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SVALBARD PINK-FOOTED GOOSE

Population status report 2017-2018

Report prepared by the AEWA European Goose Management Platform Data Centre

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Summary

This report compiles annual monitoring data on the population status of the Svalbard Pink-footed Goose for the season 2017/18. This data is used to assess the population development and provides input for the modelling of an optimal harvest strategy for the population for the coming hunting season (2018/19). This is part of an adaptive harvest management framework set up to support the implementation of the AEWA International Single Species Management Plan (ISSMP) for the population. The estimated population size in spring 2018 was c. 67,000 individuals, supported by a count of c. 72,000 geese in mid-November 2017 and an estimation of 80,000 geese based on marked birds. The decrease followed a poor breeding season in 2017 (7.6% juveniles in the autumn), which corresponds well with predictions based on temperatures in Svalbard in May 2017 showing a late spring. The total number of Pink-footed Geese harvested in Norway and Denmark

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in the 2017/18 hunting season was c. 11,388, which is lower than in the preceding season and despite an opening of shooting in Denmark in January 2018. The breeding output in 2018 is predicted to be high due to record warm conditions in Svalbard in May. Trends in indicators of the agricultural damage caused by Pink-footed Geese in the Range States have been reported. In Norway, subsidies paid to farmers have increased, which is in accordance with increasing goose numbers in spring when damage occurs. In Belgium compensation paid for damage has remained stable, which is in accordance with overall stable wintering goose numbers. In the Netherlands compensation payments have been stable, but the national numbers of wintering Pink-footed Geese have declined.

1 – Aim

The aim of this report is to compile annual monitoring data on the population status of the Svalbard Pink-footed Goose for the season 2017/18. This data is used to assess the population development and provide input data for the modelling of an optimal harvest strategy for the population for the coming hunting season (2018/19). This is part of an adaptive harvest management framework set up to support the implementation of the ISSMP for the population (Madsen et al., 2017; Madsen and Williams, 2012). Data from the previous seasons 2012/13-2016/17 have been published in separate annual reports. Previous reports and further information about the ISSMP process will be found on the website <http://egmp.aewa.info>. For the first time, in this report we also report on the trend in survival of the population as well as status and trends in indicators of other than population related objectives of the ISSMP, namely subsidies/compensation paid for coping with agricultural damage caused by Pink-footed Geese in the Range States and the rate of crippling due to wounding from shooting with shotguns.

We thank the national volunteer networks who contributed with counts, the Danish hunters providing wings of shot birds, the Danish Environmental Protection Agency and Statistics Norway for supplying preliminary hunting bag statistics and Vlaamse Overheid, Agentschap Natuur & Bos in Belgium, Faunafund in the Netherlands and the County Governors of Trøndelag and Nordland in Norway for supplying data on subsidies/compensation schemes.

2 – Population estimate 2017/18

Internationally coordinated population counts were performed on 19 November 2017 and 5 May 2018. Counts were coordinated as closely as possible to these dates. Flocks were either counted when they were leaving roost sites in the morning, arriving at roost sites in the evening, or alternatively on fields. The main known sites were covered by a network of trained observers who coordinated the coverage and timing of counts. Additional information was retrieved from internet reporting portals, where birdwatchers had reported flocks in areas outside the main areas (<http://artsobservasjoner.no/fugler>; <https://www.artportalen.se/>; <http://dofbasen.dk>; <https://www.tiira.fi/>). Count data from Germany is not available, but numbers present were likely to be very low.

The mid-November population count was performed in Norway, Sweden, Denmark, the Netherlands and Belgium, and gave a population estimate of 72,000 geese (rounded up to nearest 1,000). During this time of the year a large proportion of the birds was concentrated in Jutland, Denmark (c. 75%), but relative high numbers were also found in Belgium (c. 15%) and in the Netherlands (c. 8%) (Table 1; Fig. 1a). The rest was scattered around in Sweden and Norway. Large numbers of geese (approximately 10,000) had abandoned Norway just few days prior to the count date due to a cold spell.

The May count was performed in Norway, Sweden, Finland and Denmark, and gave a population estimate of 67,000 geese. In May the majority of geese was located in Norway (c. 90%), but with record high numbers in Finland (c. 6%) (Table 1; Fig. 1b). Only few birds were left in Denmark and Sweden.

The autumn estimate of c. 72,000 geese is used as the estimate for the 2017/18 season (Table 1; Fig. 2).

Table 1. Results of synchronized counts of Pink-footed Geese in autumn 2017 and spring 2018

Country	Region	Numbers	
		18-19 November 2017	5-6 May 2018
Norway	Trøndelag	15	60,436
	Vesterålen		598
	South-Norway		867
	North-Norway		2
Denmark	Jutland	54,027	115
	Lolland	167	0
Finland	Oulu region	-	4,220
	Elsewhere		85
Sweden	Various sites	489	225
Germany		NA	-
The Netherlands		5,535	-
Belgium	Flanders	11,419	-
TOTAL		71,651	66,548

