its judgment of 17 March 2004 referred to above. The case law of the Court does not lead to any other opinion. The Defendant's argument regarding the fact that the area concerned is not included in the 1989 and 1994 "Inventory of Important Bird Areas in the European Community" cannot constitute a reason for failing to carry out a survey and study of the lesser white-fronted geese, whether ringed or unringed, occurring in the "De Abtskolk-De Putten" area. It is relevant that, in the light of the case law of the Division, these lists do not have a mandatory effect. One cannot exclude the possibility that other studies may show that the ornithological features of the area justify its being designated as an SPA (see, for example, the judgment rendered by the Division on 12 December 2001, 200001861/1, JM 2002/46). The information submitted by the Defendant (with reference being made to the report of the meeting of the Birds Directive Committee of 5 October 1999 and the letter from the European Commission of 18 March 2004) regarding the uncertainty in scientific circles as to current and future conservation measures for the lesser white-fronted goose should have been all the more reason for the Defendant to carry out a survey and study of this species in the area concerned before rendering a new decision on the Appellant's objection.

It follows from the above that the challenged decision was rendered contrary both to the duty of due care that must be observed in preparing a decision and the requirement that the decision on an objection must be supported by proper reasons. The appeal is held to be well-founded, meaning that the contested decision must be set aside due to its being contrary to Articles 3:2 and 7:12(1) of the General Administrative Law Act (*Algemene wet bestuursrecht*). Given this finding, and taking into account that before rendering a new decision on the complaint the Defendant must carry out a survey and study of the lesser white-fronted goose in the "De Abtskolk-De Putten" area, the Division considers that there are no grounds for acceding to the Appellant's accessory request. The Division does however see good reason to impose the following preliminary injunction as a measure to protect the area concerned as a habitat for the lesser white-fronted goose, applying Article 8:72(5) of the General Administrative Law Act.

2.5 The Defendant must be ordered to pay the costs of the proceedings in the manner specified below.

### 3. Decision

The Administrative Jurisdiction Division of the Council of State,

Rendering judgment in the name of the Queen,

I. declares the appeal to be well-founded;

II. sets aside the decision rendered by the Minister of Agriculture, Nature and Food Quality on 7 September 2004;

III. imposes the preliminary injunction that the Defendant should treat the “De Abtskolk-De Putten” area as if it had been designated as a Special Protection Area within the meaning of Article 4(1) of the Birds Directive for the lesser white-fronted goose, doing so until six weeks after the new decision to be taken on the objection;

IV. denies what was otherwise requested;

V. orders the Minister of Agriculture, Nature and Food Quality to pay the costs of the appeal proceedings incurred by the Appellant in the amount of EUR 644, which sum consists entirely of the fee paid for professional legal assistance rendered by a third party; the said sum shall be paid to the Appellant by the State of the Netherlands (Ministry of Agriculture, Nature and Food Quality);

VI. orders the State of the Netherlands (Ministry of Agriculture, Nature and Food Quality) to reimburse the Appellant for the court registry fees (EUR 232) which it was required to pay in respect of the adjudication of its appeal.

Thus determined by R.J. Hoekstra (President) and R.H. Lauwaars and J.G.C. Wiebenga (Panel Members) in the presence of P.J.A.M. Broekman (Officer of State).

(signature) Hoekstra (signature) Broekman  
President Officer of State

Thus announced in public on 29 December 2004.

## Appendix F – The keeping of wild animals in zoos- Directive 1999/22/EC.

COUNCIL DIRECTIVE 1999/22/EC

of 29 March 1999

relating to the keeping of wild animals in zoos

THE COUNCIL OF THE EUROPEAN UNION, Having regard to the Treaty establishing the European Community, and in particular Article 130s(1) thereof, Having regard to the proposal from the Commission, Having regard to the opinion of the Economic and Social Committee(1), Acting in accordance with the procedure laid down in Article 189c of the Treaty(2),

Whereas Council Regulation (EEC) No 338/97 of 9 December 1996 on the protection of species of wild fauna and flora by regulating trade therein(3) requires evidence of the availability of adequate facilities for the accommodation and care of live specimens of a great many species before their importation into the Community is authorised; whereas that Regulation prohibits the display to the public for commercial purposes of specimens of species listed in Annex A thereof unless a specific exemption was granted for education, research or breeding purposes;

Whereas Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds(4), and Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora(5), prohibit the capture and keeping of and trade in a great number of species, whilst providing for exemptions for specific reasons, such as research and education, repopulation, reintroduction and breeding;

Whereas the proper implementation of existing and future Community legislation on the conservation of wild fauna and the need to ensure that zoos adequately fulfil their important role in the conservation of species, public education, and/or scientific research make it necessary to provide a common basis for Member States' legislation with regard to the licensing and inspection of zoos, the keeping of animals in zoos, the training of staff and the education of the visiting public;

Whereas action at the Community level is required in order to have zoos throughout the Community contributing to the conservation of biodiversity in accordance with the Community's obligation to adopt measures for ex situ conservation under Article 9 of the Convention on Biological Diversity;

Whereas a number of organisations such as the European Association of Zoos and Aquaria have produced guidelines for the care and accommodation of animals in zoos which could, where appropriate, assist in the development and adoption of national standards,

HAS ADOPTED THIS DIRECTIVE:

Article 1

Aim

The objectives of this Directive are to protect wild fauna and to conserve biodiversity by providing for the adoption of measures by Member States for the licensing and inspection of zoos in the Community, thereby strengthening the role of zoos in the conservation of biodiversity.

