

**AEWA EUROPEAN GOOSE MANAGEMENT PLATFORM**



**WORKSHOP FOR THE REVISION OF THE INTERNATIONAL SINGLE  
SPECIES MANAGEMENT PLAN  
FOR THE SVALBARD POPULATION OF THE  
PINK-FOOTED GOOSE**



*8-9 October, Levanger, Norway*

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**DRAFT ANNEX 2  
PROBLEM ANALYSIS**

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## Services and disservices

### General overview

Expansions of breeding and/or wintering ranges have increased goose abundance in many areas, focusing attention on their adverse impacts such as damage to agricultural crops and risks to flight safety. However, benefits for people, resulting from ‘ecosystem services’ provided by the geese, should also be considered. Many of the general ecosystem services provided by geese have been summarized in a recent review (see Buij *et al.* 2017 for exhaustive list), but specific services and disservices of relevance to Pink-footed Goose management are briefly listed below.

In 2012, when the first ISSMP for the Pink-footed Goose (Madsen & Williams, 2012) was adopted, increasing agricultural damage and associated conflicts had been reported by most Range States, and increasing degradation to tundra vegetation caused by goose foraging (grubbing) was observed on their breeding grounds on Svalbard. Through implementation of the management actions suggested in the ISSMP, the population has stabilized over the recent decade, which has alleviated or reduced many problems and thus dealt with the main objectives of the ISSMP (see Madsen *et al.* 2024). However, the population has stabilized above the population target set out in the ISSMP, suggesting that several conflicts are likely to persist or resurface in the absence of continued efforts as described below.

This analysis is primarily based on responses from Pink-footed Goose Range States during the evaluation of the first ISSMP (see Madsen *et al.* 2024) as well as during a workshop held in Levanger, Norway in October 2024. Norway, Finland, Sweden, Denmark, the Netherlands, and Belgium have provided input to the analysis, and additional information has been provided by various stakeholders and gathered by evaluating the available literature.

### Human value

The presence of large flocks of geese generates a range of economic and non-economic (societal) benefits, ranging from the pleasure of watching the goose flocks to the consumptive use by hunters. The migratory habits of Pink-footed Goose (and other species) make their arrival and departure from breeding, staging and wintering areas particularly valued, and often bird migration is culturally intertwined with the changing seasons and life in the countryside. The opportunity to experience pink-footed geese outside the breeding areas (by birdwatchers, hunters, and other outdoor enthusiasts) has led to annual celebrations and events in Norway, Denmark, the Netherlands, and Belgium. The fascination of geese has the potential to bring people together, yet some stakeholders may not always agree.

The Pink-footed Goose harvest in Norway and Denmark (see further details below) locally represents opportunities for recreational hunting and a valued source of game meat. As an example, underlining the value of goose meat as a sustainably harvested delicacy, recipes based on wild goose meat were recently presented in the Norwegian book “Goose and Gourmet” (<https://www.orkana.no/produkt/gas-og-gourmet/>).

Hunters, like other users of nature, often spend considerable amounts of time and money participating in their activities, which can bring direct and indirect economic benefits to rural areas of Europe during the winter months (Kenward & Sharp 2008). While hunters most often financially contribute directly to landowners in order to have the opportunity to shoot geese, societal benefits of passive (eco-tourism, birdwatching) and non-use are more difficult to quantify. These contributions may however be estimated by counting visitors in nature reserves or goose hotspots and evaluating associated fees or local income. So far, this has not been quantified and analysed for the Pink-footed Goose. Since the early 1990s, a legbanding and neckbanding project has been carried out by Aarhus University and collaborators in Norway, The Netherlands and Finland. More than half a million resightings have been gathered by professional as well as volunteer birdwatchers along the migratory

route of the population, illustrating a big interest and curiosity in the whereabouts and movement patterns of the geese. Observers have entered their resightings into the online portal [www.geese.org](http://www.geese.org), where they have been able to follow the life history and movements of the observed geese. Likewise, hunters have reported rings and neckbands from shot geese to the national ringing centres, informing about the whereabouts and survival of geese. This has provided valuable information for scientific analyses of migration and demographics of the population, and also incentivizes birdwatchers to observe and count these birds.

