



Pink-footed Goose Svalbard Population (*Anser brachyrhynchus*)

AEWA European Goose Management Platform

EGMP Technical Report No.11
Population Status Report 2018/2019

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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 and proxies for agriculture damage i.e. compensation/subsidies for the season 2018/19. The 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 (2019/20). This is part of an Adaptive Harvest Management (AHM) framework set up to support the implementation of the AEWA International Single Species Management Plan (ISSMP) for the population. The estimated population size based on ground counts coordinated among the Range States in spring 2019 was c. 72,000 individuals, supported by a count of c. 92,000 geese in mid-November 2018 and an estimation of 75,000 geese based on marked birds. The breeding success was close to the long-term average (14.2% juveniles in the autumn), however, it is below the predictions based on the fact that the spring in Svalbard in 2018 was record early. The total number of Pink-footed Geese harvested in Norway and Denmark in the 2018/19 hunting season was c. 13,203 (preliminary data). The breeding output in 2019 is predicted to be intermediate due to an average number of thaw days in Svalbard in May. Trends in indicators of the agricultural damage caused by Pink-footed Geese in the Range States are reported. In Norway, subsidies paid to farmers have an increasing long-term trend but have remained stable in the last 3-4 years. In Belgium compensation paid for damage increased compared to the previous years, while compensation payments in the Netherlands remained low and stable.

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 2018/19. 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 (2019/20). This is part of an AHM framework set up to support the implementation of the AEWA ISSMP for the population (Madsen et al., 2017a; Madsen and Williams, 2012). Data from the previous seasons 2012/13-2017/18 have been published in separate annual reports. Previous reports and further information about the ISSMP process can be found on the website <http://egmp.aewa.info/>. In this report we also describe 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 compensation/subsidies paid for alleviating 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, BIJ12 in the Netherlands and the County Governors of Trøndelag and Nordland in Norway for supplying data on compensation/subsidies schemes.

2 Population estimate 2018/19

Internationally coordinated population counts were performed on 17-18 November 2018 and 5-6 May 2019. Counts were coordinated to take place 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 (www.artsobservasjoner.no/fugler; www.artportalen.se; www.dofbasen.dk; 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 c. 92,000 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. 84%), with additional

numbers found Belgium (c. 9%) and in the Netherlands (c. 5%) (Table 1; Figure 1a). The remaining was scattered around in Sweden and Norway.

The May count was performed in Norway, Sweden, Finland and Denmark, the area expected to host the whole population at that time of the year, and gave a population estimate of c. 72,000 geese. In May the majority of the geese was located in Norway (c. 90%), but with record high numbers in Finland (c. 8%) (Table 1; Figure 1b). Only few birds were left in Denmark and Sweden. We used the maximum count in Finland from a few days before the official count date, since these geese cannot have moved to any other site after this date, since it was too early to depart for the breeding areas at Svalbard.

The autumn estimate of c. 92,000 geese is used as the final population estimate for the 2018/19 season (Table 1; Figure 2).

Table 1. Results of synchronized counts of Pink-footed Geese in autumn 2018 and spring 2019

Country	Region	Numbers	
		17-18 November 2018	5-6 May 2019
Norway	Trøndelag	1,524	64,138
	Vesterålen	-	1,079
	southern Norway	309	372
	northern Norway	-	5
Denmark	Jutland	76,831	724
	eastern Denmark	76	2
Finland	Oulu region	-	5,800
	Elsewhere	-	68
Sweden	Various sites	258	245
Germany		NA	-
the Netherlands		4,176	-
Belgium	Flanders	8,691	-
TOTAL		91,865	72,433