Article 2

Definition

For the purpose of this Directive, "zoos" means all permanent establishments where animals of wild species are kept for exhibition to the public for 7 or more days a year, with the exception of circuses, pet shops and



**Wild animals in Zoos directive**

establishments which Member States exempt from the requirements of this Directive on the grounds that they do not exhibit a significant number of animals or species to the public and that the exemption will not jeopardise the objectives of this Directive.

## Article 3

## Requirements applicable to zoos

Member States shall take measures under Articles 4, 5, 6 and 7 to ensure all zoos implement the following conservation measures:

- participating in research from which conservation benefits accrue to the species, and/or training in relevant conservation skills, and/or the exchange of information relating to species conservation and/or, where appropriate, captive breeding, repopulation or reintroduction of species into the wild,
- promoting public education and awareness in relation to the conservation of biodiversity, particularly by providing information about the species exhibited and their natural habitats,
- accommodating their animals under conditions which aim to satisfy the biological and conservation requirements of the individual species, inter alia, by providing species specific enrichment of the enclosures; and maintaining a high standard of animal husbandry with a developed programme of preventive and curative veterinary care and nutrition,
- preventing the escape of animals in order to avoid possible ecological threats to indigenous species and preventing intrusion of outside pests and vermin,
- keeping of up-to-date records of the zoo's collection appropriate to the species recorded.

## Article 4

## Licensing and inspection

1. Member States shall adopt measures for licensing and inspection of existing and new zoos in order to ensure that the requirements of Article 3 are met.

2. Every zoo shall have a licence within four years after the entry into force of this Directive or, in the case of new zoos, before they are open to the public.

3. Each licence shall contain conditions to enforce the requirements of Article 3. Compliance with the conditions shall be monitored inter alia by means of regular inspection and appropriate steps shall be taken to ensure such compliance.

4. Before granting, refusing, extending the period of, or significantly amending a licence, an inspection by Member States' competent authorities shall be carried out in order to determine whether or not the licensing conditions or proposed licensing conditions are met.

5. If the zoo is not licensed in accordance with this Directive or the licensing conditions are not met, the zoo or part thereof:

(a) shall be closed to the public by the competent authority; and/or

(b) shall comply with appropriate requirements imposed by the competent authority to ensure that the licensing conditions are met.

Should these requirements not be complied with within an appropriate period to be determined by the competent authorities but not exceeding two years, the competent authority shall withdraw or modify the licence and close the zoo or part thereof.

## Wild animals in Zoos directive

### Article 5

Licensing requirements set out in Article 4 shall not apply where a Member State can demonstrate to the satisfaction of the Commission that the objective of this Directive as set out in Article 1 and the requirements applicable to zoos set out in Article 3 are being met and continuously maintained by means of a system or regulation and registration. Such a system should, inter alia, contain provisions regarding inspection and closure of zoos equivalent to those in Article 4(4) and (5).

### Article 6

#### Closure of zoos

In the event of a zoo or part thereof being closed, the competent authority shall ensure that the animals concerned are treated or disposed of under conditions which the Member State deems appropriate and consistent with the purposes and provisions of this Directive.

### Article 7

#### Competent authorities

Member States shall designate competent authorities for the purposes of this Directive.

### Article 8

#### Penalties

Member States shall determine the penalties applicable to breaches of the national provisions adopted pursuant to this Directive. The penalties shall be effective, proportionate and dissuasive.

### Article 9

#### Implementation

1. Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this directive not later than 9 April 2002. They shall forthwith inform the Commission thereof.

When Member States adopt these measures, they shall contain a reference to this Directive or shall be accompanied by such reference on the occasion of their official publication. The methods of making such a reference shall be laid down by the Member States.

2. Member States shall communicate to the Commission the main provisions of national law which they adopt in the field covered by this Directive.

### Article 10

#### Entry in force

This Directive shall enter into force on the day of its publication in the Official Journal of the European Communities.

### Article 11

This Directive is addressed to the Member States. Done at Brussels, 29 March 1999.

For the Council, The President

F. MÜNTEFERING

(1) OJ C 204, 15.7.1996, p. 63. (2) Opinion of the European Parliament of 29 January 1998. (OJ C 56, 23.2.1998, p. 34), Council Common Position of 20 July 1998 (OJ C 364, 25.11.1998, p. 9), and Decision of the European Parliament of 10 February 1999 (not yet published in the Official Journal). (3) OJ L 61, 3.3.1997, p. 1. Regulation as last amended by Commission Regulation (EC) No 2307/97 (OJ L 325, 27.11.1997, p. 1). (4) OJ L 103, 25.4.1979, p. 1. Directive as last amended by Directive 97/49/EC (OJ L 223, 13.8.1997, p. 9). (5) OJ L 206, 22.7.1992, p. 7. Directive as last amended by Commission Directive 97/62/EC (OJ L 305, 8.11.1997, p. 42).

## Appendix G – The Birds Directive - Directive 2009/147/EC.

### DIRECTIVE 2009/147/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 30 November 2009

on the conservation of wild birds

(codified version)

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 175(1) thereof,

Having regard to the proposal from the Commission,

Having regard to the opinion of the European Economic and Social Committee <sup>(1)</sup>,

Acting in accordance with the procedure laid down in Article 251 of the Treaty <sup>(2)</sup>,

Whereas:

- (1) Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds <sup>(3)</sup> has been substantially amended several times <sup>(4)</sup>. In the interests of clarity and rationality the said Directive should be codified.
- (2) Decision No 1600/2002/EC of the European Parliament and of the Council of 22 July 2002 laying down the Sixth Community Environment Action Programme <sup>(5)</sup> calls for specific action for biodiversity, including to protect birds and their habitats.
- (3) A large number of species of wild birds naturally occurring in the European territory of the Member States are declining in number, very rapidly in some cases. This decline represents a serious threat to the conservation of the natural environment, particularly because of the biological balances threatened thereby.
- (4) The species of wild birds naturally occurring in the European territory of the Member States are mainly migratory species. Such species constitute a common heritage and effective bird protection is typically a trans-frontier environment problem entailing common responsibilities.
- (5) The conservation of the species of wild birds naturally occurring in the European territory of the Member States is necessary in order to attain the Community's objectives regarding the improvement of living conditions and sustainable development.
- (6) The measures to be taken must apply to the various factors which may affect the numbers of birds, namely the repercussions of man's activities and in particular the destruction and pollution of their habitats, capture and killing by man and the trade resulting from such practices; the stringency of such measures should be adapted to the particular situation of the various species within the framework of a conservation policy.
- (7) Conservation is aimed at the long-term protection and management of natural resources as an integral part of the heritage of the peoples of Europe. It makes it possible to control natural resources and governs their

**The Birds Directive**

use on the basis of the measures necessary for the maintenance and adjustment of the natural balances between species as far as is reasonably possible.

- (8) The preservation, maintenance or restoration of a sufficient diversity and area of habitats is essential to the conservation of all species of birds. Certain species of birds should be the subject of special conservation measures concerning their habitats in order to ensure their survival and reproduction in their area of distribution. Such measures must also take account of migratory species and be coordinated with a view to setting up a coherent whole.
- (9) In order to prevent commercial interests from exerting a possible harmful pressure on exploitation levels, it is necessary to impose a general ban on marketing and to restrict all derogation to those species whose biological status so permits, account being taken of the specific conditions obtaining in the different regions.
- (10) Because of their high population level, geographical distribution and reproductive rate in the Community as a whole, certain species may be hunted, which constitutes acceptable exploitation where certain limits are established and respected, as such hunting must be compatible with maintenance of the population of these species at a satisfactory level.
- (11) The various means, devices or methods of large-scale or non-selective capture or killing and hunting with certain forms of transport must be banned because of the excessive pressure which they exert or may exert on the numbers of the species concerned.
- (12) Because of the importance which may be attached to certain specific situations, provision should be made for the possibility of derogations on certain conditions and subject to monitoring by the Commission.
- (13) The conservation of birds and, in particular, migratory birds still presents problems which call for scientific research. Such research will also make it possible to assess the effectiveness of the measures taken.
- (14) Care should be taken in consultation with the Commission to see that the introduction of any species of wild bird not naturally occurring in the European territory of the Member States does not cause harm to local flora and fauna.
- (15) The Commission will every three years prepare and transmit to the Member States a composite report based on information submitted by the Member States on the application of national provisions introduced pursuant to this Directive.
- (16) The measures necessary for the implementation of this Directive should be adopted in accordance with Council Decision 1999/468/EC of 28 June 1999 laying down the procedures for the exercise of implementing powers conferred on the Commission <sup>(6)</sup>.
- (17) In particular, the Commission should be empowered to amend certain Annexes in the light of scientific and technical progress. Since those measures are of general scope and are designed to amend non-essential elements of this Directive, they must be adopted in accordance with the regulatory procedure with scrutiny provided for in Article 5a of Decision 1999/468/EC.
- (18) This Directive should be without prejudice to the obligations of the Member States relating to the time limits for transposition into national law of the directives set out in Annex VI, Part B,

**The Birds Directive**

HAVE ADOPTED THIS DIRECTIVE:

*Article 1*

1. This Directive relates to the conservation of all species of naturally occurring birds in the wild state in the European territory of the Member States to which the Treaty applies. It covers the protection, management and control of these species and lays down rules for their exploitation.

2. It shall apply to birds, their eggs, nests and habitats.

*Article 2*

Member States shall take the requisite measures to maintain the population of the species referred to in Article 1 at a level which corresponds in particular to ecological, scientific and cultural requirements, while taking account of economic and recreational requirements, or to adapt the population of these species to that level.

*Article 3*

1. In the light of the requirements referred to in Article 2, Member States shall take the requisite measures to preserve, maintain or re-establish a sufficient diversity and area of habitats for all the species of birds referred to in Article 1.

2. The preservation, maintenance and re-establishment of biotopes and habitats shall include primarily the following measures:

- (a) creation of protected areas;
- (b) upkeep and management in accordance with the ecological needs of habitats inside and outside the protected zones;
- (c) re-establishment of destroyed biotopes;
- (d) creation of biotopes.

*Article 4*

1. The species mentioned in Annex I shall be the subject of special conservation measures concerning their habitat in order to ensure their survival and reproduction in their area of distribution.

In this connection, account shall be taken of:

- (a) species in danger of extinction;
- (b) species vulnerable to specific changes in their habitat;
- (c) species considered rare because of small populations or restricted local distribution;
- (d) other species requiring particular attention for reasons of the specific nature of their habitat.

Trends and variations in population levels shall be taken into account as a background for evaluations.

## The Birds Directive

Member States shall classify in particular the most suitable territories in number and size as special protection areas for the conservation of these species in the geographical sea and land area where this Directive applies.

2. Member States shall take similar measures for regularly occurring migratory species not listed in Annex I, bearing in mind their need for protection in the geographical sea and land area where this Directive applies, as regards their breeding, moulting and wintering areas and staging posts along their migration routes. To this end, Member States shall pay particular attention to the protection of wetlands and particularly to wetlands of international importance.

3. Member States shall send the Commission all relevant information so that it may take appropriate initiatives with a view to the coordination necessary to ensure that the areas provided for in paragraphs 1 and 2 form a coherent whole which meets the protection requirements of these species in the geographical sea and land area where this Directive applies.

