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TAIGA BEAN GOOSE POPULATION STATUS REPORT 2019-2020

Report prepared by the AEWA European Goose Management Platform (EGMP) Data Centre

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Summary

This report compiles annual monitoring data on the population status of the four Management Units (MUs) (Western, Central, Eastern1 and Eastern2) of Taiga Bean Goose for the season 2019/2020. Monitoring data are used to assess the population development and provide input for the modelling of a harvest strategy for the Central MU for the coming hunting season (2020/2021). The latter is part of an harvest management framework set up to support the implementation of the AEWA International Single Species Action Plan (ISSAP) for the population. The population was counted at three different times of the year: October, midwinter and in March for the Central MU, but only during mid-winter for the Western MU. The population sizes for the two Eastern MUs remain unknown. In Central MU, the October 2019 count totalled 75,574 Taiga Bean Geese (including birds from Western MU). This is an increase compared to the previous years, probably a result of a much higher production of young. In January 2020, 1,384 individuals for the Western MU and 38,414 individuals for the Central MU were counted, however the latter count was far from complete. The March count totalled 62,213 Taiga Bean Geese of which c. 1,000 were from Latvia that was not included in the previous reports. Harvest data are only available for the Central MU but is currently not up-to-date everywhere. Such data are very important when modelling population estimates and assessing harvest. Data on survival and/or reproduction and observations of the ratio of young to adults in the autumn would be helpful for improving the model. In 2019, an initiative to develop an integrated population model (IPM) was taken with the purpose of improving harvest management. Based on the IPM, the Central MU Taiga Bean Goose population size was estimated to be 80,700 in October 2019 and 75,200 in March 2020.

1. Aim

The aim of this report is to compile and review the available annual monitoring data upon which to assess the population status of the Taiga Bean Goose *(Anser fabalis fabalis)* for the season 2019/2020. The data have been compiled to establish the population size and trend of each of the four MUs, i.e., Western, Central, Eastern1 and Eastern2 (Figure 1) of the Taiga Bean Goose, as well as providing specific data for input to the modelling and assessment of a harvest strategy for the Central MU for the forthcoming hunting season (2020/2021). This is part of an effort to establish an Adaptive Harvest Management (AHM) framework² to support the implementation of the AEWA ISSAP for the population (Marjakangas et al., 2015). We thank the national goose monitoring networks who contributed to this report.

² It should be noted that until reliable and up-to-date population and harvest data are available on an annual basis, it is not possible to establish an adaptive harvest management program.



Figure 1. The four MUs of Taiga Bean Goose: Western, Central, Eastern1 and Eastern2 (dotted line indicates linkages between breeding areas in norther Fennoscandia and known moulting areas in Novaya Zemlya and the Kola Peninsula)

Range States for the Western MU: Norway* (b), Sweden* (b), Denmark (w), UK (w)

- Range States for the Central MU: Russia (b), Finland (b), northern Norway** (b), northern Sweden** (b), Denmark (w), Germany*** (w), the Netherlands***,**** (w), Poland*** (w), southern Sweden (w)
- Range States for the Eastern1 MU: Russia (b), Germany (w), the Netherlands**** (w), Poland (w), southern Sweden* (w), Belarus (m), Estonia (m), Latvia (m), Lithuania (m), Ukraine (m)

Range States for the Eastern2 MU: Russia (b), China (w), Kazakhstan (w), Kyrgyzstan (w)

Range States marked in bold = EGMP Range States

- b = primarily breeding Range State
- w = primarily wintering Range State
- m = primarily migrating/staging Range State
- * Small numbers may be wintering here
- ** The border between the Western and Central MU breeding birds in northern Norway and northern Sweden is unclear *** Cold winter refuge
- **** It is unclear whether the birds observed in the Netherlands belong to the Central or Eastern1 MU, the numbers are however very low

2. Western MU

2.1. Population estimates and productivity

Population estimates for the Western MU of the Taiga Bean Goose, consist of counts from north of Limfjorden in North Jutland in Denmark, as well as from England and Scotland in the United Kingdom.