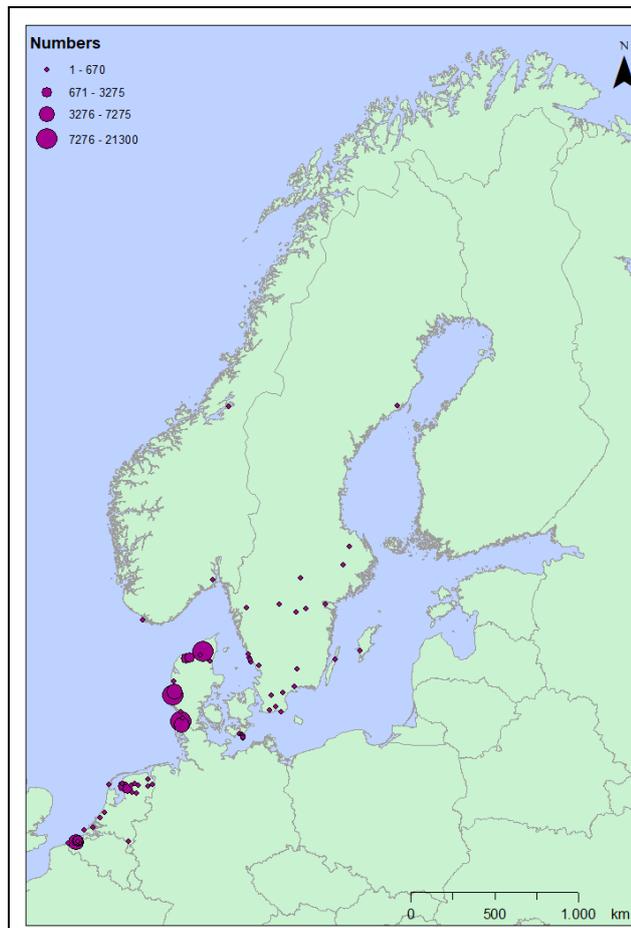


Figure 1a. Distribution of Pink-footed Geese in November 2017

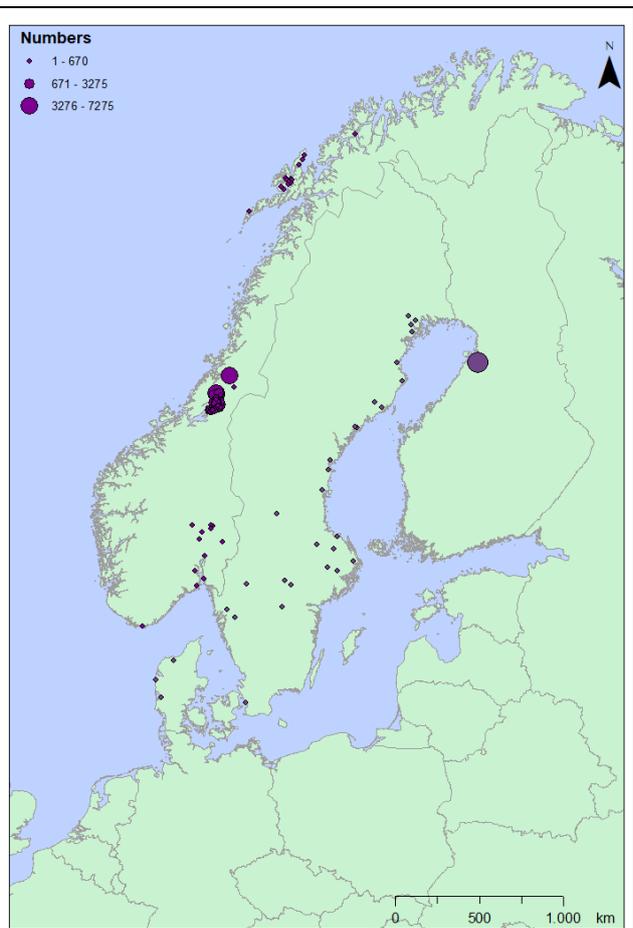


Figure 1b. Distribution of Pink-footed Geese in May 2018

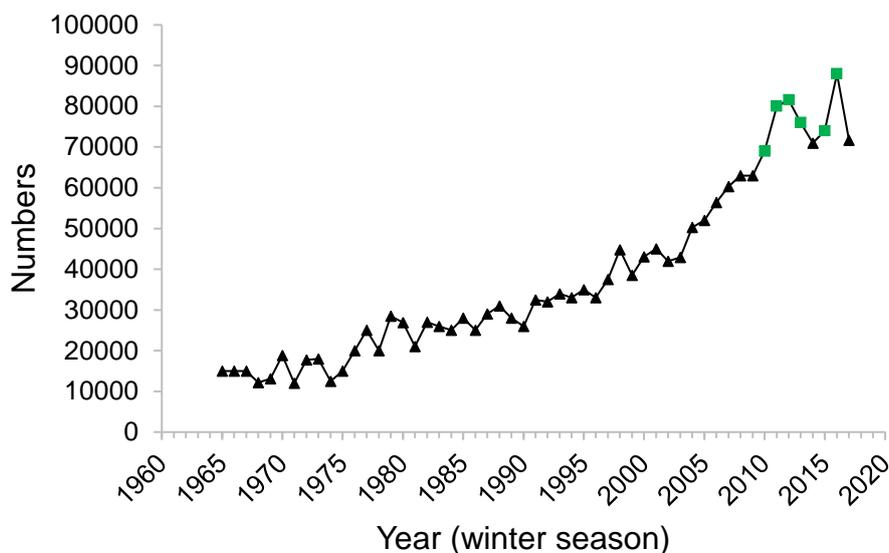


Figure 2. Development of the size of the Svalbard population of the Pink-footed Goose, 1965/66-2017/18. Green squares show years where November counts have been replaced by counts in the following spring.

