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PINK-FOOTED GOOSE SVALBARD POPULATION STATUS REPORT 2019-2020

Report prepared by the AEWA European Goose Management Platform Data Centre

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The 5th Meeting of the AEWA European Goose Management International Working Group is taking place remotely in an online conference format.

Summary

This report compiles annual monitoring data on the population status of the Svalbard Pink-footed Goose and proxies for agricultural damage i.e. compensation/subsidies for the season 2019/20. 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 (2020/2021). This is part of an Adaptive Management (AM) framework set up to support the implementation of the AEWA International Single Species Management Plan (ISSMP) for the population. The counted population size based on ground counts coordinated among the Range States in early May 2020 was c. 63,000 individuals, supported by a count of c. 82,000 geese in mid-November 2019 and an estimation of c. 66,500 geese based on marked birds. After integrating all parameters in an Integrated Population Model (IPM), the population size is estimated at 80,400 in November 2019 and 68,400 in May 2020, which is closer to the population target than it has been since 2006. Because the spring in Svalbard in 2019 was close to the long-term average, an intermediate level of reproduction was predicted, but the breeding success (5.86% juveniles) was lower and also low compared to the long-term average (14.2% juveniles in the autumn). The breeding output in 2020 is predicted to be above the long-term average due to a mild second half of May in Svalbard. The total number of Pink-footed Geese harvested in Norway and Denmark in the 2019/20 hunting season was c. 11,646 (preliminary data). 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 the last 4-5 years. In Belgium compensation paid for damage has increased the last few years 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 2019/20. 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 (2020/2021). This is part of an adaptive management framework set up to support the implementation of the AEWA ISSMP for the population (Madsen et al., 2017; Madsen & Williams, 2012). Data from the previous seasons 2012/13-2018/19 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 present status and trends in indicators of other than population-related objectives of the ISSMP; however, this year's report only provides an update on compensation/subsidies paid for alleviating agricultural damage caused by Pink-footed Geese in the Range States, since no new X-ray is available to assess the crippling rate.

We thank the national volunteer network 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/subsidy schemes. We also wish to thank the Pink-footed Goose Task Force for helpful reviews of earlier drafts and the EGMP Range states that contributed to the annual budget of the EGMP Data Centre.

2. Population estimate 2019/2020

Internationally coordinated population counts were performed on 16-17 November 2019 and 2-3 May 2020. 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 (http:/artsobservasjoner.no/fugler; https://www.artportalen.se/; http://dofbasen.dk; https://www.tiira.fi/). Count data from Germany was 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. 82,000 geese (rounded to nearest 1000). During this time of the year, a large proportion of the birds was concentrated in Jutland, Denmark (c. 78%), with additional numbers found in Belgium (c. 16%), in the Netherlands (c. 3%) , at various places in Sweden (c. 2%) and in Norway (c. 0.7%) (Table 1).

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. 63,000 geese. In May the majority of the geese was located in Norway (c. 89%), but with a record high proportion in Finland (c. 9%) (Table 1). 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 (Table 1; Figure 1).

Table 1. Results of synchronized counts of Pink-footed Geese in autumn 2019 and spring 2020

Country	**Region**	**Numbers**	
		16-17 November 2019	**2-3 May 2020**
Norway	Trøndelag	440	55,318
	Vesterålen	-	843
	Southern Norway	151	39
	Northern Norway	-	27
Denmark	Jutland	64,317	68
	Eastern Denmark	88	0
Finland	Oulu region	-	5,910
	Elsewhere	-	60
Sweden	Various sites	1,684	648
Germany		NA	-
The Netherlands	Friesland and elsewhere	2,408	-
Belgium	Flanders	12,886	-
TOTAL		**81,974**	**62,913**