### Dispersal of plants and invertebrates

Pink-footed geese have been shown to act as long-distance dispersal vectors for plants previously assumed to lack such a mechanism, thus potentially allowing terrestrial and aquatic plants to cross oceans and to keep pace with climate change (Lovas-Kiss *et al.* 2023). Plant propagules dispersal by other goose species are commonly reported (Ayers *et al.* 2010), usually detected in droppings during migration, suggesting that geese could potentially assist selected species to extend their native range in response to habitat loss. On the other hand, geese may also facilitate the spread of invasive alien plant species such as the New Zealand Pygmyweed *Crassula helmsii* (Denys *et al.* 2014).

High goose densities resulting in intensive grazing has been shown to deplete local seed stocks, influencing the long-term potential for vegetation recovery after a disturbance (Kuijper *et al.* 2006) and potentially outcompete other goose species where formerly allopatric species now overlap on the breeding grounds (Rozenfeld & Sheremetiev 2014).

As well as plant propagules (Takacs *et al.* 2017), geese are likely important dispersers of invertebrates (Buij *et al.* 2017) such as bryozoans (Figuerola *et al.* 2004).

### Other ecosystem services

In Belgium, wintering geese traditionally occupy wet grassland areas where goose grazing, leaving the sward short and dense in February-March, creates an attractive habitat for migratory waders passing through in spring. At the start of the breeding season, the same short-grazed wet grasslands are very attractive for meadow-breeding waders such as Black-Tailed Godwit *Limosa limosa*, Lapwing *Vanellus vanellus*, and Eurasian Curlew *Numenius arquata*. As such, grazing by wintering geese conditions the area for use by numerous other bird species and reduces the amount of rough vegetation at the start of the breeding season. Similar effects have been recorded in Denmark, where grazing by wintering, spring-staging and/or breeding Pink-footed, Barnacle and Greylag Geese apparently benefit staging and breeding waders.

### Damage to agricultural crops and associated management actions

Leading up to the adoption of the first ISSMP for the Svalbard population of Pink-footed Goose, increasing agricultural conflict had been registered in most of the range states. Conflicts were still increasing in Norway during spring, whereas conflicts caused by Pink-footed Geese in the southern Range States were stabilizing. In Denmark, conflicts were partly alleviated due to the changing spring migration phenology of the geese (Madsen & Williams 2012). Nevertheless, agricultural conflicts remain a cause of concern with considerable economic costs. In four Range States (Norway, Sweden, the Netherlands, and Belgium) subsidy schemes or compensation payments have been instigated to alleviate conflicts and/or compensate farmers for losses. In two of these (Belgium and the Netherlands), there is a systematic recording of agricultural damage caused by geese. Subsidies and compensation payments in Norway, The Netherlands and Belgium amount to approximately half a million EUR per year (Madsen *et al.* 2024).

Establishing an adaptive harvest management (AHM) programme has been a key action under the ISSMP to ensure that a stable population has been maintained, to avoid a possible escalation of agricultural conflicts.

However, the on-going move from traditional agricultural practices to a more intensified land use may in some cases result in new conflicts if crops become more sensitive to grazing and trampling.

## Effects on other flora and fauna

### Arctic tundra vegetation

With the increasing population size and range expansion observed during recent decades, signs of a negative effect of foraging Pink-footed Geese on tundra vegetation in Svalbard were also reported (Pedersen *et al.* 2013). As the geese are grubbing for roots and rhizomes in the wet moss carpets, moss and other food plants are pulled out which may create holes or craters which appear to regenerate at variable rates. Regeneration depends on wetness, patch size and the plant community (Speed *et al.* 2010) and is slowed down by the fact that geese return to the same patches year after year, grubbing on the edges of already open patches. The foraging activity may cause a shift in vegetation composition with a decrease in moss cover and an increase in graminoids (grasses and sedges) (van der Wal *et al.* 2007). The adaptive harvest management (AHM) programme has stabilised the population size which may reduce the negative effects on Arctic tundra ecosystems. Note, however, that the observed and anticipated rapid warming of the Arctic may alter the effects of goose grazing on tundra vegetation.