To obtain an alternative estimate of total population size of Pink-footed Geese, we used a capture-recapture approach (Lincoln index) on sightings of geese marked with neck collars in Denmark, Norway and Svalbard. The estimation is based on the ratio of total geese per marked goose and the total number of marked geese in the population (Sheaffer and Jarvis, 2013). Recordings of marked versus unmarked individuals in flocks were started in 1991 (Ganter and Madsen, 2001). In the first 20 years, recordings were made on relatively few flocks (average number of flocks scanned annually was 28; range 1-153); since 2012, the recordings have been intensified to increase the sample size (average number of flocks scanned was 320, range 287-383). For each year during 1991-2018 we estimated a mean ratio of marked to unmarked geese for all flocks >100 individuals recorded autumn and spring in Denmark and the Netherlands. In 2017/18, only data from Denmark (October-November 2017 and March-April 2018) has been used because so few geese staged in the Netherlands. The number of neckbanded geese alive was estimated based on the number of marked geese seen at least twice in an observation window covering mid-March to mid-May (corresponding to a period with coordinated observation efforts), corrected for the detection rate of marked birds alive. Ringing and re-sighting data was extracted from www.geese.org, where observers add their registrations. Detection rate was estimated using the program MARK (White and Burnham, 1999). As the detection rate of the previous year in a time series is not estimable, we assumed the detection rate and the variance for the most recent year to be identical to the previous year, as the variation between subsequent years has been moderate. The total population size was estimated as the number of marked geese alive divided with the corrected estimate of the ratio. The confidence limits were estimated based on the variance estimate for the population.

The estimated population size was 79,900 individuals ($\pm 12,671$ 95% CL) in May 2018. As shown in Fig. 3, there has been a relatively good accordance between the population counts and the Lincoln index estimate in recent years.

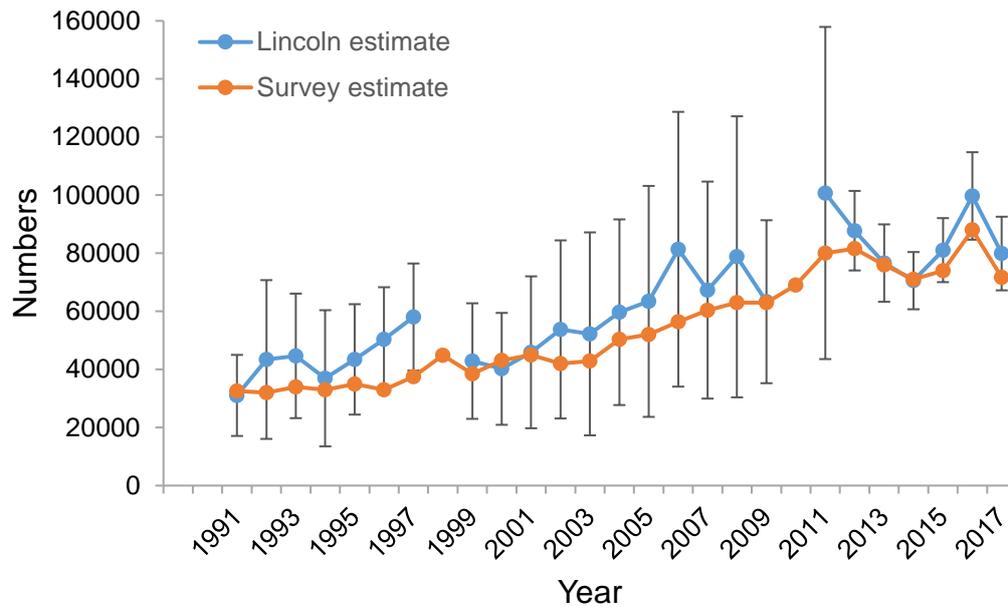


Figure 3. Comparison of population estimates based on surveys and marked individuals (average \pm 95% CL). During 1991-2011, the number of goose flocks scanned for marked/unmarked birds was relatively low, but since 2012 it has increased, which is the reason for the decrease in variance. In years with fewer than 10 flocks scanned (1998, 2010), estimates have not been shown.

3 - Productivity

Age counts, i.e. recording of the proportion of juvenile birds in random flocks during autumn, were performed in Trøndelag, Norway, NW and W Jutland, Denmark, Friesland, the Netherlands and Flanders, Belgium, on 13 October and 4 November 2017. In contrast to previous years, the proportion of juveniles increased from the north to the south. The weighed estimate of 7.6% is below the long-term average for the population (14.3%) (Table 2; Fig. 4). The low breeding output is in line with the predictions made on basis of weather conditions in Svalbard (May temperatures 2017); hence, 2017 was a late season (see J. Madsen et al., 2017 and Fig. 9).

Table 2. Age counts in autumn 2017 and a weighed estimate for the entire population, based on the age counts and numbers in each region in mid-November (see Table 1). The approximate number of geese per region in late October (when the age counts are performed) is judged from surveys in the various countries.