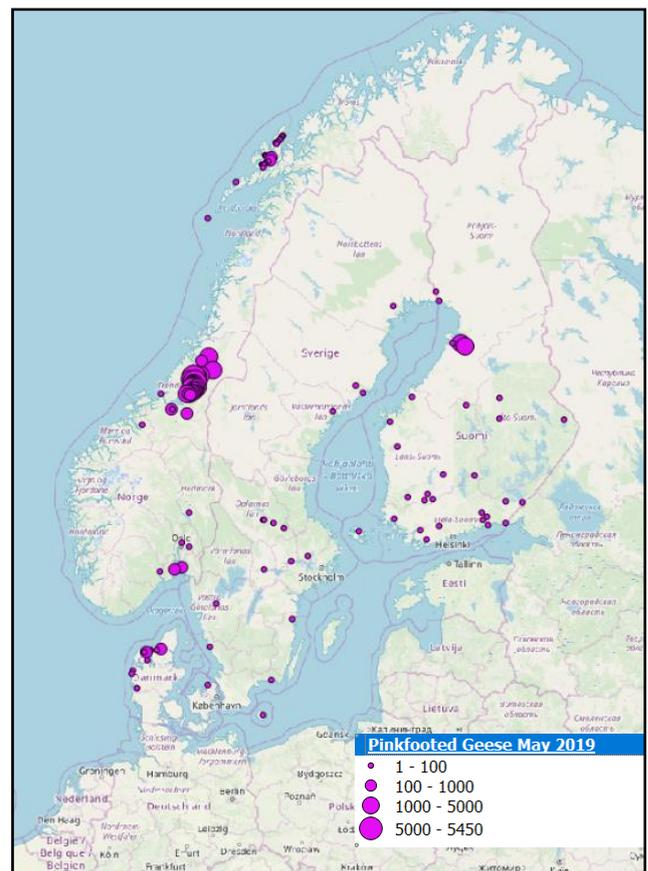
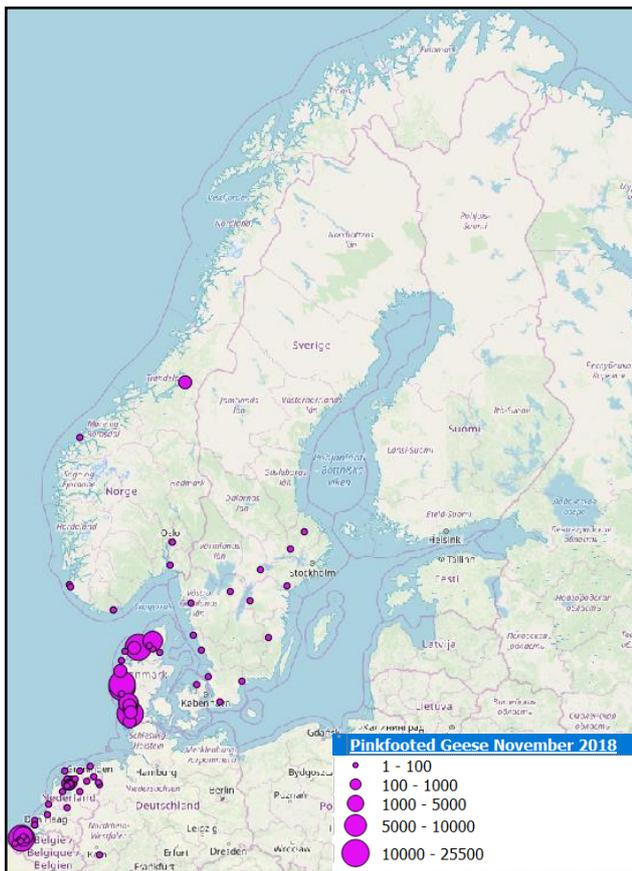


Figure 1a. Distribution of Pink-footed Geese 17-18 November 2018

Figure 1b. Distribution of Pink-footed Geese 5-6 May 2019

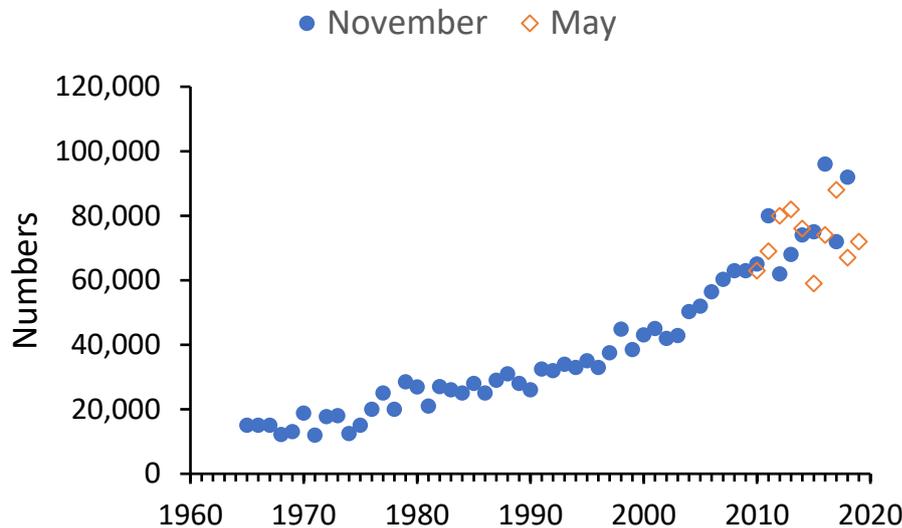


Figure 2. Development of the size of the Svalbard autumn population of the Pink-footed Goose, 1965/66-2018/19 (filled blue) with additional spring population in 2010-2019 (open orange)

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 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 295, range 227-383). For each year during 1991-2018 we estimated a mean ratio of marked to unmarked geese for all flocks >100 individuals recorded in autumn and spring in Denmark and the Netherlands. In 2018/19 only data from Denmark (October-November 2018 and March-April 2019) has been made available. The number of neck-banded 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 of 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 last 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, since the variation between subsequent years has been moderate. The total population size was estimated as the number of marked geese alive divided by the corrected estimate of the ratio. The confidence limits were estimated based on the variance estimate for the population.