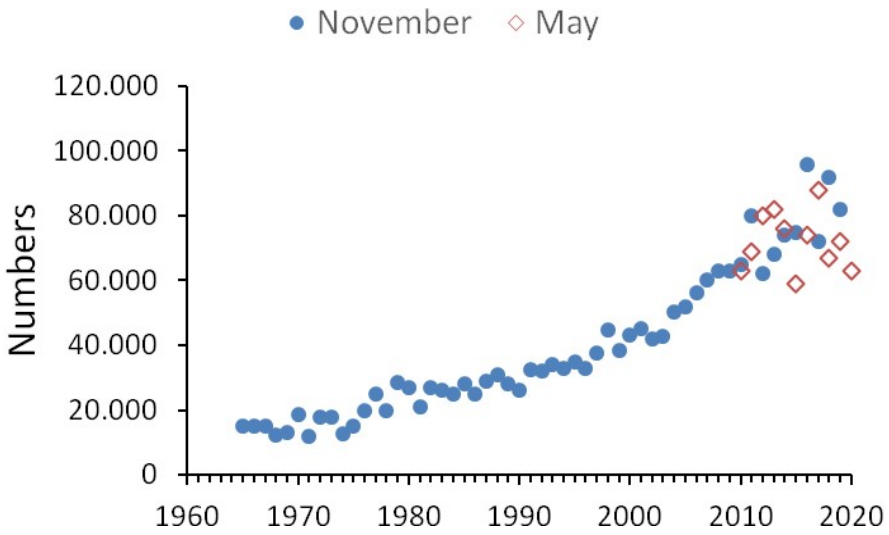

Figure 1. Development of the size of the Svalbard autumn population of the Pink-footed Goose, 1965/66-2019/20 (filled blue) with additional spring population in 2010-2020 (open red).

To obtain an alternative estimate of total population size of Pink-footed Geese, we used a capture-mark-recapture approach (Lincoln index) on sightings of geese marked with neckbands in Denmark, Norway, Svalbard and Finland. The estimation is based on the ratio of total geese per marked goose and the total number of marked geese in the population (Clausen et al., 2019; Sheaffer & Jarvis, 2013). Recordings of marked versus unmarked individuals in flocks started in 1991 (Ganter & 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 1991-2019 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 (Clausen et al., 2019). In 2019/20, only data from Denmark (October-November 2019 and March-April 2020) was 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 with coordinated observation efforts), corrected for the detection rate of marked birds alive. Ringing and re-sighting data was extracted from http://www.geese.org, where observers add their registrations. Detection rate was estimated using the program MARK (White & 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. In the last two springs (2018 and 2019) as well as in the summer of 2018, a total of 44 Pink-footed Geese have been marked with GPS neckband transmitters by the Netherlands Institute of Ecology and Aarhus University. In the spring of 2020, 33 of these were still alive (Kees Schreven, Netherlands Institute of Ecology pers. comm.). Since we know for sure that these geese were alive, apart from few geese which stopped transmitting but still carried their neckbands, this number has been added to the estimate of marked birds alive based on the resighted neckbanded geese. 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. A full description of the methods are given in Clausen et al., (2019).

In May 2020, the estimated population size was c. 66,500 individuals (95% CL: 54,744-78,298). As shown in Figure 2, there has been a good accordance between the spring population counts and the Lincoln index estimate in recent years.

In the adaptive harvest management report (Johnson et al., 2020) the population size is estimated for autumn and spring, respectively, by the use of an Integrated Population Model (IPM). This model uses all parameters (counts, demography, harvest) and therefore provides the most reliable population estimates with confidence limits. The estimated population size was estimated at 80,400 (71,700-89,200) in November 2019 and 68,400 (59,800-77,600) in May 2020 (Johnson et al., 2020).