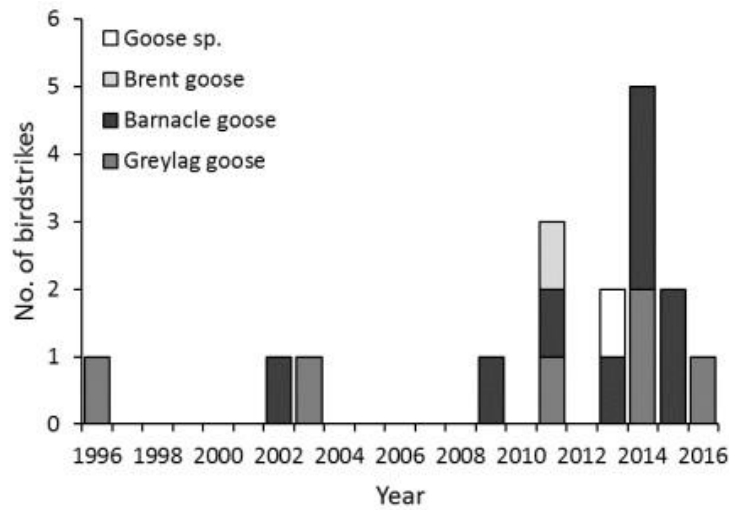
### Competition with other species

The formation of a new breeding area and migration route for Pink-footed Goose has increased the overlap between this species and the Taiga Bean Geese (*Anser fabalis fabalis*) breeding in central and northern Scandinavia and the boreal forests in the northwestern part of Russia. As the Scandinavia/Denmark and UK population of Taiga Bean Goose is declining, and conservation efforts are currently applied to all Taiga Bean Goose populations, competition between pink-footed geese and taiga bean geese at wintering and staging sites in Finland and Sweden is of potential conservation concern and should be monitored in the coming years.

At the spring-staging site in Northern Norway, Vesterålen, the number of pink-footed geese has decreased significantly with a corresponding increase in the number of barnacle geese *Branta leucopsis* over the previous decades (Tombre *et al.* 2013). This is presumably an effect of inter-specific competition for food (Madsen & Tombre, unpublished), but it also coincides with an intensification of scaring by the Vesterålen farmers (before the subsidy system was in place) and an increasing use of the Mid-Norway stopover site in Trøndelag. Hence, competition between the two goose species is probably not the only reason for a shift in spring migration phenology.

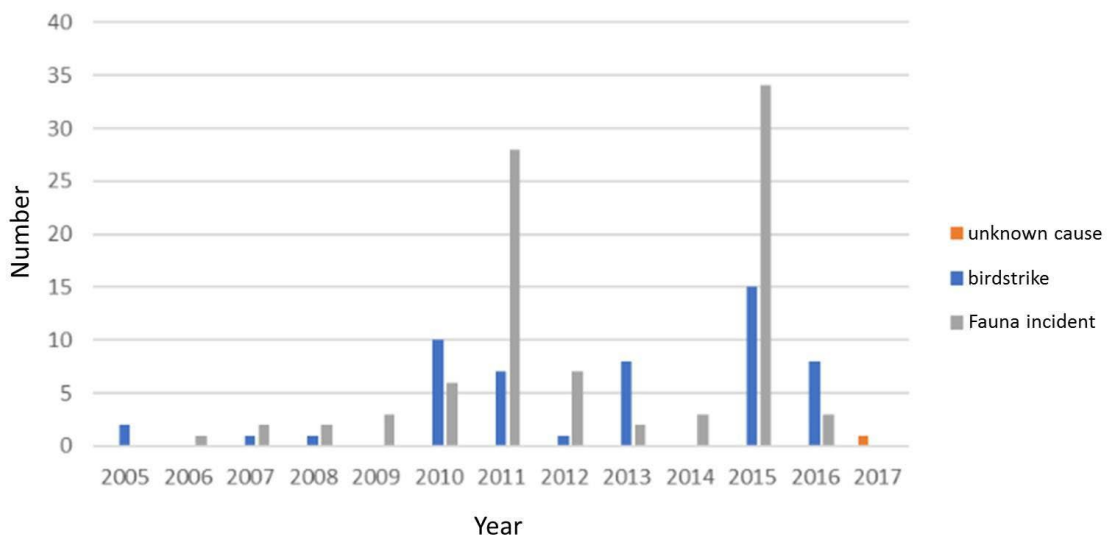
### Flight safety (bird strikes)

To our knowledge, no bird strikes involving pink-footed geese have been registered to date. However, bird strikes involving other goose species have been reported from at least five Range States (Norway, Sweden, Denmark, the Netherlands and Belgium), and specific concerns related to pink-footed geese are growing locally in at least two Range States (Norway and Denmark). At Copenhagen Airport in Denmark, the first bird strikes involving geese (primarily Greylag Geese *Anser anser* and Barnacle Geese) were recorded in the second half of the 1990s, and the frequency of bird strikes with geese has increased during the last decades (Figure 1). This increase seems to be linked to an increase in numbers of geese migrating over the Copenhagen area between staging areas in the southern part of Sweden and wintering sites in Denmark and further south, but may also be related to the increasing airport traffic (source: Eurostat Data; Bradbeer *et al.* 2017; Stroud *et al.* 2017).