4. In respect of the protection areas referred to in paragraphs 1 and 2, Member States shall take appropriate steps to avoid pollution or deterioration of habitats or any disturbances affecting the birds, in so far as these would be significant having regard to the objectives of this Article. Outside these protection areas, Member States shall also strive to avoid pollution or deterioration of habitats.

### *Article 5*

Without prejudice to Articles 7 and 9, Member States shall take the requisite measures to establish a general system of protection for all species of birds referred to in Article 1, prohibiting in particular:

- (a) deliberate killing or capture by any method;
- (b) deliberate destruction of, or damage to, their nests and eggs or removal of their nests;
- (c) taking their eggs in the wild and keeping these eggs even if empty;
- (d) deliberate disturbance of these birds particularly during the period of breeding and rearing, in so far as disturbance would be significant having regard to the objectives of this Directive;
- (e) keeping birds of species the hunting and capture of which is prohibited.

### *Article 6*

1. Without prejudice to paragraphs 2 and 3, Member States shall prohibit, for all the bird species referred to in Article 1, the sale, transport for sale, keeping for sale and the offering for sale of live or dead birds and of any readily recognisable parts or derivatives of such birds.

2. The activities referred to in paragraph 1 shall not be prohibited in respect of the species referred to in Annex III, Part A, provided that the birds have been legally killed or captured or otherwise legally acquired.

3. Member States may, for the species listed in Annex III, Part B, allow within their territory the activities referred to in paragraph 1, making provision for certain restrictions, provided that the birds have been legally killed or captured or otherwise legally acquired.

Member States wishing to grant such authorisation shall first of all consult the Commission with a view to examining jointly with the latter whether the marketing of specimens of such species would result or could

## The Birds Directive

reasonably be expected to result in the population levels, geographical distribution or reproductive rate of the species being endangered throughout the Community. Should this examination prove that the intended authorisation will, in the view of the Commission, result in any one of the aforementioned species being thus endangered or in the possibility of their being thus endangered, the Commission shall forward a reasoned recommendation to the Member State concerned stating its opposition to the marketing of the species in question. Should the Commission consider that no such risk exists, it shall inform the Member State concerned accordingly.

The Commission's recommendation shall be published in the *Official Journal of the European Union*.

Member States granting authorisation pursuant to this paragraph shall verify at regular intervals that the conditions governing the granting of such authorisation continue to be fulfilled.

### Article 7

1. Owing to their population level, geographical distribution and reproductive rate throughout the Community, the species listed in Annex II may be hunted under national legislation. Member States shall ensure that the hunting of these species does not jeopardise conservation efforts in their distribution area.
2. The species referred to in Annex II, Part A may be hunted in the geographical sea and land area where this Directive applies.
3. The species referred to in Annex II, Part B may be hunted only in the Member States in respect of which they are indicated.
4. Member States shall ensure that the practice of hunting, including falconry if practised, as carried on in accordance with the national measures in force, complies with the principles of wise use and ecologically balanced control of the species of birds concerned and that this practice is compatible as regards the population of these species, in particular migratory species, with the measures resulting from Article 2.

They shall see in particular that the species to which hunting laws apply are not hunted during the rearing season or during the various stages of reproduction.

In the case of migratory species, they shall see in particular that the species to which hunting regulations apply are not hunted during their period of reproduction or during their return to their rearing grounds.

Member States shall send the Commission all relevant information on the practical application of their hunting regulations.

### Article 8

1. In respect of the hunting, capture or killing of birds under this Directive, Member States shall prohibit the use of all means, arrangements or methods used for the large-scale or non-selective capture or killing of birds or capable of causing the local disappearance of a species, in particular the use of those listed in Annex IV, point (a).
2. Moreover, Member States shall prohibit any hunting from the modes of transport and under the conditions mentioned in Annex IV, point (b).

### Article 9

**The Birds Directive**

1. Member States may derogate from the provisions of Articles 5 to 8, where there is no other satisfactory solution, for the following reasons:
  - (a) — in the interests of public health and safety,
    - in the interests of air safety,
    - to prevent serious damage to crops, livestock, forests, fisheries and water,
    - for the protection of flora and fauna;
  - (b) for the purposes of research and teaching, of re-population, of re-introduction and for the breeding necessary for these purposes;
  - (c) to permit, under strictly supervised conditions and on a selective basis, the capture, keeping or other judicious use of certain birds in small numbers.
2. The derogations referred to in paragraph 1 must specify:
  - (a) the species which are subject to the derogations;
  - (b) the means, arrangements or methods authorised for capture or killing;
  - (c) the conditions of risk and the circumstances of time and place under which such derogations may be granted;
  - (d) the authority empowered to declare that the required conditions obtain and to decide what means, arrangements or methods may be used, within what limits and by whom;
  - (e) the controls which will be carried out.
3. Each year the Member States shall send a report to the Commission on the implementation of paragraphs 1 and 2.
4. On the basis of the information available to it, and in particular the information communicated to it pursuant to paragraph 3, the Commission shall at all times ensure that the consequences of the derogations referred to in paragraph 1 are not incompatible with this Directive. It shall take appropriate steps to this end.

*Article 10*

1. Member States shall encourage research and any work required as a basis for the protection, management and use of the population of all species of bird referred to in Article 1. Particular attention shall be paid to research and work on the subjects listed in Annex V.
2. Member States shall send the Commission any information required to enable it to take appropriate measures for the coordination of the research and work referred to in paragraph 1.