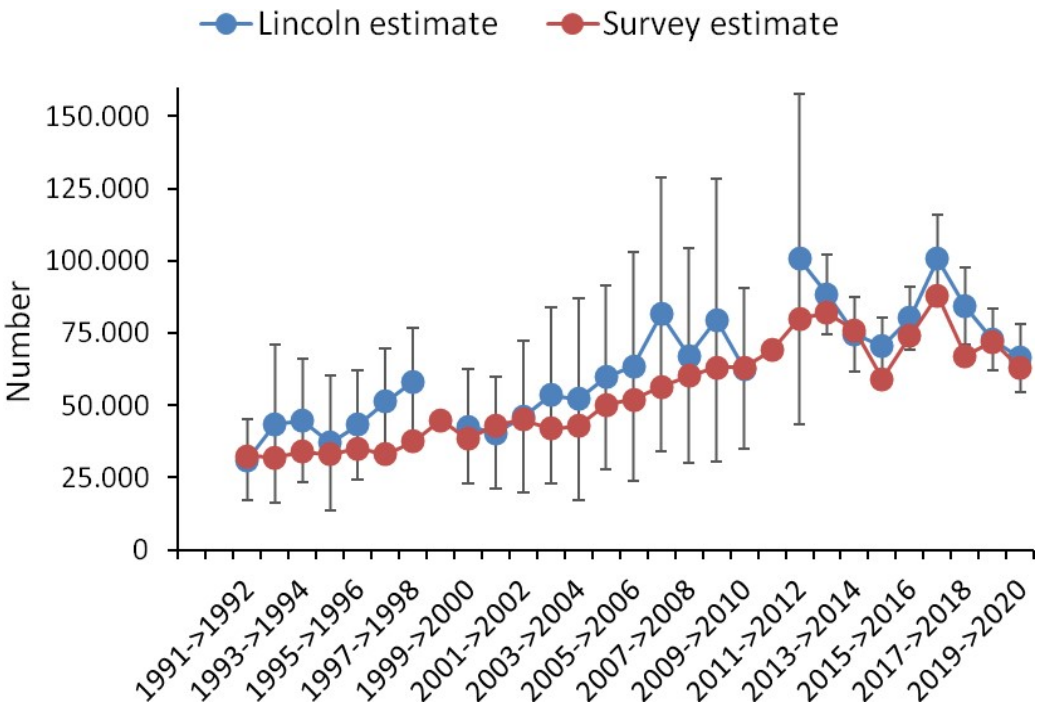

Figure 2. Comparison of population estimates based on counts and marked individuals (average ± 95% CL) during 1991/92 – 2019/20. During 1991-2011, the number of goose flocks scanned for marked/unmarked birds was relatively low, but since 2012-13 it has increased, which is the reason for the decrease in variance. In years with fewer than 10 flocks scanned (1998/99, 2010/11), 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, Flanders (Belgium) and for the first time included here, also in Ørebro, Sweden between 12 October and 4 November 2019. The proportion of juveniles differed between countries and was lower in Denmark and Sweden compared to the other countries (Table 2). Since 2012, we have weighted the proportion of juveniles per country against the number of geese present in each of the countries in order to derive at a population-wide age ratio. In this report, the weighted estimates were re-calculated for the years since 2012 in order to estimate the binomial variance around the overall mean age ratio. The new annual estimates are 11.3% lower to 0.2% higher than the previous ones. The weighted estimate for autumn 2019, taking into account the percentage of geese staging in the different countries was 5.86%, which is very low compared to the long-term average for the population (14.2%) (Table 2; Figure 3). The breeding output is lower than the intermediate level predicted on the basis of spring weather conditions in Svalbard ((Johnson et al., 2019) and Figure 7). Because the autumn population count is performed later than the age counts, the weighting has been based on counts in Norway, Sweden, The Netherlands and Belgium in second half of October. In Denmark, there was no count in October, but we estimated the numbers of geese in Denmark from the total count in mid-November (Table 1), subtracting the numbers present in the other countries in October.

Table 2. Age counts in autumn 2019 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 the mid-November count minus the numbers in the other range states in second half of October has been used.