**Figure 1.** Number of bird strikes caused by geese in Copenhagen Airport 1996-2017. Data courtesy: Copenhagen Airport.

At Schiphol Airport in the Netherlands, bird strikes with geese have been recorded since 2005 and the frequency of such bird strikes also appears to have increased during the last decades (Figure 2), despite the fact that a comprehensive management scheme has been in place.



**Figure 2.** Collisions with geese reported at Schiphol, Airport between 2005 and 2017. Bird strike is an actual collision of a goose with an airplane at Schiphol Airport; fauna incident involves found geese (often still intact) at the Schiphol site (source: Bird Control Schiphol).

### Health/welfare issues

Wild goose species may act as a reservoir for viral diseases (e.g. avian influenza, coronavirus) as well as carriers of pathogenic protozoans (*Toxoplasma gondii*) and bacteria (e.g. *Salmonella*, *E. coli* and *Campylobacter*). Such diseases have the potential to cause human health effects (Alexander 2000; Gorham and Lee 2016), and geese have even been found to act as vectors for resistant strains of *E. coli* closely related to those commonly occurring in humans (Kallbekken & Mjelde 2020). However, there is little evidence of transfer to livestock and humans (Elmberg *et al.* 2017).

Due to their migratory behaviour, geese may potentially transport infectious diseases over long distances, thus also potentially transmitting diseases to poultry farms. Studies show that migratory geese are often exposed to diseases such as avian influenza in the large flocks on the wintering grounds (Yin *et al.* 2017), indicating that migratory geese may be more likely to act as vectors during the spring, and less so during autumn migration. The first detection of highly pathogenic avian influenza virus in Norway included a wild Pink-footed Goose that had probably been exposed to the virus in its wintering area (Madslien *et al.* 2021).

A localized outbreak of *Campylobacter* bacteria registered in a local human community in mid Norway was suggested to be caused by pink-footed geese using a drinking water reservoir for roosting, thus transmitting *Campylobacter* to the human population. Even though the causal relationship was not demonstrated, the local authorities took the initiative to scare away the geese from the site as a precautionary measure (Madsen & Williams 2012).

Overall, the risks are poorly understood, and a formal risk assessment would be necessary to properly evaluate the implications. To our knowledge, fouling of amenity areas by pink-footed geese has not been reported.

The use of lead shot for goose shooting may constitute a human health issue (see Chapter Diseases and contamination below).

## Potential threats to the population

### General overview

This section is not intended as a full risk assessment but merely outlines the anticipated actual/potential threats to the population. The assessment is based on available knowledge through several decades of studies on this species, incorporating recent information from Range States and international stakeholder organisations.

A number of factors have the potential to become a threat to this population, such as outbreaks of avian influenza (Melville & Shortridge 2006) or increased predation pressure, which for some goose populations have had significant local effects. Currently, for Pink-footed Geese these threats appear to be negligible at population level yet may still be of local concern.

### Habitat loss

#### Altered habitat use

Changes in habitat use may cause loss of foraging opportunities for pink-footed geese. Overgrowing of pastures, intensification of land use, or other effects of abandoning traditional agricultural practices may force Pink-footed Geese to explore new foraging areas. Funding opportunities for reestablishing and maintaining natural meadows and marsh areas are currently limited, resulting in limited capacity for mitigation measures. If no high-quality natural habitat is available, this may locally increase damages to sensitive agricultural crops.

In some cases, nature restoration may also have negative impacts on the Pink-footed Goose population. An important autumn staging area in Denmark, consisting of farmland utilised by a large proportion of the Pink-footed Goose population, was transformed into a restored wetland area (lake) to benefit waterbirds and biodiversity in general, but caused the geese to avoid the area and seek new agricultural foraging sites, initially even leaving for the Netherlands earlier than in previous years (Clausen & Madsen 2016).

#### Competition with other species

Competition for food with barnacle geese at spring staging sites in northern Norway may cause reduced opportunities for spring fattening prior to migration to the breeding grounds on Svalbard. This still needs to be

analysed in more detail, and possible effects on reproductive output remains to be documented, but the inter-specific competition has shifted important spring staging areas in Norway further south to Trøndelag (I. Tombre & J. Madsen unpublished). Likewise, in western Denmark, exponential growth in the wintering numbers of barnacle geese has led to increased inter-specific competition with pink-footed geese. This has resulted in abandonment of important wintering sites by pink-footed geese, and their redistribution further north and inland (J. Madsen unpublished).