*Article 11*



## The Birds Directive

Member States shall see that any introduction of species of bird which do not occur naturally in the wild state in the European territory of the Member States does not prejudice the local flora and fauna. In this connection they shall consult the Commission.

### *Article 12*

1. Member States shall forward to the Commission every three years, starting from 7 April 1981, a report on the implementation of national provisions taken under this Directive.
2. The Commission shall prepare every three years a composite report based on the information referred to in paragraph 1. That part of the draft report covering the information supplied by a Member State shall be forwarded to the authorities of the Member State in question for verification. The final version of the report shall be forwarded to the Member States.

### *Article 13*

Application of the measures taken pursuant to this Directive may not lead to deterioration in the present situation as regards the conservation of the species of birds referred to in Article 1.

### *Article 14*

Member States may introduce stricter protective measures than those provided for under this Directive.

### *Article 15*

Such amendments as are necessary for adapting Annexes I and V to technical and scientific progress shall be adopted. Those measures, designed to amend non-essential elements of this Directive, shall be adopted in accordance with the regulatory procedure with scrutiny referred to in Article 16(2).

### *Article 16*

1. The Commission shall be assisted by the Committee for Adaptation to Technical and Scientific Progress.
2. Where reference is made to this paragraph, Article 5a(1) to (4) and Article 7 of Decision 1999/468/EC shall apply, having regard to the provisions of Article 8 thereof.

### *Article 17*

Member States shall communicate to the Commission the texts of the main provisions of national law which they adopt in the field governed by this Directive.

### *Article 18*

Directive 79/409/EEC, as amended by the acts listed in Annex VI, Part A, is repealed, without prejudice to the obligations of the Member States relating to the time limits for transposition into national law of the Directives set out in Annex VI, Part B.

References to the repealed Directive shall be construed as references to this Directive and shall be read in accordance with the correlation table in Annex VII.

*Article 19*

This Directive shall enter into force on the 20th day following its publication in the *Official Journal of the European Union*.

*Article 20*

This Directive is addressed to the Member States.

Done at Brussels, 30 November 2009.

*For the European Parliament*

*The President*

J. BUZEK

*For the Council*

*The President*

B. ASK

## Appendix H – Tables with numbers used for figures in the report

**Table A.** Data for figure 6. Annual numbers of accepted records held by British Rarities Committee 1986-2011.

Year	1886	1887	1888	1889	1890	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900
# records	1														
	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915
	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945
	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
	1	2	1	1	4	3	4	1	5	4	2	0	4	4	6
	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
	3	3	3	3	0	3	2	1	2	1	3	2	1	1	3
	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
	2	2	3	4	3	1	2	4	1	1	2	1	1	1	
	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
				2	3	2	1	1			1		1		
	2006	2007	2008	2009	2010	2011									
					1	1									

**Table B.** Data for figure 7. Monthly distribution of records of Lesser White-fronted Geese in Hungary in 2015. (data from <http://piskulka.net>).

Month	Russian	Fennoscandian
January	10	
February	13	
March	28	6
April	2	
May		
June		
July		
August		
September	1	3
October	19	2
November	32	
December	20	

**Table C.** Data for figure 8. Distribution of group size of Lesser White-fronted Geese of Russian and Fennoscandian origin observed in Hungary in 2015. (data from <http://piskulka.net>).

	Fennoscandian	%	Russian	%
1-5	1	0.09	105	0.89
6-10		0.00	13	0.11
11-20	1	0.09		0.00
21-50	3	0.27		0.00
51-100	4	0.36		0.00
100-150	2	0.18		0.00

**Table D.** Data for figure 11. Average weekly maximum number of Lesser White-fronted Geese throughout the annual cycle in the years 2011-2015. Data from <http://piskulka.net>.

Week	Greece	Hungary	Lithuania	Estonia	Finland	Norway
1	20.8	1.8	0	0	0	0
2	30.8	4.8	0	0	0	0
3	22.2	1.6	0	0	0	0
4	33	1.2	0	0	0	0
5	42.8	1.6	0	0	0	0
6	9.2	1.6	0	0	0	0
7	13	4.8	0	0	0	0
8	35.4	1.6	0	0	0	0
9	37.4	3.8	0	0	0	0
10	22.2	6.6	0	0	0	0
11	24.8	5.2	0.2	0	0	0
12	0	29	0	0	0	0
13	0	58.2	0	0	0	0
14	0	55.8	0	0	0	0
15	0	26.2	0.6	0	0	0
16	0	11	0.6	3.6	0.2	0
17	0	0	3.4	11.2	0.6	0.4
18	0	0	0.4	16	7.8	0
19	0	0	0.2	11	37.2	8.4
20	0	0	0	0	32.6	39.4
21	0	0	0	0	0	34.8
22	0	0	0	0	0	13
23	0	0	0	0	0	4.4
24	0	0	0	0	0	15.2
25	0	0	0	0	0	0.8
26	0	0	0	0	0	1
27	0	0	0	0	0	0.2
28	0	0	0	0	0	0
29	0	0	0	0	0	0

30	0	0	0	0	0	1
31	0	0	0	0	0	0.8
32	0	0	0	0	0	0
33	0	0	0	0	0	11.4
34	0	0	0	0	0	50
35	0	0	0	0	0	58.2
36	0	0	0	0	0	62.2
37	0	0.4	0	0	0	4.4
38	0	21.2	0	0	0	0
39	0	36.2	0	0	0	0
40	30.2	43.4	0	0.2	0	0
41	39.4	18.2	0	0	0	0
42	36	13.75	0	0	0	0
43	32.75	5.75	0	0	0	0
44	38.5	6.25	0	0	0	0
45	56.25	4.75	0	0	0	0
46	40.25	8	0	0	0	0
47	40.25	2.5	0	0	0	0
48	57.75	7.75	0	0	0	0
49	58	5	0	0	0	0
50	36	3.25	0	0	0	0
51	25	3.25	0	0	0	0
52	13.25	13.5	0	0	0	0

**Table E.** Data for figure 12. Total numbers of Lesser White-fronted Geese during spring staging in Porsangen fjord, Finnmark Norway during the years 1990-2015.