The estimated population size was 75,300 individuals ($\pm 11,128$ 95% CL) in May 2019. As shown in Figure 3, there has been a relatively good accordance between the spring population counts and the Lincoln index estimate in recent years.

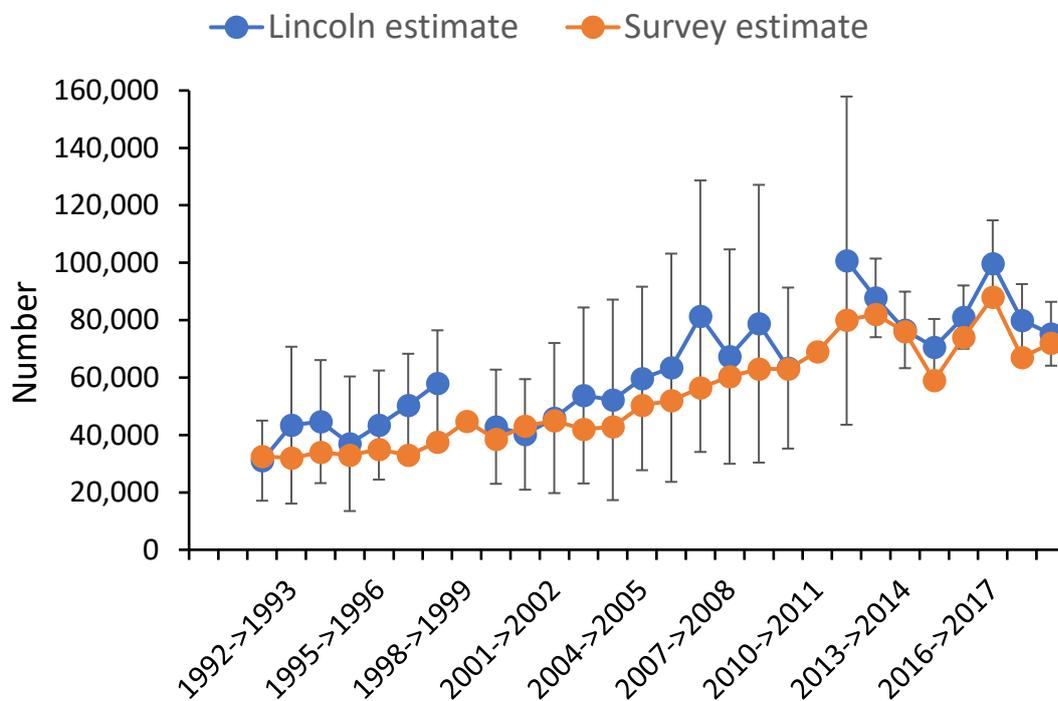


Figure 3. Comparison of population estimates based on counts and marked individuals (average \pm 95% CL) during 1991/92 – 2018/19. During 1991-2011, the number of goose flocks scanned for marked/unmarked birds was relatively low, but since 2012-13 it has increased, which is the reason for the decrease in variance. In years with fewer than 10 flocks scanned (1998, 2010), estimates have not been shown. Since 2009-10, count population estimates for spring have been shown, because the Lincoln estimate also represents a spring estimate.

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 during 12 October and 4 November 2018. The proportion of juveniles differed between countries and was lowest in Denmark and highest in Flanders. The weighted estimate, taking into account the percentage of geese staging in the different countries of 14.2% is close to the long-term average for the population (14.3%) (Table 2; Figure 4). The breeding output is lower than predicted on the basis of spring weather conditions in Svalbard, i.e. positive temperature days in May 2018 which were record high (see Madsen et al., 2018 and Figure 9).

Because the population count is performed later than the age counts, the weighting has been based on counts in Norway in October and an assumption that the numbers in the Netherlands and Belgium remained the same from late October to mid-November, while the birds staging in Norway in October subsequently continued to Denmark. If the age ratio would be based on the number of birds sampled in each country, the proportion of juveniles would be 14.6%.

Table 2. Age counts in autumn 2018 and a weighted estimate for the entire population based on the age counts and approximate numbers in each country. For Trøndelag in Norway, systematic counts in the second half of October have been used. For Denmark (and including Sweden) the mid-November numbers minus the numbers in Norway in October has been used, while for the Netherlands and Belgium, the mid-November counts have been used.