	No. Juvs	No. Adults	Total sample	% juv	Population late Oct per region	Estimated no juvs per region
Trøndelag, Norway	210	3,741	3,951	5.3	10,000	532
Jutland, Denmark	1,265	16,315	17,580	7.2	53,000	3,814
Friesland, Netherlands	359	2,590	2,949	12.2	4,000	487
Flanders, Belgium	525	3,537	4,062	12.9	5,000	646
Total	2,359	26,183	28,542		72,000	5,478
Weighed proportion of juveniles						7.6

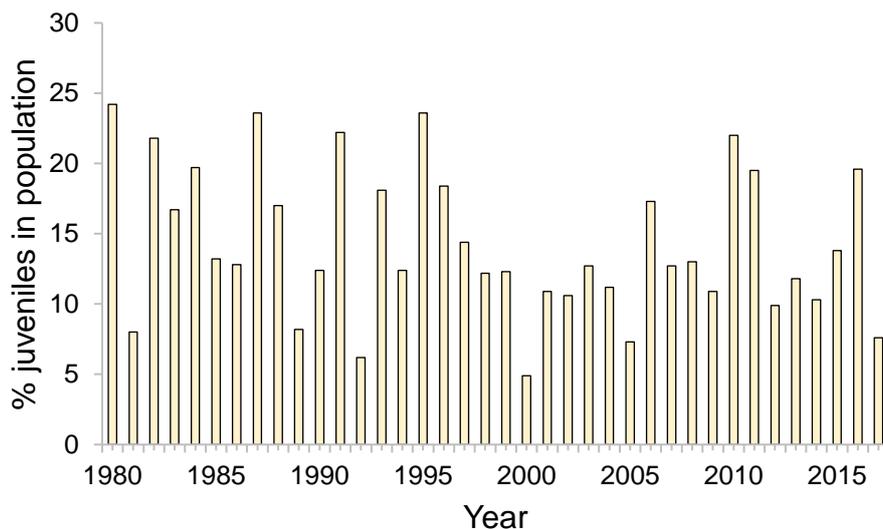


Figure 4. Proportion of juveniles in the autumn population of the Svalbard Pink-footed Goose, 1980-2017

4 – Survival

Annual survival was estimated using the program MARK (White and Burnham, 1999), based on dead recoveries and encounter histories (Joint Live and Dead Encounters) of all Pink-footed Geese ringed with neck collars during 1990-2018. Ringing and re-sighting data was extracted from www.geese.org and dead recoveries were supplied by the ringing offices in Denmark and Norway. Encounter histories were based on an observation window from 23 March to 22 May, and because neck-collared individuals are generally seen several times during this period, only birds with at least two sightings within the observation window were included as positive observations. This ensured that the influence of re-sighting errors were kept to an absolute minimum. Using MARK a number of models was fitted with various constraints on survival, re-sighting probability and recovery probability. These models were evaluated using AIC (Burnham and Anderson, 2002), and estimates of annual survival from the best performing model used.

The survival estimates are updated each year, and subject to minor changes due to continuous reporting of re-sightings. Overall, adult survival has decreased during the last two decades. Based on the newest update, the adult survival estimate was 0.73 in 2016-2017 (Fig. 5).

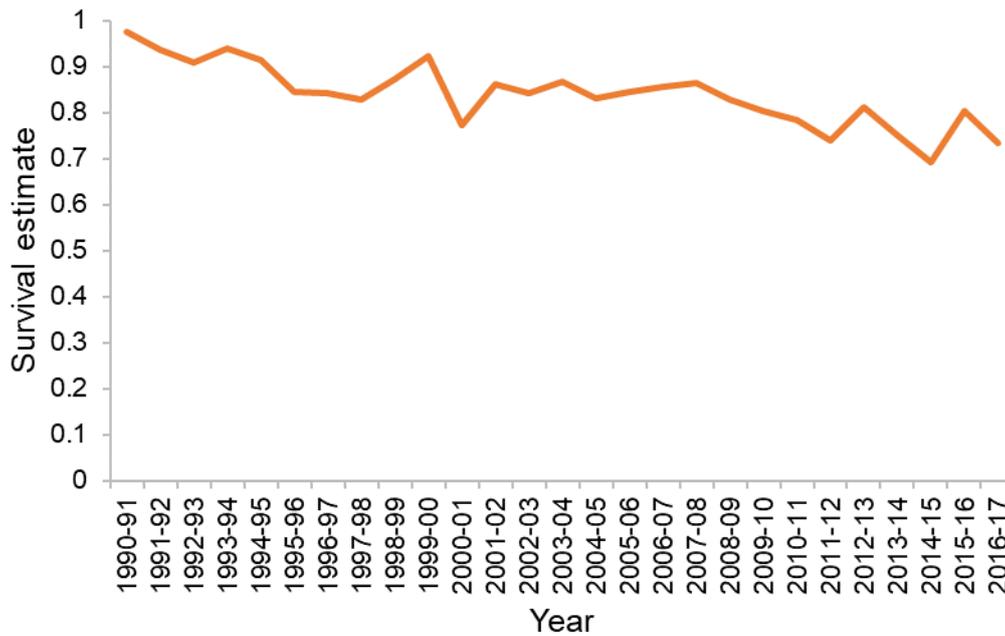


Figure 5. Adult survival estimates of the Svalbard Pink-footed Goose, 1990/91-2016/17

5 – Harvest in Norway and Denmark 2017/18

Following the optimal harvest strategy for the hunting season 2017/2018 (Johnson and Madsen, 2017) the International Working Group for the ISSMP recommended to increase the harvest of Pink-footed Geese (from 25,000 in 2016/17 to 36,000 in 2017/18) in order to reduce the population towards the 60,000 target (Madsen and Williams, 2012). In consequence, in Denmark, the hunting season continued to include January, as in the previous hunting season. In Norway, the attempt to improve the organization of goose hunting continued.