### **Energy infrastructure**

Large-scale development planning for renewable energy plants such as solar panels, offshore and land-based windfarms is on-going, and the green transition is currently gaining momentum. Pink-footed geese exhibit strong changes in foraging behaviour by avoiding windfarms by several hundred metres (Larsen & Madsen 2000, Plonczkier & Simms 2012). The risk of collision is considered small, yet displacement effects may limit high-quality foraging areas available to the geese, demonstrating a need for strategic planning of energy clusters including careful consideration of potential effects on birds throughout the annual cycle.

High voltage power lines often cross open landscapes used for roosting and foraging by large flocks of geese, which may cause collisions (not least when geese are disturbed by predators or human activities). A project in Flanders, Belgium is currently on-going (led by Natuurpunt), and further research and monitoring is recommended on the impact of power lines.

### **Disturbance**

A growing interest in visiting Svalbard has been registered in recent years, and tourist activity by both cruise ship passengers and hikers visiting the archipelago is increasing rapidly (Kaltenborn *et al.* 2024). Breeding pink-footed geese are highly sensitive to disturbances, both during nesting and brood rearing (Madsen *et al.* 2009), yet tourists may not realise the disturbance they cause as pink-footed geese exhibit strong avoidance behaviour and will likely leave at relatively long distances (often more than 1 km). The Governor of Svalbard has declared protection zones with limitations on tourist access; however, in Isfjorden, the central breeding area for Pink-footed Geese, tourist activities are less restricted. Case studies exist of single hikers tenting in a core goose brood rearing area (the river plains in Sassendalen) observed to displace hundreds of Pink-footed Goose families from a 4-5 km key stretch of the valley for several days (J. Madsen unpublished data).

During the migration and wintering periods, Pink-footed Geese may be displaced by intensive scaring activities (to avoid crop damage) and hunting. As hunting intensity and practise varies along the flyway, disturbance from hunting is likely to be of mainly local importance, yet efforts to coordinate hunting in order to reduce disturbance will allow the geese to remain in suitable areas until food resources are utilized. Intensive scaring was previously suggested to affect body condition, reproduction and summer survival (Madsen 1995; Klaassen *et al.* 2006), and even though conflicts in some areas have been solved by introducing subsidy schemes, future goose grazing in new areas (for example along the newly established migratory route) may invoke similar conflict.

### **Diseases and contamination**

Avian Influenza is not prevalent in Pink-footed Goose yet increasing prevalence of pathogens during late autumn and winter suggest that the geese may be in contact with barnacle geese, dabbling ducks or other species with a significantly higher prevalence (Hoye *et al.* 2011). There have been no reports of die-offs of Pink-footed Geese which could be related to Avian Influenza, although an AI seroprevalence of around 50% has been recorded in the population (Lam *et al.* 2020).

The use of lead shot for shotgun shooting has been banned in Denmark for more than three decades, and in Norway the use of lead shot has been banned in and close to wetlands since 2023 (as part of the EU REACH directive which is also legally binding for Norway). This is likely to reduce the contamination caused by ingestion of lead shot by geese and other waterbirds in the longer term, even though shotgun pellets may remain in the soil for decades (Kanstrup *et al.* 2020). However, the fact that most goose shooting takes place over farmland, often at a distance from wetlands, means that lead shot can still be used for goose hunting in Norway (and Russia). This may potentially have an ecotoxicological effect on birds being hit (and surviving as crippled), as well as causing a human health exposure to people ingesting lead shot or fragmented lead shot when eating goose meat from shot birds (Kanstrup 2024).

The recent breeding colonisation of pink-footed geese in Novaya Zemlya is placed in, or in the vicinity of, former Soviet nuclear weapon test sites, used during 1954 to 1990. It is known that there is a widespread radioactive contamination of the environment from the fallout and leakage from nuclear weapon testing as well as radioactive dumping in the area (<https://www.nuclear-risks.org/en/hibakusha-worldwide/novaya-zemlya.html>). It is unknown to what extent this has contaminated geese breeding and moulting in the area, not only pink-footed geese but also large concentrations of other goose species undertaking flight feather moult in Novaya Zemlya, for example the majority of the taiga bean geese (Piironen *et al.* 2021).