	No. Juveniles	No. Adults	Total sample	% juveniles	Population late Oct. per region	Estimated no. juveniles per region
Trøndelag, Norway	732	3,644	4,376	16.7	18,700	3,128
Jutland, Denmark	1,766	13,066	14,832	11.9	60,800	7,239
Friesland, the Netherlands	732	3,449	4,181	17.5	4,200	735
Flanders, Belgium	501	1,640	2,141	23.4	8,200	1,919
Total	3,731	21,799	25,530		91,900	13,021
Weighted proportion of juveniles						14.2

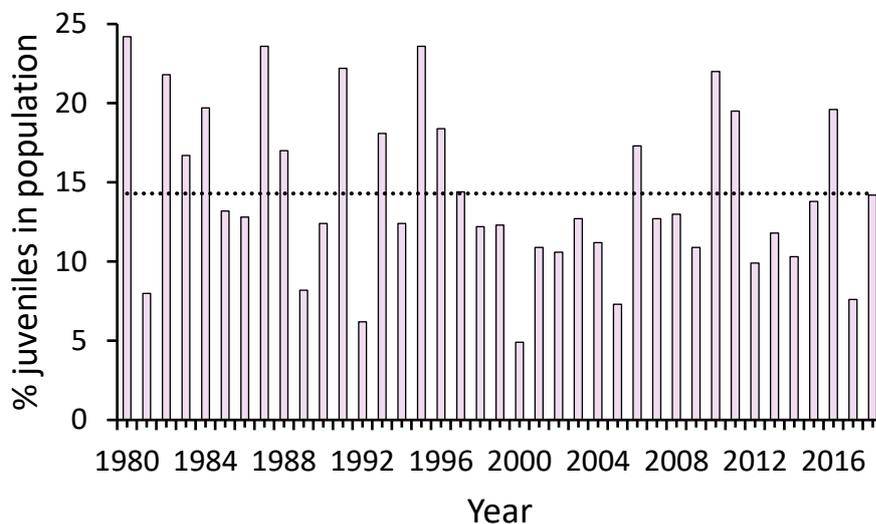


Figure 4. Proportion of juveniles in the autumn population of the Svalbard Pink-footed Goose, 1980-2018. The dotted line indicates the mean of the whole period.

4 Survival

Annual survival was estimated using the program MARK (White and Burnham, 1999) based on recoveries of dead birds and encounter histories (Joint Live and Dead Encounters) of all Pink-footed Geese ringed with neck-collars during 1990-2018 (inclusive observations in 2019). Ringing and re-sighting data was extracted from www.geese.org and recoveries of dead birds were supplied by the ringing offices in Denmark and

Norway. Encounter histories were based on an observation window from 23 March – 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 was kept to an absolute minimum. Using MARK, a number of models were 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. Therefore, the most recent estimate is preliminary. Overall, adult survival has decreased during the last two decades. Based on the newest update, the adult survival estimate was 0.73 in 2017-2018 (Figure 5).