Data on hunting bags from Norway has been supplied by Statistics Norway (www.ssb.no) (communicated via the Norwegian Environment Agency). Hunting bags from Denmark have been derived from the National Hunting Bag Statistics (Danish Environmental Protection Agency; Aarhus University) (<http://bios.au.dk/videnudveksling/til-jagt-og-vildtinteresserede/vildtudbytte>). In both Norway and Denmark, reporting the harvest is mandatory, and hunters report their bags online. However, since not all hunters in Norway and Denmark may yet have reported their hunting bags (as of 29 May 2018), the data for 2017/18 is still preliminary (Table 3). For Denmark, the proportion of hunters having reported their bag by May is c. 90%; however, it is highly likely that the remaining 10% of hunters are not representative, but shoot little. Therefore, the harvest has not been corrected for lacking response.

In Norway, a total of 1,731 Pink-footed geese were reported shot, mainly from Nord-Trøndelag (1449). This is lower than in previous years (Table 3, Fig. 6), but in line with observations from Nord-Trøndelag, where geese were only observed for a relatively short period, i.e., geese arriving late and staging for a short time, mass-departing due to a cold spell in the middle of November. This is also evident from the population count from mid-November, which shows that more or less all geese had left Nord-Trøndelag by this time (only 15 left by mid-November), compared to last year when c. 8,600 (c. 10% of the population) still remained.

The numbers of Pink-footed Geese reported shot in Denmark was 9,657 (Table 3, Fig. 6). This is lower than in previous years when January shooting was also allowed (2014/2015 and 2016/2017) (Table 3), but comparable to years when January shooting was not allowed. During the last two years when January shooting was allowed, approximately 40%² of the Danish harvest was taken in January. However, in January 2018 only

² Estimated based on wing collection (Fig. 7) and recoveries of ringed geese reported shot (Fig. 8).

approximately 16%¹ was shot in January. This seasonal distribution is seen in both the reporting of wings by hunters and the recoveries of ringed geese reported as shot (Figs. 7 and 8) (Madsen et al. 2017).

In total, the preliminary number of harvested geese was 11,388 (Table 3, Fig. 6). For exact numbers shot in previous years, final data from Statistics Norway (www.ssb.no) and Aarhus University, Denmark (<http://fauna.au.dk/>) should be used.

Table 3. Hunting bags of Pink-footed Geese in Norway and Denmark, hunting seasons 2012/13-2017/18 (preliminary numbers). Birds killed by derogation shooting are not included in the bag data.

Country	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Norway	2,169	1,819	1,594	2,460	2,808	1,731
Denmark	8,580	9,262	13,200	8,761	13,335	9,657
TOTAL	10,749	11,081	14,794	11,221	16,143	11,388

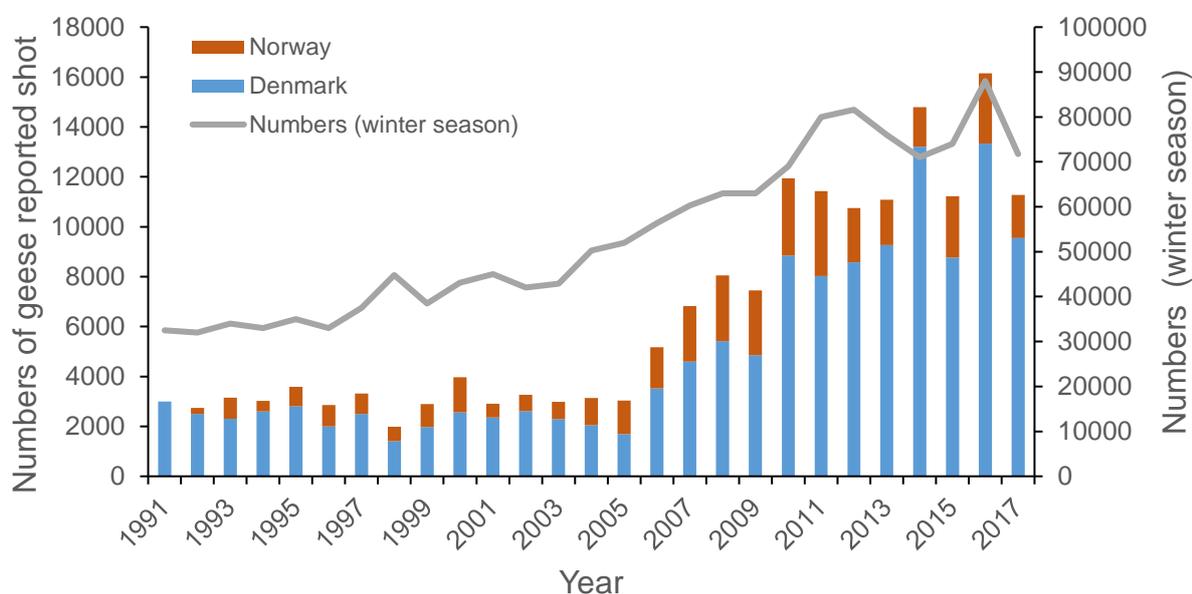


Figure 6. Development in the harvest of Pink-footed Geese in Norway and Denmark, 1990/91-2017/18. Harvest data for Norway was available from 1992 onwards. Grey line shows development of the size of the Svalbard population of the Pink-footed Goose in the corresponding years.