Year	Total
1990	65
1991	99
1992	63
1993	68
1994	56
1995	60
1996	56
1997	59
1998	84
1999	58
2000	63
2001	41
2002	43
2003	41
2004	41
2005	43
2006	43

2007	30
2008	34
2009	30
2010	30
2011	40
2012	69
2013	73
2014	67
2015	66

**Table F.** Data for figure 14. Number of released captive-bred Lesser White-fronted Geese in Fennoscandia in the period 1981-2015.

Year	# released Sweden	# released Norway	# released Finland	# French-project
1980				
1981	11			
1982	28			
1983	37			
1984	33			
1985	22			
1986	13			
1987	16			
1988	12			
1989	15		5	
1990	12		25	
1991	9		24	
1992	0		28	
1993	0		17	
1994	30		16	
1995	20		6	
1996	21		15	
1997	27		7	
1998	25			
1999	17			30
2000	0			
2001	0			
2002	0			
2003	0			
2004	0			
2005	0			
2006	0			
2007	0			
2008	0			
2009	0			
2010	5	5		

2011	10	6		
2012	28			
2013	50			
2014	55			
2015	65			
SUM	561	11	143	30

**Table G.** Data for figure 23. Maximum numbers of Lesser White-fronted Goose of feral origin in the Netherlands and Belgium 2002-2015 (source: Waarneming.nl, Waarnemingen.be).

Year	Belgium	the Netherlands
2000		
2001		
2002		1
2003	3	1
2004	1	5
2005	1	10
2006		2
2007		8
2008	2	5
2009	2	7
2010	1	2
2011	2	10
2012	3	2
2013	1	2
2014	1	15
2015	1	4

**Table H.** Data for figure 25. Population trajectories for the original wild Lesser White-fronted Goose in Sweden and the Swedish reintroduced population as assessed during winter in the Netherlands

Year	Spring counts in Västerbotten 1975-1997	No. pairs Sweden	Swedish national estimates of no. of breeding pairs in original population, plotted as ind.	Winter counts of the reintroduced population in the Netherlands
1975	13	100	200	
1976	35			
1977	6			
1978	9			
1979	3			
1980	3			
1981	12			
1982	18			
1983	5			
1984	6			

1985	13			
1986	6			
1987	2			
1988	8			
1989	3			24
1990	9	10	20	20
1991	5			15
1992	0			21
1993	0			22
1994	1			49
1995	4			55
1996	5			47
1997	7			65
1998				69
1999		2	4	74
2000				102
2001				83
2002				98
2003				122
2004				123
2005				101
2006				91
2007				123
2008				109
2009				112
2010				97
2011				127
2012		2	4	67
2013				45
2014				45
2015				43

**Table I.** Data for figure 26 and 27.

Year	Maximum counts, Västerbotten in spring	Winter counts in the Netherlands of the reintroduced population	Västerbotten in spring - Olsson & Wiklund (1999)
1910	10		
1911			
1912			
1913			
1914			
1915			
1916			
1917			



1918	
1919	
1920	
1921	
1922	
1923	200
1924	
1925	
1926	
1927	
1928	1
1929	
1930	20
1931	
1932	
1933	
1934	
1935	
1936	12
1937	
1938	200
1939	
1940	800
1941	
1942	1
1943	
1944	
1945	1
1946	
1947	
1948	20
1949	150
1950	10
1951	1
1952	
1953	2
1954	50
1955	32
1956	26
1957	
1958	24
1959	28
1960	14
1961	16
1962	36
1963	22

1964	9		
1965	6		
1966	16		
1967	7		
1968	11		
1969	6		
1970	17		
1971	15		
1972	6		
1973	7		
1974	5		
1975	7		13
1976	24		35
1977	5		6
1978	5		9
1979	4		3
1980	5		3
1981	9		12
1982	11		18
1983	5		5
1984	4		6
1985	5		13
1986	5		6
1987	4		2
1988	3		8
1989	3	24	3
1990	9	20	9
1991	2	15	5
1992	4	21	0
1993	3	22	0
1994	2	49	1
1995	5	55	4
1996	12	47	5
1997	8	65	7
1998	5	69	
1999	4	74	
2000	2	102	
2001	2	83	
2002	2	98	
2003	4	122	
2004	4	123	
2005	22	101	
2006	9	91	
2007	12	123	
2008	11	109	

2009	6	112
2010	8	97
2011	14	127
2012	30	67
2013	17	45
2014	11	45
2015	20	43
2016	20	

**Table J.** Data for figure 28 (+29 & 30). Population trend for the Swedish reintroduced Lesser White-fronted Geese based upon counts during winter in the Netherlands.