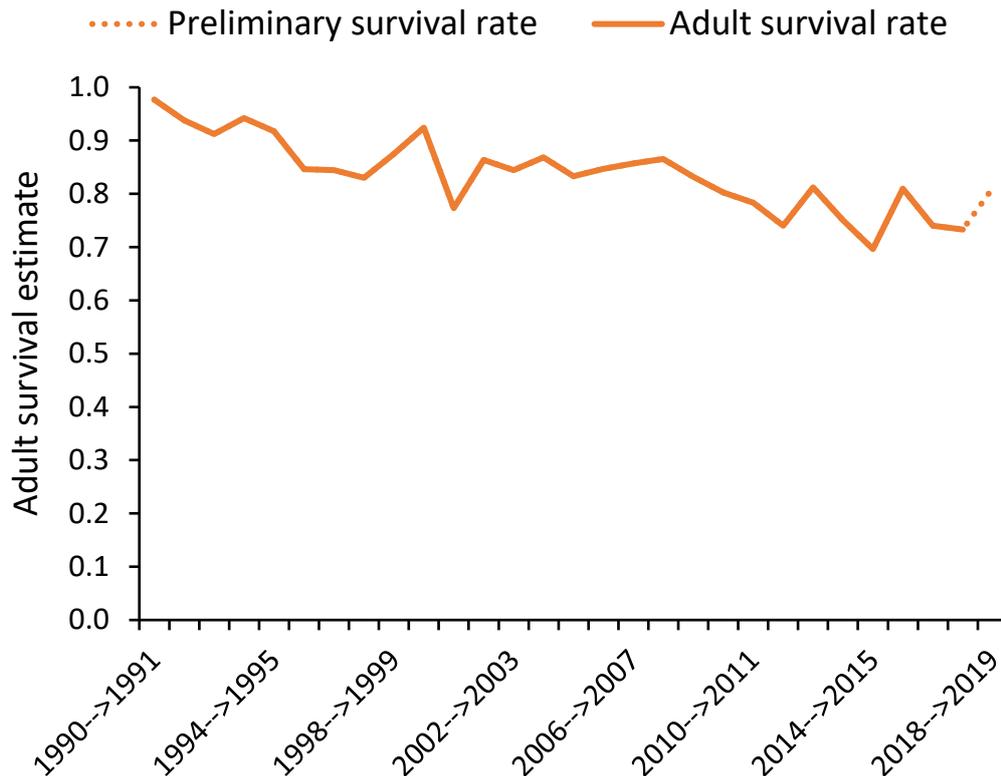


Figure 5. Adult survival estimates of the Svalbard Pink-footed Goose, 1990/91-2017/18 with a preliminary estimation for 2018/19 (also see text)

5 Harvest in Norway and Denmark 2018/19

Following the optimal harvest strategy for the hunting season 2018/2019 (Johnson and Madsen, 2018) the International Working Group for the ISSMP recommended a harvest of Pink-footed Geese of 25,000 in 2018/19 in order to reduce the population towards the 60,000 target (Madsen and Williams, 2012). As a consequence, the hunting season continued to include January in Denmark, similar to 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) ([Link](#)). Both in 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 15 May 2019), the data for 2018/19 is still preliminary (Table 3). For Denmark, the proportion of hunters having reported their bag by May is c. 90%; however, based on experiences from previous years, it is likely that the remaining 10% of

hunters are not representative but shoot little. Therefore, the harvest has not been corrected for lacking response. For Norway, data from earlier years have been updated with the final reports.

In Norway, a preliminary total of 3,087 Pink-footed Geese were reported shot, all from Trøndelag. This is higher than all previous years (Table 3, Figure 6).

The number of Pink-footed Geese reported shot in Denmark was 10,116 (Table 3, Figure 6). This number is lower than the first two years (2014/2015, 2016/2017) of extended hunting season (January), but higher than the third year of hunting in January (2017/2018; Table 3). In 2018/2019, 46% of the hunting bag was from January, comparable to the two first years with harvest in January (although, in 2017/2018 only approximately 16% was shot in January). This seasonal distribution is seen in the reports of wings by hunters as well as in the recoveries of ringed geese reported as shot (Figures 7 and 8; Madsen et al. 2017b, 2018).

In total, the preliminary number of harvested geese was 13,203 (Table 3, Figure 6).

Table 3. Hunting bags of Pink-footed Geese in Norway and Denmark (preliminary numbers; see text), hunting seasons 2012/13-2018/19. Birds killed by derogation shooting are not included in the bag data.

* The number from Norway in 2018/19 is preliminary; all remaining years show the final official annual numbers of harvested geese.

Country	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19
Norway	2,180	2,010	1,830	3,170	3,490	2,590	3,087*
Denmark	8,580	9,262	13,200	8,761	13,335	9,657	10,116
TOTAL	10,760	11,272	15,030	11,931	16,825	12,247	13,203

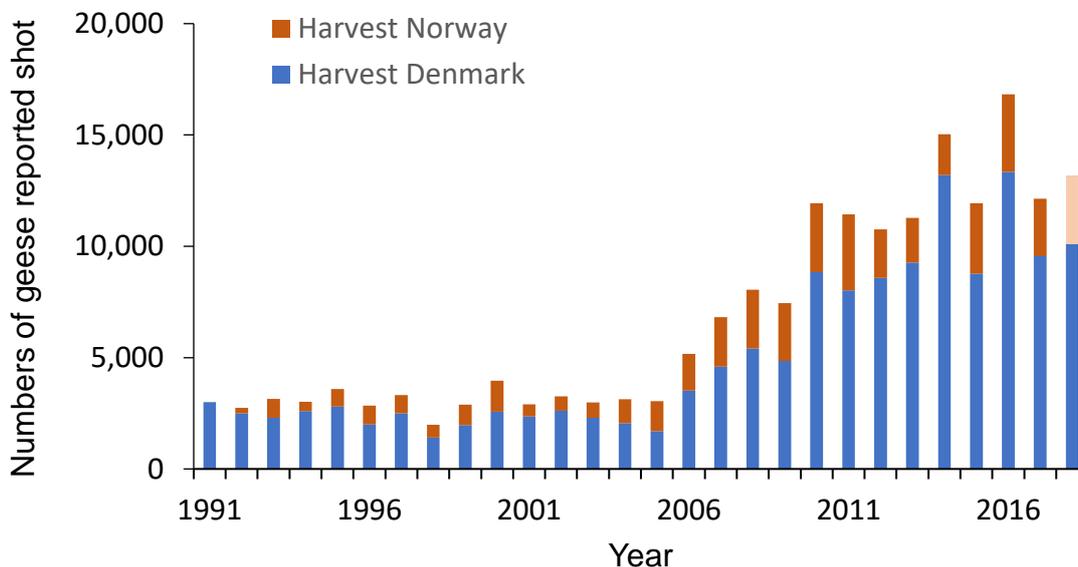


Figure 6. Development in the harvest of Pink-footed Geese in Norway (orange) and Denmark (blue), 1990/91-2018/19. Harvest data for Norway was available from 1992 onwards. The preliminary harvest number in Norway in 2018/19 is indicated in bright orange.