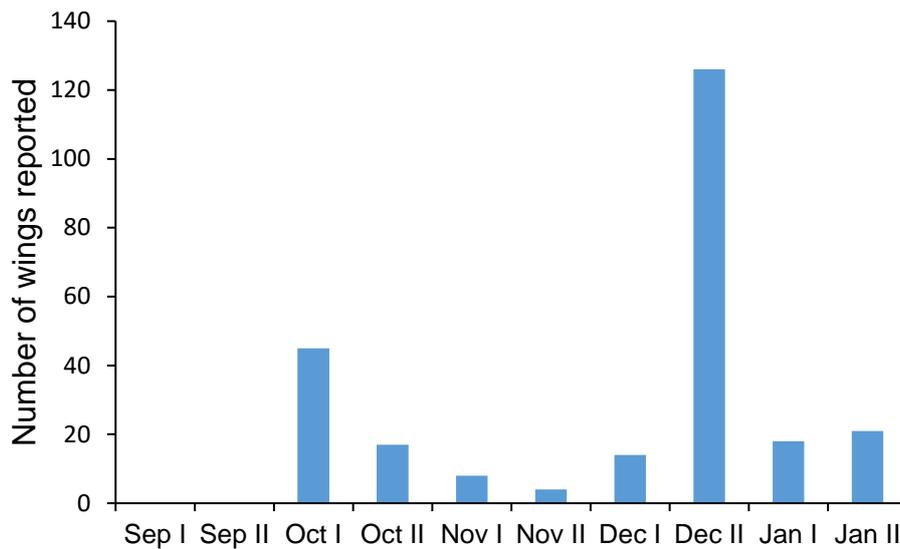


Figure 7. Number of wings of Pink-footed Geese ($N_{total}=247$; $N_{Oct-18 Nov}=72$) collected from hunters in Denmark in the 2017/18 hunting season, divided into half-monthly intervals.

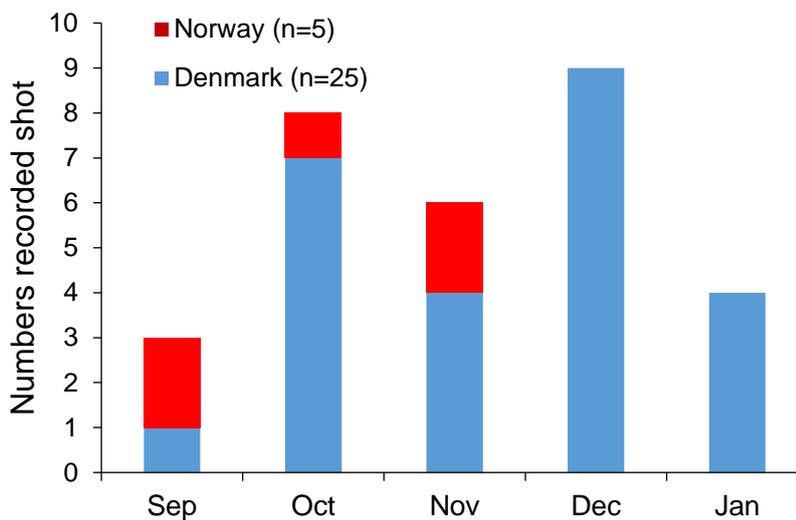


Figure 8. Number of marked Pink-footed Geese recorded as shot in the 2017/18 hunting season in Denmark and Norway

5 - Crippling

Status and trend of crippling of Pink-footed Geese caused by shotgun shooting has been given by Clausen et al. (2017). On 28 April 2018, 12 Pink-footed Geese were caught by canon-nets and X-rayed at Tyrnävä, near Oulu, Finland. No geese (10 adults and two juveniles) carried shotgun pellets in their tissues. However, the sample is too small for statistical treatment and comparison with previous years.

6 – Spring weather conditions in Svalbard 2018

For the modelling of optimal harvest strategy for the hunting season 2018/19, we use the weather conditions in May in Svalbard as a predictor of the production of young (Jensen et al., 2014). The mean daily temperatures are derived from Ny Ålesund and Svalbard Airport meteorological stations (www.yr.no). In May 2018, Ny Ålesund had 28 thaw days and Svalbard Airport had 26 thaw days. For further analysis an average of 27 thaw days will be used, which is well above the long-term average for 1990-2018 (8.8 days), and close to the possible maximum number of thaw days in May (see Fig. 9). Hence, we predict the 2018 breeding success will be high.

The optimal harvest strategy is reported separately (Johnson et al. 2018).