Country	No. juveniles	No. Adults	Total sample	% juveniles	Binomial mean	Binomial variance	Population late Oct	Estimated no. juveniles
Trøndelag, Norway	498	3,118	3,616	13.8	498.0	429.4	8,000	1,102
Jutland, Denmark	577	10,327	10,904	5.3	577.0	546.5	62,200	3,291
Sweden	73	1,205	1,278	5.7	73.0	68.8	3,100	177
Friesland, The Netherlands	254	2,295	2,549	10.0	254.0	228.7	4,000	399
Flanders, Belgium	408	2,565	2,973	13.7	408.0	352.0	5,000	686
Weighted proportion of juveniles ± sd (%)								5.86 ± 23.40

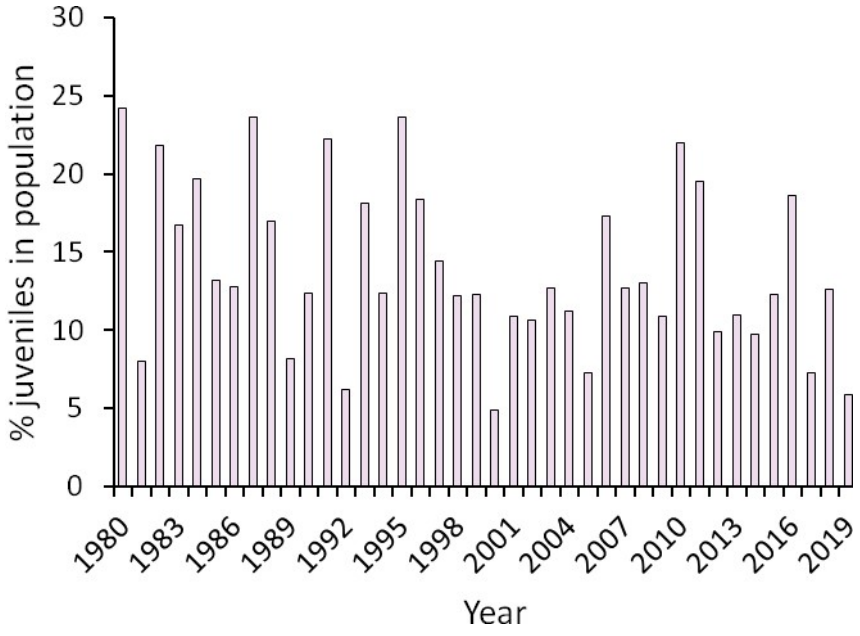

Figure 3. Proportion of juveniles in the autumn population of the Svalbard Pink-footed Goose, 1980-2019.

4. Survival

Annual survival was estimated using the program MARK (White & 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 (including observations in 2019/2020). Ringing and re-sighting data were extracted from http://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 neckbanded 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 & 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 2018-2019, while the most recent estimate for 2019-2020 remains uncertain (Figure 4).

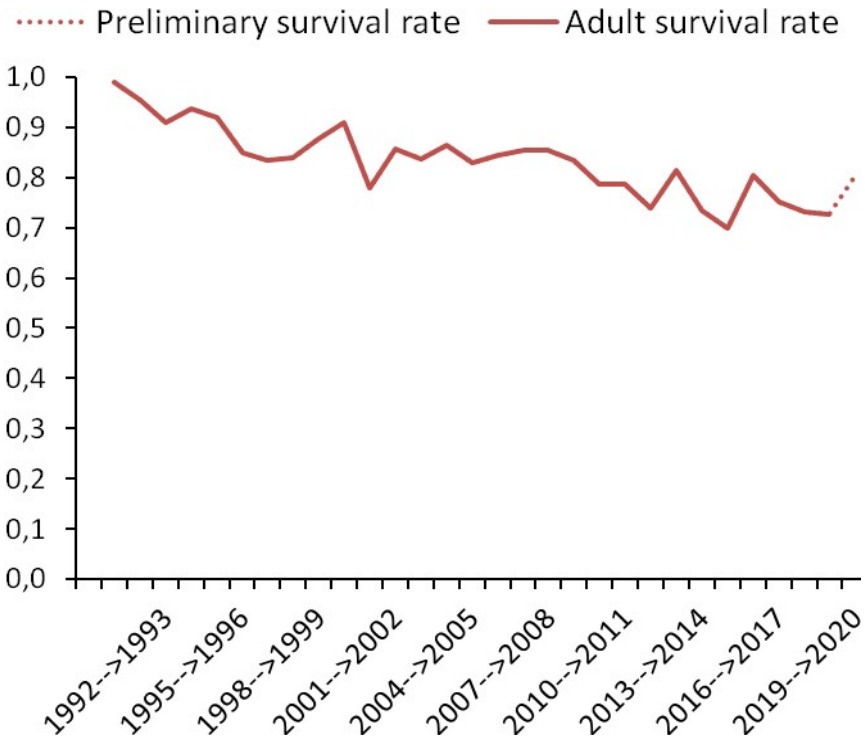

Figure 4. Adult survival estimates of the Svalbard Pink-footed Goose, 1990/91-2018/19 with a preliminary estimation for 2019/20 (see also text).