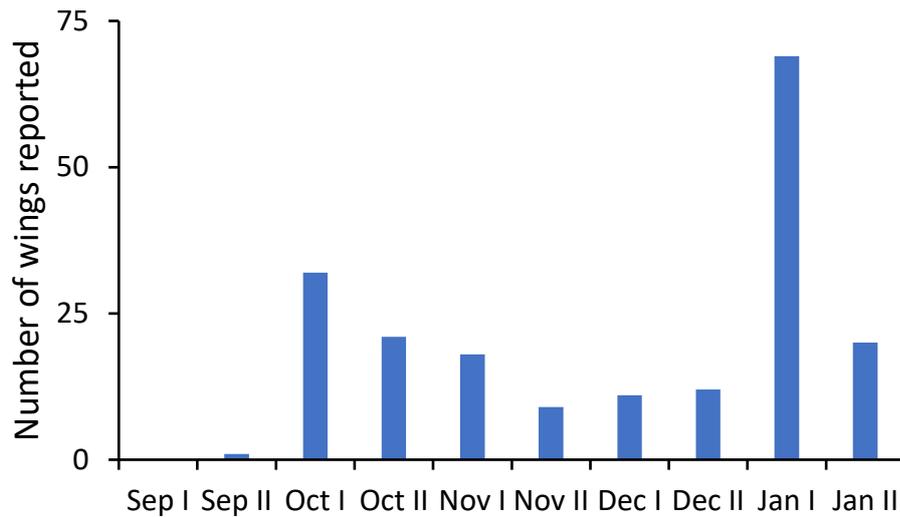


Figure 7. Number of wings of Pink-footed Geese ($N_{total}=194$; $N_{Sep-Nov I}=72$) collected from hunters in Denmark in the 2018/19 hunting season, divided into half-monthly intervals

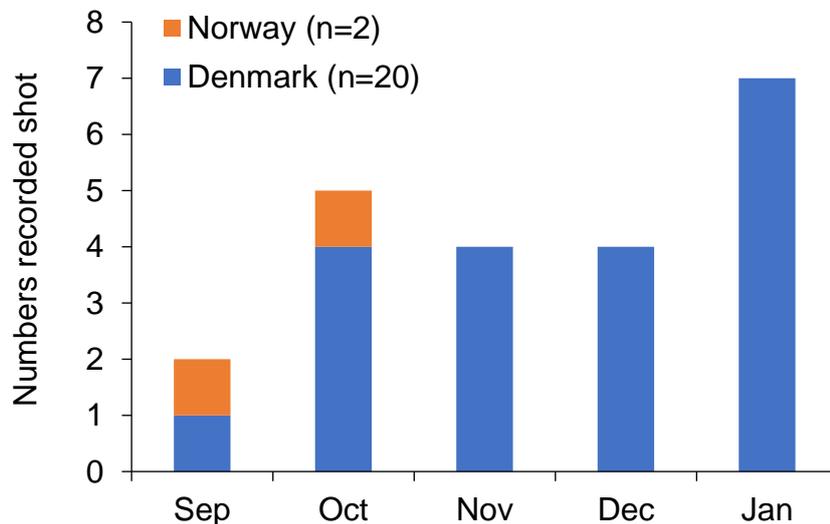


Figure 8. Number of marked Pink-footed Geese recorded as shot in the 2018/19 hunting season in Denmark and Norway

6 Crippling

Status and trend of crippling of Pink-footed Geese caused by shotgun shooting has been given by Clausen et al. (2017). On 27 April and 1 May 2019, a total of 23 adult Pink-footed Geese were caught by cannon-net and X-rayed at Tyrnävä, near Oulu, Finland. Four geese (17.4%) carried shotgun pellets in their tissues. However, the sample is too small for statistical treatment and comparison with previous years.

7 Spring weather conditions in Svalbard 2018

For the modelling of optimal harvest strategy for the hunting season 2019/20, 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 8 thaw days and Svalbard Airport had 9 thaw days. For further analysis an average of 8.5 thaw days will be used, which is almost identical to the long-term average for 1990-2019 (8.8 days; see Figure 9). Hence, we predict the 2019 breeding success will be intermediate.