Year	Number released Sweden	Peak count the Netherlands
1981	11	
1982	28	
1983	37	
1984	33	
1985	22	
1986	13	
1987	16	
1988	12	
1989	15	24
1990	12	20
1991	9	15
1992	0	21
1993	0	22
1994	30	49
1995	20	55
1996	21	47
1997	27	65
1998	25	69
1999	17	74
2000	0	102
2001	0	83
2002	0	98
2003	0	122
2004	0	123
2005	0	101
2006	0	91
2007	0	123
2008	0	109
2009	0	112
2010	5	97
2011	10	127

2012	28	67
2013	50	45
2014	55	45
2015	65	43

**Table K.** Data for figure 33-36. Monthly maxima Sweden, the Netherlands, Denmark, Belgium, France, Germany, Norway.

Month	SWEDEN	NETHERLANDS	DENMARK	BELGIUM	FRANCE	GERMANY	NORWAY
December 2015						1	
November 2015	6	34				1	
October 2015	8	34					
September 2015	28	10					2
August 2015	34	2	1				2
July 2015	28	1					
June 2015	19	2					
May 2015	36	2	1			1	4
April 2015	49	2	4			1	2
March 2015	9	3	2			2	
February 2015	0	47	5			3	
January 2015	0	25	1			2	
December 2014	5	30	5			2	6
November 2014	21	31				1	6
October 2014	26	31	2				7
September 2014	39	7					7
August 2014	40	3					6
July 2014	28	2					
June 2014	17	2					
May 2014	28	2	1				
April 2014	30	2	1				1
March 2014	1	23	1			1	
February 2014	0	37				2	
January 2014	0	38					
December 2013	6	37				1	
November 2013	7	29					
October 2013	11	31	1				
September 2013	43	5				2	4
August 2013	37	3					1
July 2013	37	2					
June 2013	31	1					
May 2013	31	2	1				
April 2013	71	2	9				
March 2013	2	50				1	
February 2013	0	45				1	

January 2013	0	45		1		2	2
December 2012	0	46				1	
November 2012	6	40				1	
October 2012	29	49				1	
September 2012	56	2					1
August 2012	37	2					
July 2012	5	2					
June 2012	7	2					
May 2012	101	1	1				1
April 2012	105	2	1				
March 2012	6	103	1			2	
February 2012	1	97	1	1			
January 2012	0	107	1	2		1	
December 2011	3	88				1	
November 2011	1	91					
October 2011	116	77	3				
September 2011	105	3					
August 2011	109	10					
July 2011	1	2					
June 2011	11	2					
May 2011	55	1	6				
April 2011	68	1	6				1
March 2011	3	88					
February 2011	0	58					
January 2011	0	59		1			
December 2010	0	43					
November 2010	1	74		1			
October 2010	6	70					
September 2010	80	2					1
August 2010	64	1					
July 2010	1	3					
June 2010	31	3					
May 2010	74	1					
April 2010	108	1	67				
March 2010	1	92		1			
February 2010	0	68		1			
January 2010	0	50		1			
December 2009	0	65		1			
November 2009	2	59					
October 2009	55	72					
September 2009	101	1					
August 2009	101	2					
July 2009	12	4					
June 2009	11	2					
May 2009	70	1					
April 2009	69	2	1				

March 2009	2	17		1	
February 2009	0	67		1	
January 2009	0	31		1	3
December 2008	2	39	1	1	2
November 2008	5	46			
October 2008	7	42	10		
September 2008	20	2			
August 2008	69				
July 2008	20				
June 2008	21	2			
May 2008	70	3			
April 2008	65	1	1		
March 2008	3	57			
February 2008	1	68	2		
January 2008	0	67			
December 2007	0	61			
November 2007	1	50	2		
October 2007	9	60	7		
September 2007	78	7			
August 2007	90	2			
July 2007	18	2	1		
June 2007	24	1	1		
May 2007	50	1			
April 2007	48	7	2		
March 2007	2	32	1		
February 2007	2	33			1
January 2007	0	45			
December 2006	1	63			
November 2006	2	59	3		
October 2006	42	40			
September 2006	76	2			
August 2006	75	2			
July 2006	3	2			
June 2006	21				
May 2006	60	2	1		
April 2006	3	1			
March 2006	2	14			
February 2006	0	40	1	1	
January 2006	0	43		1	
December 2005	0	52			
November 2005	2	50	1		
October 2005	37	60	1		
September 2005	79	3			
August 2005	59	1			
July 2005	16				
June 2005	18	1			

May 2005	50	1	1	
April 2005	32	1	2	
March 2005	2	20	1	
February 2005	0	33		
January 2005	0	30	1	
December 2004	0	33	1	
November 2004	1	41		
October 2004	52	48	1	
September 2004	84	1		
August 2004	84	1		
July 2004	22	1		
June 2004	12	1	1	
May 2004	37	1	1	
April 2004	37	5	3	
March 2004	17	32	1	
February 2004	0	34		3
January 2004	1	35		1
December 2003	2	41		2
November 2003	1	49	1	
October 2003	25	57	1	
September 2003	69	1		
August 2003	70	1		
July 2003	18			
June 2003	26			
May 2003	38		15	
April 2003	25	1	5	
March 2003	23	26	8	
February 2003	0	12	1	
January 2003	1	24		3
December 2002	1	20		3
November 2002	2	34		
October 2002	8	32		
September 2002	72	32		
August 2002	60		1	
July 2002	14	1		
June 2002	15	1		
May 2002	40	1	1	
April 2002	27	4	2	
March 2002	10	34	1	
February 2002	1	16		
January 2002	1	16		1
December 2001	1	11		1
November 2001	3	19	1	
October 2001	22	24	1	
September 2001	46	1	1	
August 2001	27		1	

July 2001	11				
June 2001	5	1			
May 2001	25	1			
April 2001	17	3	1		
March 2001	4	15	1	1	1
February 2001	1	18	1	1	1
January 2001	1	16	1		1
December 2000	3	10	2	2	1
November 2000	9	16	1		2
October 2000	17	15			1
September 2000	17	1			
August 2000	48				
July 2000	11				
June 2000	5				
May 2000	12	1			
April 2000	11	2	1		
March 2000	1	9	1	1	
February 2000	2	7	1		
January 2000	1	16	1	1	

**Table L.** Data for figure 37. Wintering of Lesser White-fronted Geese in Sweden shown as maximum counts each month between November to February for the years 2000-2016.