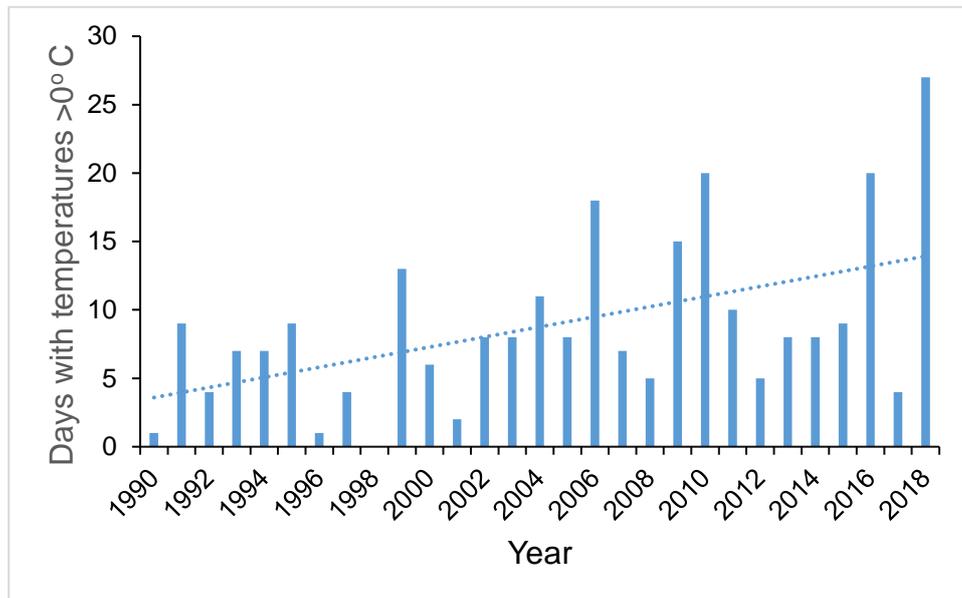


Figure 9. Number of thaw-days (days with average temperatures above 0°C) in May on Svalbard, expressed as an average for Ny Ålesund and Longyearbyen Airport. (data source: Norwegian Meteorological Institute). Dotted line shows the trend based on a linear regression.

7 – Agricultural damage

Various indicators of agricultural damage related to Pink-footed Geese are reported from Norway, Denmark, the Netherlands and Belgium. In Finland and Sweden, which still hold a small proportion of the population, no damage has been reported. In Norway, the agricultural authorities subsidise farmers for allowing Pink-footed Geese to forage on their land. The level of subsidy is negotiated nationally each year. In the Netherlands and Belgium, farmers are paid compensation for damage. In Denmark, derogation shooting outside the open hunting season is used to alleviate agricultural damage.

The Norwegian subsidy scheme has been in place since 2006 in Nord-Trøndelag and Nordland (Vesterålen). Nowadays, almost the entire Pink-footed Goose population stages in Nord-Trøndelag in spring, and as the population has increased, so have the subsidy expenditures; from 123,600 EUR in 2006 (split between 46 farms) to a peak number in 2017 of 454,410 EUR (split between 66 farms). Pink-footed Geese have almost stopped using Nordland county as a stopover area due to increasing competition with Barnacle Geese (Eythórsson et al., 2017). Here, the subsidies paid for hosting Pink-footed Geese have decreased from 92,700 EUR in 2006 to 35,047 EUR in 2017. The total subsidies paid for Pink-footed Geese in Norway have increased from 216,300 EUR in 2006 to 489,457 EUR in 2017 (Fig. 10).

Belgium has a compensation scheme in place since 2009 for crop losses due to foraging geese; however species-specific estimations for winter crop damage have only been available since 2013/14. During 2013/14 and 2017/18, the expenditures caused by Pink-footed Geese have varied between 34,171 EUR (2013/14) and 60,180 EUR (2014/15), with a mean of 49,508 EUR (Fig. 10). It should be noted that when mixed flocks of Pink-footed Geese and White-fronted Geese have been reported, the expenditures have been divided by two, which is of course an estimate. Furthermore, in Belgium a farmer always retains some “own risk”, hence the expenditures are always slightly lower than the estimated damage cost.

In the Netherlands it has been possible for individual farmers to apply for compensation payments since 1977 (Eerden, 1990). At that time the volume of payments was approximately 165,000 EUR (for all goose species). In 2005/06 the national goose management policy was changed following ban of goose hunting and escalating costs. Key to this new approach was the replacement of direct damage reimbursement with fixed³ ‘accommodation payments’ per hectare in specifically designated goose foraging areas throughout the country (Kwak et al., 2008). From c. 2013/14 the goose management policy has changed again, and the province of Friesland is responsible for the management, which now consist of a mixture of fixed payments and damage payments. From 2005/06 and until now the annual expenditures (payments for damage, excluding fixed payments) for Pink-footed Geese have fluctuated between 20,822 EUR (2015/16) and 89,172 EUR (2009/10), with a mean of 65,285 EUR (Fig. 10). Compensation attributed to Pink-footed Geese comprise <1% of the total amount of goose damage payments in the Netherlands.

In Denmark in 2016 113 Pink-footed Geese were shot under derogation (Table 4; Data: EU derogation report). During 2008-2016, there has been an increase in the numbers shot under derogation.