5. Harvest in Norway and Denmark 2019/20

Following the optimal harvest strategy for the hunting season 2019/2020 (Johnson et al., 2019) the EGMP International Working Group recommended a harvest of Pink-footed Geese of 22,000 in 2019/20 in order to reduce the population towards the 60,000 target (Madsen and Williams, 2012). Consequently, the hunting season continued to include January in Denmark, in line with 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). 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 20), the data for 2019/20 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 (in 2018/19, the final number of harvested birds was 1.2% higher than the reported preliminary numbers). Therefore, the harvest has not been corrected for lacking responses. For Norway, data from earlier years have been updated with the final reports. In Norway, a preliminary total of 3,025 Pink-footed Geese were reported shot, all from Trøndelag. This is at the same level as previous years (Table 3, Figure 5). In Norway in 2018/19, the final number of harvested birds was 15.6% higher than the reported preliminary numbers.

The preliminary number of Pink-footed Geese reported shot in Denmark was 8,621 (Table 3, Figure 5). This number is lower than all other years of extended hunting season (January; 2014/2015, 2016/2017-2018/2019; Table 3). In total, the preliminary number of harvested geese was 11,646 (Table 3, Figure 5). Based on the reporting of wings to the Danish wing survey in 2019/2020, 65% of the geese were shot in January, which is higher than in any other year with an open season in January. (Figure 6; Heldbjerg et al., 2019; Madsen et al., 2018).

As a result of reduced ringing activity in recent years, only 12 birds with neckbands were shot in 2019/20, which is too few to describe the seasonal harvest activity, which in previous years supported the information from the reporting of wings.

Table 3. Hunting bags of Pink-footed Geese in Norway and Denmark (preliminary numbers; see text), hunting seasons 2012/13-2019/20.
* The numbers in 2019/20 are 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	2019/20
Norway	2,180	2,010	1,830	3,170	3,490	2,590	3,570	3,025*
Denmark	8,580[A]	9,262[A]	13,200[B]	8,761[A]	13,335[B]	9,657[B]	10,116[B]	8,621*[B]
TOTAL	**10,760**	**11,272**	**15,030**	**11,931**	**16,825**	**12,247**	**13,203**	**11,646***