"winter"	November	December	January	February
1999-2000			1	2
2000-2001	5	5	1	1
2001-2002	3	1	1	0
2002-2003	2	1	1	0
2003-2004	1	1	0	0
2004-2005	2	0	0	0
2005-2006	2	0	0	0
2006-2007	2	1	0	2
2007-2008	1	0	0	1
2008-2009	5	2	0	0
2009-2010	2	0	0	0
2010-2011	1	0	0	0
2011-2012	1	3	0	1
2012-2013	6	0	0	0
2013-2014	7	6	0	0
2014-2015	21	3	0	0
2015-2016	7	0	1	0



**Table M.** Data for figure 39. Minimum number of hybrid Barnacle Goose x Lesser White-fronted Goose individuals observed annually in Sweden in the years 1985–2015.

Year	# 1cy	#ad/subad
1985	1	0
1986		
1987		1
1988		
1989		1
1990		1
1991		2
1992		1
1993		1
1994		5
1995		
1996		
1997		
1998		
1999		1
2000		1
2001		2
2002	2	1
2003		1
2004	8	4
2005	4	11
2006	6	10
2007	5	4
2008	5	10
2009	7	8
2010	6	7
2011	11	5
2012	5	5
2013	7	9
2014	4	11
2015		4

**Table N.** Data for figure 40. Population trend for the Swedish reintroduced free-flying population.

Winter	Peak count the Netherlands	Hybrids
1989-90	24	2
1990-91	20	
1991-92	15	3
1992-93	21	
1993-94	22	
1994-95	49	
1995-96	55	
1996-97	47	

1997-98	65	
1998-99	69	
1999-00	74	1
2000-01	102	
2001-02	83	2
2002-03	98	
2003-04	122	1
2004-05	123	19
2005-06	101	15
2006-07	91	8
2007-08	123	3
2008-09	109	9
2009-10	112	17
2010-11	97	15
2011-12	127	11
2012-13	67	12
2013-14	45	14
2014-15	45	8

**Table O.** Data for Figure 46 & 47. Annual estimate of juveniles produced per adult in the winter population the preceeding winter for the Swedish reintroduced population and the wild Fennoscandian populations for the years 1994-2015

Year	the Netherlands	exp. Greece	juv Sweden	juv Norway	juv/ad winter Sweden	juv/ad Fennoscandia
1994	49.000	69.951	15	33		
1995	55	94.88132	0	67	.00000000	0.957812
1996	47	63.65148	10	23	0.181818	0.242408
1997	65	71.95482	8	32	0.170213	0.502738
1998	69	93.27236	0	31	0	0.430826
1999	74	61.62752	13	17	0.188406	0.182262
2000	102	56.56762	14	2	0.189189	0.032453
2001	83	59.93238	15	38	0.147059	0.671762
2002	98	59.16834	21	34	0.253012	0.567306
2003	122	53.00282	20	27	0.204082	0.456325
2004	123	43.55342	11	12	0.090164	0.226403
2005	101	47.82906	6	16	0.04878	0.367365
2006	91	52.23878	13	23	0.128713	0.480879
2007	123	49.75938	19	33	0.208791	0.631715
2008	109	38.03808	0	13	0	0.261257
2009	112	32.6366	38	10	0.348624	0.262894
2010	97	48.3856	11	35	0.098214	1.072416
2011	127	62.83424	38	44	0.391753	0.909361
2012	67	66.24474	3	9	0.023622	0.143234
2013	45	69.75634	1	9	0.014925	0.13586
2014	45	65.74886	11	11	0.244444	0.157692
2015	43	106	3	74	0.066667	1.125495

**Table P.** Data for Figure 49. Age and sex distribution of Lesser White-fronted Geese released in Sweden 2010-2014.

1 CY males	13
2 CY males	10
1 CY unknown sex	24
2 CY unknown sex	1
male unknown age	44
female unknown age	29
unknown age / sex	92

**Table Q.** Data for Figure 50. Maximum numbers of Lesser White-fronted Geese reported in spring (April-May, pale blue columns) and autumn (July-October, dark blue columns) in Hälsingland district in Sweden 2001-2015.

Year	Spring (April-May)	Autumn (July-October)
2001	24	42
2002	18	61
2003	34	66
2004	31	77
2005	35	64
2006	31	76
2007	42	65
2008	65	69
2009	62	100
2010	63	61
2011	53	104
2012	92	55
2013	46	37
2014	26	37
2015	24	36

**Table R.** Data for Figure 51. Maximum numbers of Lesser White-fronted Geese reported in spring (April-May, pale blue columns) and autumn (July-October, dark blue columns) in Uppland district in Sweden 2001-2015.

Year	Spring (April-May)	Autumn (July-October)
2001	7	17
2002	1	13
2003	4	24
2004	8	46
2005	13	30
2006	12	40
2007	19	27
2008	21	21
2009	6	75
2010	47	54
2011	3	76
2012	19	41
2013	20	35
2014	2	25
2015	2	24

## **ERRATA**

2016-11-14:

In chapter 7.4. (p 133, AEWA IWG Trondheim meeting April 2016) it is stated that option 2 (= exclusion of the Swedish population from the AEWA action plan) would have been the only acceptable option for Sweden. This was erroneous; Sweden preferred option 1 (but could have considered option 3 as a last resort). Norway, Finland etc. were in favor of option 2.