The optimal harvest strategy is reported separately (Johnson et al. 2019).

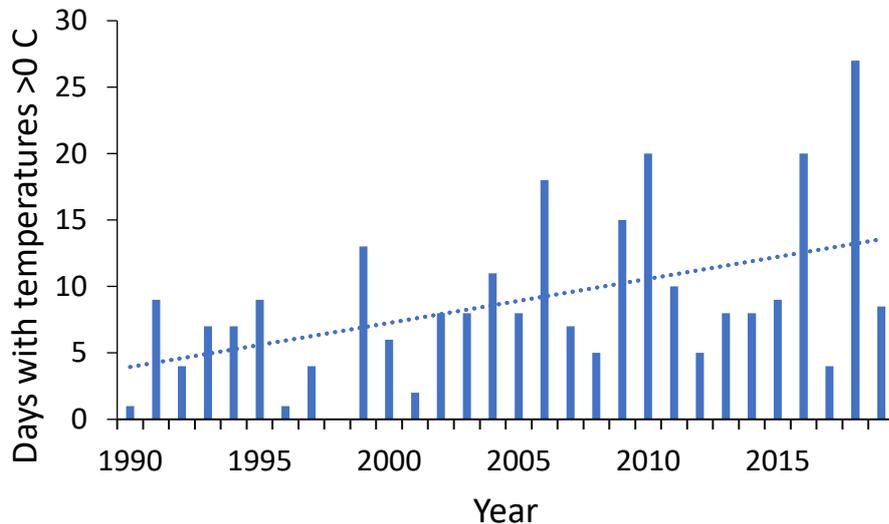


Figure 9. Number of thaw-days (days with average temperatures above 0°C) in May on Svalbard, expressed as an average for Ny Ålesund and Longyearbyen Airport (data source: Norwegian Meteorological Institute). Dotted line shows the trend based on a linear regression.

8 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, hence figures are not a direct measure of damage. 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 with subsidy expenditures of 450,771 EUR paid in 2018 (Figure 10). 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 to a peak figure of 454,410 EUR in 2017 and 409,792 EUR in 2018. Pink-footed Geese have almost stopped using Nordland county as a stopover area in spring due to increasing competition with Barnacle Geese (Tombre et al. 2013). There the subsidies paid for hosting Pink-footed Geese have decreased from 92,700 EUR in 2006 to 35,047 EUR in 2017 and 40,979 EUR in 2018.

Belgium has had 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 2018/19 the expenditures caused by Pink-footed Geese have increased with a variation between 34,171 EUR (2013/14) and the record high number of 96,478 EUR in 2017/18, with a mean of c. 59,000 EUR (Figure 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 a crude measure. Furthermore, in Belgium a farmer always has some “own risk” hence the expenditures are always slightly lower than the

estimated damage cost. The total compensation paid does not necessarily reflect the real damage in the field since an increase may also be a result of that more farmers start claiming compensation. Many farmers accept a little damage and do not ask for compensation until a certain point is reached.

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 a ban on goose hunting and escalating costs. Key to this new approach was the replacement of direct damage reimbursement with fixed¹ ‘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. Due to decentralization of nature policy, each province is responsible for establishing its own goose management, which is now consistent or a mixture of fixed payments and damage payments. Since 2005/06 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 c. 62,000 EUR (Figure 10). The compensation for 2017/18 was 22,611 EUR. Compensation attributed to Pink-footed Geese comprise <1% of the total amount of goose damage payments in the Netherlands.

In 2017, 270 Pink-footed Geese were shot under derogation in Denmark (Table 4; Data: EU derogation report (Eionet 2019)). During 2008-2017, there has been an increase in the numbers shot under derogation.