A – No January hunting in Denmark

B – January hunting in Denmark

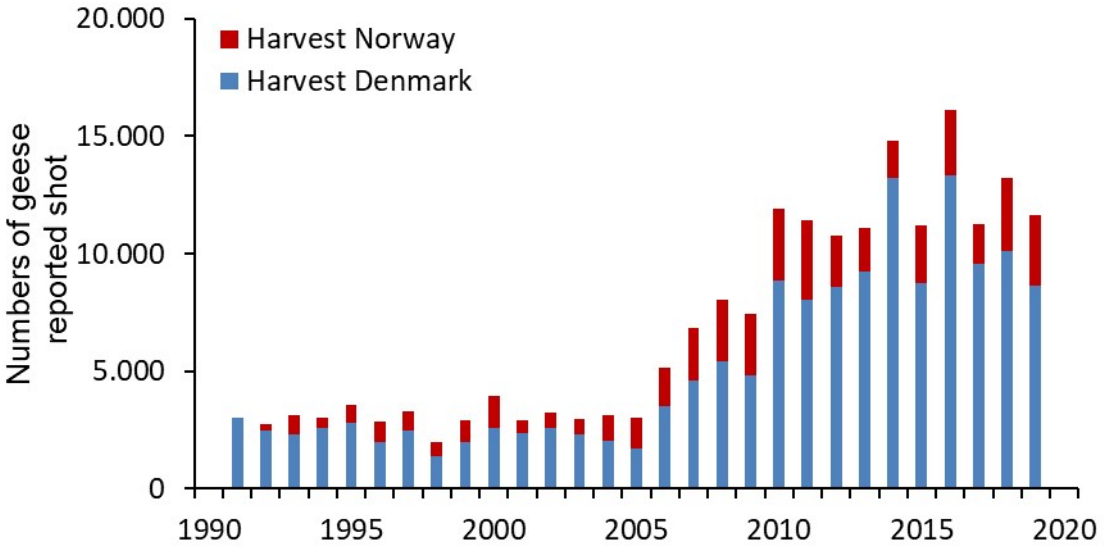

Figure 5. Development in the harvest of Pink-footed Geese in Norway (red) and Denmark (blue), 1990/91-2019/20. Harvest data for Norway was available from 1992 onwards. Harvest data from 2019/20 are preliminary.

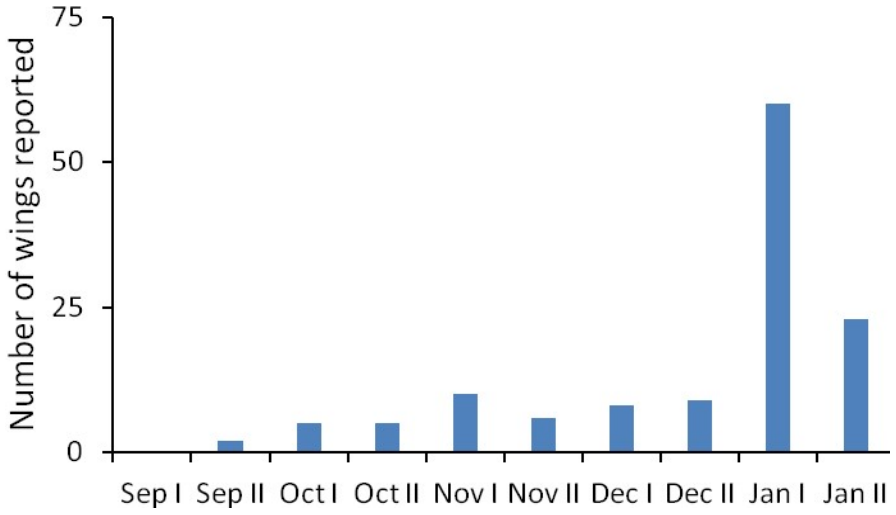

Figure 6. Number of wings of Pink-footed Geese (N_{total}=128) collected from hunters in Denmark in the 2019/20 hunting season, divided into half-monthly intervals.

6. Spring weather conditions in Svalbard 2020

For the modelling of optimal harvest strategy (Johnson et al., 2020) for the hunting season 2020/2021, 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). This information is used to describe the number of thaw days and the mean monthly May temperature at the two sites each year (Figure 7). In May 2020, Ny Ålesund had 17 thaw days and a mean May temperature of -0.3°C and Svalbard Airport had 19 thaw days and a mean May temperature of 0.1°C. For further analysis an average of 18 thaw days will be used, which is much higher than the long-term average for 1990-2020 (9.0 days). Hence, we predict the 2020 breeding success to be in the high end.