### **Predation**

As recorded for other Arctic breeding bird species, geese are increasingly exposed to mammalian and avian predators. Polar bears started to exploit Pink-footed Goose colonies by emptying nests for eggs on Svalbard in 2011, which may locally cause a decrease in breeding success (Prop *et al.* 2013), particularly in coastal breeding colonies. Predation by Arctic Fox (*Vulpes lagopus*) and other natural predators currently seem to pose no elevated threat to the population. White-tailed Eagle (*Haliaeetus albicilla*) prey on pink-footed geese (mainly observed at staging grounds in Norway) but does not have an impact at population level. The disturbance and escape flights caused by approaching White-tailed Eagles may cause energetic stress to geese in several Range States, but this has not been systematically studied for Pink-footed Goose.

### **Maintenance of range**

Pink-footed geese have traditionally been extremely faithful to a limited number of sites and regions. Nevertheless, the population has undertaken several changes in migratory routes and times and the use of staging grounds, probably partly explained by an increasing population size, inter-specific competition, land use changes and climate change. Particularly the increased use of maize in the agricultural sector in western Europe has provided geese with a lush new food supply. The geese visit the fields after harvest, feeding on spilt maize, which is energetically very attractive (Clausen *et al.* 2018a). As a result, pink-footed geese stay in Denmark throughout the winter instead of migrating to The Netherlands, and in both Denmark, The Netherlands, and Belgium, the geese have expanded their range, flying up to 45 km inland (in Denmark; 15-20 km in Flanders) in search for maize stubble fields.

Recently, the population has rapidly and unexpectedly expanded its breeding range to Novaya Zemlya in north Russia and its non-breeding range to include Finland and Sweden, partly based on an emigration from the traditional flyway. This is likely to continue in the coming decade, with yet unknown effects on the overall population size, biodiversity and human-related interests.

Hence, overall, the range of Pink-footed Geese has expanded on national as well as international scales. The geese have become increasingly explorative in their wintering strategies (Clausen *et al.* 2018b), reflecting the dynamic development of use of new food supplies and exploration of new range (Kuijken & Verscheure 2023, Madsen *et al.* 2023).



### Hunting/Derogation shooting

Pink-footed Goose is only huntable in Norway, Denmark, and Russia. The species is listed on Annex II/B of the EU Birds Directive, which means that certain Member States across the EU can allow hunting of this species. Of the current range states, this only applies to Belgium and Denmark (Norway and Russia are non-EU countries). The hunting periods vary between Range States, but generally takes place from September to January, starting in Norway (including Svalbard) and continuing in Denmark as the birds move south. No information is available on the level of hunting in Russia.

**Table 8.** *Hunting status in Range States*

H: species is huntable with declared open season, P: protected species (not huntable)

Range states	Hunting status	Open season	Remarks
Norway	H	10/8-23/12	With local restrictions
Russia	H		No information available
Finland	P		
Sweden	P		
Denmark	H	1/9 – 31/1	
Netherlands	P		
Belgium	P		

Derogations may be issued in accordance with country rules, for example in relation to problems associated with situations where agricultural damage, risks to human health and/or air safety are reported to meet pre-agreed criteria. Only very few derogation permits are issued for Pink-footed Goose, and the most recent report to the European Commission included less than 200 Pink-footed Geese shot under derogation (see Table 9).

**Table 9.** *Availability of bag statistics, derogation reports and recent bag sizes for the Pink-footed Goose*

Range state	Annual statutory bag statistics	Annual hunting bag size (latest estimate)	Hunting season	Annual derogation size (latest estimate)	Year
Norway	Yes	2,927	2023/24	NA	-
Russia	No	Not available	-	Not available	-
Finland	NA	0	-	0	2022
Sweden	NA	0	-	0	2022
Denmark	Yes	7,065	2023/24	164	2022
The Netherlands	NA	0	-	0	2022
Belgium	NA	0	-	0	2022
<i>Overall</i>		<i>9,992</i>		<i>164</i>	

### Crippling

Crippling of Pink-footed Goose caused great concern in the mid-1990s, when more than one third of the population was carrying imbedded shotgun pellets (Noer & Madsen 1996), causing an apparent lower long-

term survival (Madsen & Noer 1996). The crippling rate has been monitored closely since the adoption of the ISSMP for Pink-footed Goose, and the actions taken to reduce crippling (by raising awareness and improving hunters' skills) have served to reduce crippling to the current level where this potential threat can be considered of negligible importance to the population (Madsen *et al.* 2024). With the introduction of a legal obligation to use a retrieving dog for goose hunting in Denmark, the 'severe wounding' leading to non-retrieved, killed geese (and not reported in the hunting bag statistics), has probably decreased, but this has not been systematically investigated.

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