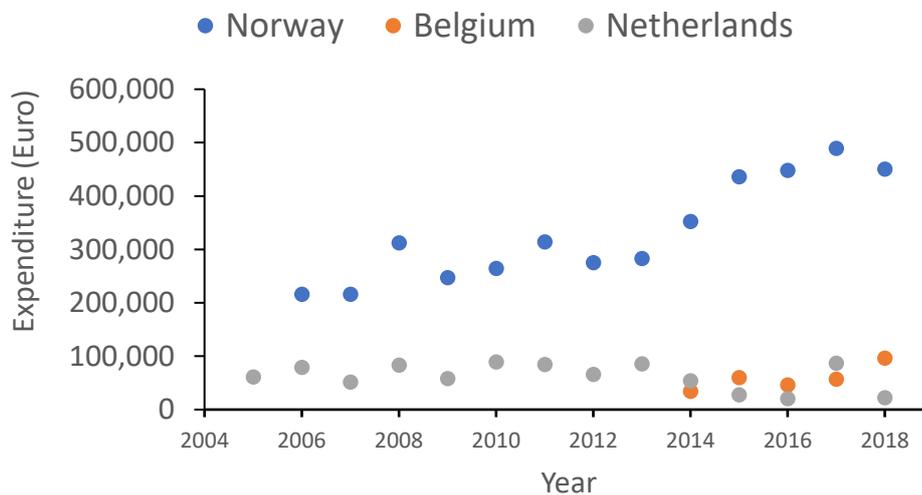


Figure 10. Expenditures related to managing agricultural damage caused by Pink-footed Geese in Belgium (Compensation paid; Oct/Nov - Jan/Feb; orange), the Netherlands (Compensation paid; 1 Nov-31 Oct; grey) and Norway (Subsidies paid; 1 Jan – 31 Dec; blue). (Data sources: Belgium: Vlaamse Overheid, Agentschap Natuur & Bos; the Netherlands: BIJ12; Norway: The County Governor of Trøndelag & Nordland).

Table 4. Pink-footed Geese shot under derogation in Denmark (Eionet 2019)

Country	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Denmark	0	1	3	0	10	5	454	71	113	270

¹ 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.

9 Discussion

The size of the Svalbard population of Pink-footed Goose increased in 2018/19 compared to the season before. This was expected due to record early thaw in the breeding area. The juvenile percentage was however lower than expected and was only at the average level for the whole period covered. The decline in numbers from mid-November 2018 to early May 2019 was approximately 20,000 birds; this cannot be explained by harvest alone. From the Danish wing surveys, we can calculate that approximately 62% of the Danish harvest was taken between mid-November and the end of January, equivalent to c. 6,300 geese, while all the Norwegian harvest was taken before mid-November. Hence, the major part of the discrepancy between the two counts has to be explained by count errors: either the November count was too high, or the May count was too low, and it is a challenge to adapt the monitoring scheme to the recent changes in distribution. In November, when most counts are made at roosts, the Pink-footed Geese often flock with Barnacle Geese, and at long distance the two species can be difficult to distinguish which may lead to an overestimate. This is especially a problem when counting birds flying to or from the roosting site, when large flocks are passing in a very short period. These counts are mainly from Denmark where many birds forage long distances from the roosting sites.

In spring, when most counts in Norway are performed in the middle of the day, most Pink-footed Geese occur on roost sites, but in recent years and increasing number of flocks have remained in the fields and become more difficult to find, which may lead to an underestimate. It is encouraging to see that there is a good accordance between the May count results and the Lincoln index.

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. More research is needed to understand the reasons for these changes. In April 2018 and again in late April 2019 small numbers of Pink-footed Geese were caught by cannon-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,b). 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 also increasingly used (leading to exploration of new sites as well), but highest numbers are still feeding on grassland.

The increase in harvest in 2018-19 can be attributed to the population increase mainly due to the higher proportion of juveniles in the population compared to the year before. As juvenile geese are known to be more susceptible to hunting than older birds, the hunting opportunities may have been better than the year before (Madsen, 2010).

It was predicted that the breeding output in 2018 would be high due to a record early spring. However, this turned out not be the case. It is not clear what has negatively affected the breeding success. More detailed studies of the phenology of nesting, densities of nests and breeding success in selected colonies conducted as part of the COAT Svalbard long-term monitoring program (www.coat.no) may give more insight into factors affecting breeding success in the coming years. Given that the number of days in May with a mean temperature above 0 degrees Celsius in Svalbard in 2019 is close to the mean, it is predicted that the breeding success will be intermediate in 2019.

The preliminary data on expenditures related to agricultural damage prevention caused by Pink-footed Geese indicate that in Norway national subsidies correlate with the overall national population estimates of Pink-footed Geese (Baveco et al. 2017). In Belgium the population size and expenditures are relatively stable; however, the compensation payments increased in 2018. 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; the possibility of compensation is better known among farmers; an increasing interest in claiming

goose damage; increasing agricultural (market) prices; changing compensation policy; the appraisers' skills and capabilities to determine the species who is 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.

With regard to future needs for additional monitoring, it remains important to track new development of areas used by the Pink-footed Geese. 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 the new staging area near Oulu in Finland in April 2018 and again in April 2019 and the data from these will provide important information on phenology, staging areas and migratory routes for this part of the population. Furthermore, during July and August 2018, adult females were tagged during moulting in Svalbard (Netherlands Institute for Ecology, Aarhus University). The tagged birds have provided very useful insights into local and regional site use and interchange between sites. Furthermore, looking at the reporting by volunteer ornithologists on national online portals gives an important first clue about new developments.

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