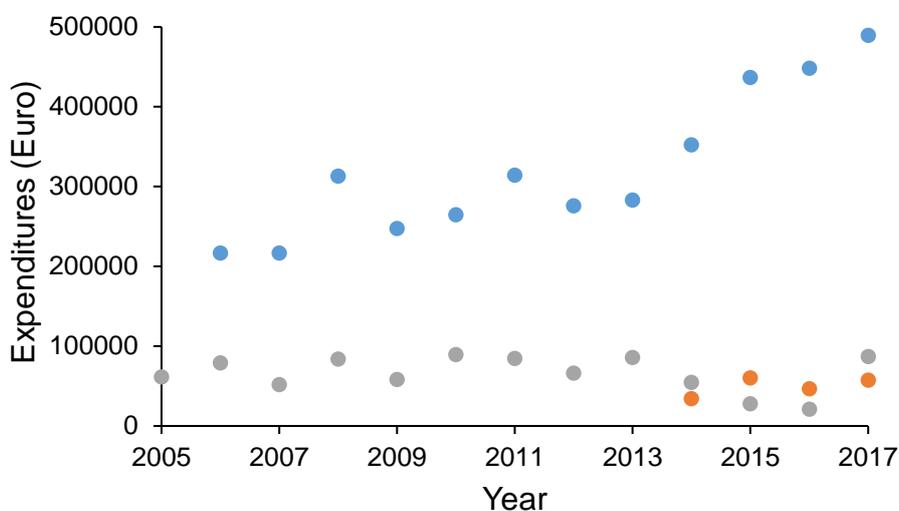


Figure 10. Expenditures related to managing agricultural damage caused by Pink-footed Geese in Belgium (Oct/Nov - Jan/Feb; orange), the Netherlands (1 Nov-31 Oct; grey) and Norway (1 Jan – 31 Dec; blue). (Data sources: Belgium: Vlaamse Overheid, Agentschap Natuur & Bos; the Netherlands: Faunafund; Norway: The County Governor of Trøndelag & Nordland).

Table 4. Pink-footed Geese shot under derogation in Denmark

Country	2008	2009	2010	2011	2012	2013	2014	2015	2016
Denmark	0	1	3	0	10	5	454	71	113

8 – Discussion

The size of the Svalbard population of Pink-footed Goose declined in 2017-18 compared the season before, which can be attributed to a poor breeding season in 2017 combined with a low survival, which is attributed to a high harvest rate (see Johnson et al. 2018). The decline in population size is somewhat higher than expected; however, count errors and biases which are difficult to account for have to be considered and may affect the estimates. It is encouraging to see that there is a good accordance between the count results and the population estimates based on the marked individuals (Lincoln index), also showing a decline, although Lincoln population estimates are slightly higher than the count estimates.

³ Fixed payments per hectare cannot be assigned to species level, since accommodation areas are multi-species units. Thus, there are no specific areas for Pink-footed Geese.

In recent years, the number of Pink-footed Geese utilizing the Oulu area in Finland as well as the southern part of Sweden and SE Denmark have been rapidly increasing. It is too early to judge what this new development represents; however, in April 2018 a small group of Pink-footed Geese were caught by canon-nets in the Oulu area and marked with GPS collars to track their further migration and breeding areas (J. Madsen & J. Pessa unpubl. data).

The number of Pink-footed Geese migrating to the Netherlands during autumn has declined in recent years, while geese have been extending their stay in Denmark. The most likely explanation for this rapid change in migration strategy is the recent introduction of maize as a fodder crop in Denmark, which has led to a new highly energetic food resource in the autumn, based on the waste of corn after harvest (Clausen et al., 2018a). In contrast, the number of Pink-footed Geese migrating to Flanders in Belgium has remained more stable, but geese have increasingly shifted from foraging on grassland to waste crops (potatoes, maize) (Kuijken and Verscheure, 2016). In the Netherlands, maize is increasingly used as well (also leading to exploration of new sites), but highest numbers are still feeding on grassland.

The decline in harvest in 2017-18 can be attributed to a combination of factors. First, the proportion of juveniles in the population was low. As juvenile geese are known to be more susceptible to hunting than older birds, the hunting opportunities may have been reduced (Madsen, 2010). Second, the population had declined compared to the year before, which is likely to cause a reduction in total harvest. Third, exceptionally high densities of maize waste was available in the southwestern part of Jutland in the autumn of 2017 (due to a hurricane downing large areas of maize before harvest; Clausen et al., 2018b). This attracted very high numbers of Pink-footed Geese (see Fig. 1a), and they stayed throughout the winter. This is a region which has not long traditions for goose shooting in the fields and geese can easily avoid shooting because there is a vast number of alternative fields; hence, relatively few geese were shot there.

Given the early spring in Svalbard in 2018, it is predicted that the breeding success will be high and, hence, lead to an increase in the population size in the forthcoming season.

The compilation of indicators of agricultural damage is an ongoing process, to be discussed and evaluated in the coming years. The preliminary data indicate that in Norway and Belgium the national expenditures correlate with the overall national population estimates of Pink-footed Geese. Thus, in Nord-Trøndelag in Norway the population size as well as the subsidy expenditures are increasing, whereas in Belgium the population size and expenditures are relative stable (although Pink-footed Geese increasingly are observed on waste resources where they do not cause damage). In the Netherlands the expenditures have been stable, but the national numbers of Pink-footed Geese are decreasing. There might be several explanations for this discrepancy; possibility of compensation is better known among farmers; increasing interest in claiming goose damage; increasing agricultural (market) prices; changing compensation policy; the appraisers' skills and capabilities to determine the species considered responsible for the damage, and finally the estimate of damage is made before the first cut of grass in April, so damage may be a cumulative effect of several goose species being on a field during winter. Furthermore, the species assignment to damage is still under debate. Regarding the derogation shooting in Denmark, it is premature to draw further conclusions until a more detailed analysis of the underlying data has been performed.

Regarding future needs for additional monitoring, it remains important to track new development of areas used by the Pink-footed Geese. Northern Germany appears to receive increasing numbers of Pink-footed Geese in autumn, and it would be desirable to have systematic contributions from there in the mid November counts. Tracking of Pink-footed Geese by GPS-loggers can assist in detecting new traits in the migration patterns and schedules. Some first catches were made in Oulu in Finland in April 2018, and in August 2018, it is planned to make a major catch during moulting in Svalbard (Netherlands Institute for Ecology, Aarhus University). Furthermore, looking at the reporting by volunteer ornithologists on national online portals gives an important first clue about new developments.

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