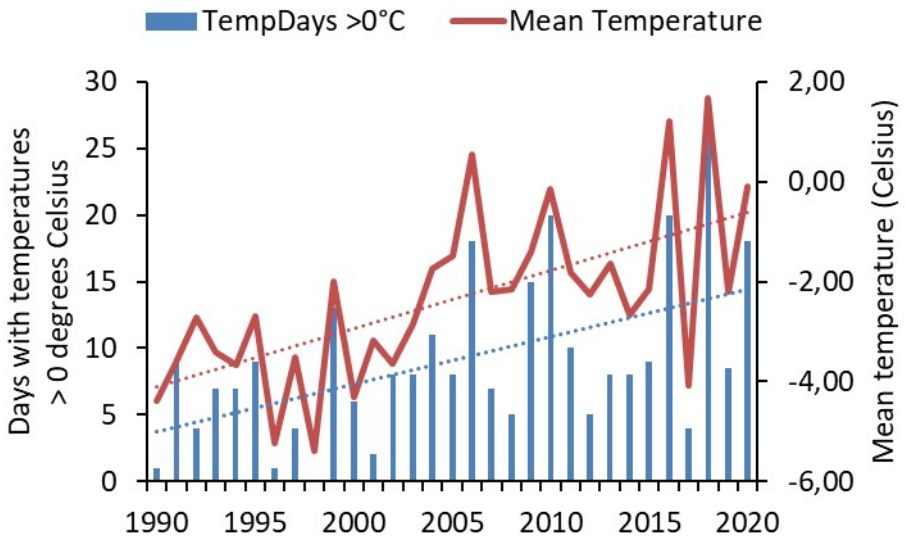

Figure 7. Number of thaw-days (days with average temperatures above 0°C; in blue) and monthly mean temperature (°C; in red in May on Svalbard 1990-2020, expressed as an average for Ny Ålesund and Longyearbyen Airport (data source: Norwegian Meteorological Institute). Dotted lines show the trends based on linear regressions.

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, hence figures are not a direct measure of damage. In the Netherlands and Belgium farmers are paid compensation for damage. In Denmark, there is no compensation nor subsidy schemes for geese, but derogation shooting outside the open hunting season (allowed only in February) is used to alleviate agricultural damage.

The Norwegian subsidy scheme has been in place since 2006 in Trøndelag and Nordland with subsidy expenditures of 482,544 EUR paid in 2019 (Figure 8). Nowadays, almost the entire Pink-footed Goose population stages in 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 412,844 EUR in 2019. 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 (at present more to Barnacle Geese) from 92,700 EUR in 2006 to 35,047 EUR in 2017 and 69,725 EUR in 2019.

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. From 2013/14 to 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. 63,000 EUR (Figure 8). The compensation for 2018/19 was 80,834 EUR. 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 (and three if more species), 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 more farmers starting to claim 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 (van 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 fixed '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 changed again. Due to decentralization of nature policy, each province is responsible for establishing its own goose management, which is now consistently using fixed payments or 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 c. 61,000 EUR (Figure 8). The compensation for 2018/19 was 50,061 EUR. Compensation attributed to Pink-footed Geese comprise <1% of the total amount of goose damage payments in the Netherlands.

In 2018, 331 Pink-footed Geese were shot under derogation in Denmark (Table 4; Data: EU derogation report (Eionet, 2020)). During 2008-2018, there has been an increase in the numbers shot under derogation.

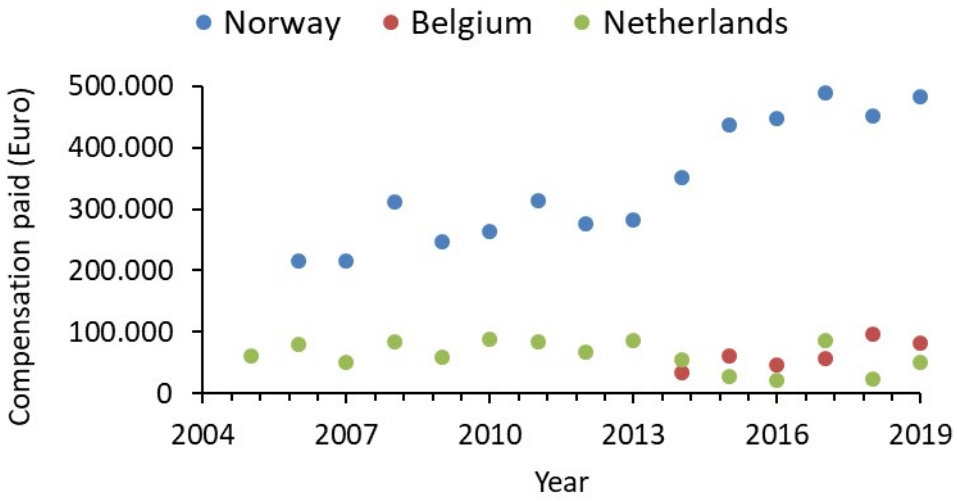

Figure 8. Expenditures related to managing agricultural damage caused by Pink-footed Geese in Belgium (Compensation paid; Oct/Nov - Jan/Feb; orange), the Netherlands (Compensation paid; 1 Nov-31 Oct; green) and Norway (Subsidies paid; 1 Jan – 31 Dec; blue). (Data sources: Belgium: Vlaamse Overheid, Agentschap Natuur & Bos; the Netherlands: BIJ12; Norway: The County Governors of Trøndelag & Nordland).

Table 4. *Pink-footed Geese shot under derogation in Denmark* (Eionet, 2020).

Country	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Denmark	0	1	3	0	10	5	454	71	113	270	331

8. Discussion

The size of the Svalbard population of Pink-footed Geese decreased in 2019/20 compared to the season before. The decline is manifest in both counts and the Lincoln index. From experiences in the past years, where counts were both performed in autumn and spring, accompanied by the intensified use of the Lincoln index, it has been realised that the individual counts are rather sensitive to bias and therefore not so reliable for taking management decisions. The uncertainties are attributable to several reasons: varying weather conditions on the count dates, geese finding new staging areas, changing behaviour, which makes them more challenging to count or mixing with other species. Therefore, we have decided to base the estimation of the population size on the integrated population model, which has now been developed. This model uses all the information which is collected annually combined with the time series data and therefore smoothens and adjust the annual fluctuations which inevitably occur in the counts. Using the IPM estimate of 68,400 geese in May 2020, it is suggested that the count in November 2019 was close to the estimate, while the count in May 2020 was slightly lower. It is noticeable that the population is now at the lowest level since 2006. As documented in the adaptive harvest report (Johnson et al., 2020), the decline is a result of the recent increase in the harvest rate, which has been part of the strategy in the ISSMP to adjust the population towards the population target of 60,000 individuals by increasing harvest. In 2019, the productivity was low, which also contributed to the most recent decline. Given that the spring in Svalbard has been early in 2020, it is predicted that the breeding success will be high. This is likely to maintain a stable population in the coming season. The historic population development based on the IPM estimates is presented in Johnson et al. (2020).

In recent years, the number of Pink-footed Geese utilizing the Oulu area in Finland in spring, as well as the southern part of Sweden (autumn and spring) and Southeast Denmark (winter) have been rapidly increasing. In early May 2020, the numbers in Oulu were record high (5,910). 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 & K. Schreven unpubl. data). The results of the tracking are currently being analysed and it is planned to publish a separate publication on the new development now that two full annual cycles of tracking have been achieved.

The autumn 2019 count has reiterated the recent observation that 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, remaining there throughout the winter (Clausen et al., 2018). In contrast, the number of Pink-footed Geese migrating to Flanders in Belgium has remained more stable. In spring, the count confirms that Trøndelag in Norway remains the key area for the population, while Vesterålen in North Norway to some extent has lost its importance.

The decline in harvest in 2019-20 can be attributed to the population decline, which is a result of the lower 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 lower than the year before (Madsen, 2010). In Norway, the harvest was maintained at the level from the years before, which is attributed to an improved organisation of the hunting.

The preliminary data on expenditures related to agricultural damage prevention caused by Pink-footed Geese indicate that the levels are similar to the previous years, which is in accordance with the stability in the population size; however with a minor increase in Belgium in 2019 corresponding to a higher number counted here than in 2018.

With regard to future needs for additional monitoring, it is important to step up the marking and X-raying of geese to provide data on movements, demography, Lincoln estimates of population size as well as crippling rate. Tracking of Pink-footed Geese by GPS-loggers can assist in detecting new traits in the migration patterns and schedules and the tagged birds have provided very useful insights into local and regional site use and interchange between sites (e.g. Kuijken & Verscheure, n.d.). Further tagging with GPS-loggers is planned for the marking program in the spring of 2021.

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