2.1.1.Denmark

Goose monitoring in Denmark is coordinated as part of the national nature monitoring programme NOVANA (data recorded online into fugledata.dk), supplemented with observations from BirdLife Denmark's citizen science portal DOFbasen.dk. The programme contributes to the mid-winter

International Waterbird Census (IWC) coordinated by Wetlands International. The IWC count in 2020 took place on and around the weekend of 11-12 January, but data in DOFbasen.dk improve the coverage of the north-western parts of Denmark, where this population is found. Based on these counts from January 2020 there were 1,170 Taiga Bean Geese, 0 Tundra Bean Geese and 0 unidentified Bean Geese in Jutland northwest of Limfjorden (Thy, Hanherred and Morsø; Table 1).

Estimates for Denmark are currently preliminary, because there might be a few observers who have not yet entered their registrations in fugledata.dk and DOFbasen.dk. Bean Geese in North Jutland are notoriously very difficult to locate, but this year's number is comparable in size to the number in 2019 (1,094).

2.1.2.United Kingdom

The Bean Goose counts in the United Kingdom also contribute to the international counts coordinated by Wetlands International. In Scotland and England, the counts are carried out regularly throughout the winter months and, instead of relying on a January count, a maximum winter count (which can be any month, including the January count) is used as the final estimate.

A maximum of 207 Bean Geese was counted at Slamannan, Falkirk, Scotland on 24 October 2019 (34 fewer than in winter 2018/19). The first birds in Scotland were recorded on 2 October 2019 (from telemetry data) and 108 birds were counted the next day. The last bird was seen on 7 February 2020 (but see departure schedule below). The first four birds were counted at Yare Valley, Norfolk, England on 10 December 2019 with a maximum of seven birds on 5 January 2020. Counts are made in a collaboration between the Wildfowl & Wetlands Trust (WWT), the Bean Goose Action Group Scotland (BGAG) and the Royal Society for the Protection of Birds (RSPB).

Unexpectedly, the first bird known to have moved from Scotland back to NW Denmark did so on 6 January (telemetry data) with another GPS-tagged bird moving on 9 January 2020. Both movements may have also involved other unmarked birds. These movements were a month earlier than in any previous year and it is therefore likely that some birds from Scotland may be in Denmark at the time of the 'international' count there. The earlier departure from Scotland, if repeated in future years, follows a similar pattern evident in the Norfolk flock, which leaves that county in early January. On 22 January a GPS-tagged bird had moved from Scotland to Saffle (Sweden) and was joined there by another on 26 January.

Further details, including annual reports of monitoring of the Scottish flock can be found here:

https://sites.google.com/view/scotlands-bean-geese/downloads

The population estimate for the United Kingdom was 214 individuals in 2019/2020 (Table 1).

2.2. Harvest

Taiga Bean Geese from the Western MU are protected from hunting in the UK and technically protected from hunting in Denmark by a regional hunting ban.

2.3. Conclusions for the Western MU

2.3.1.Population estimate

A total of 1,384 individuals was counted in the Western MU in 2019/2020, which is similar to the preceding winter. There are, however, some conditions that might have influenced the count:

- 1) Data from Denmark are currently preliminary.
- 2) Bean Geese in North Jutland are very difficult to locate; hence some flocks might be missing during the counts. Data gathered from telemetry devices fitted to Western MU Taiga Bean Geese in NW Jutland showed them using wetlands and natural habitats well away from roads and human habitation that are not normally extensively searched during count periods and which are unlikely to be found by birdwatchers without a specific interest in locating these birds.
- 3) In recent years, numbers accounted for during mid-winter counts in the Central MU have fallen below those generated by surveys undertaken at other times of the winter season. For instance, both the spring and autumn counts of Central MU Taiga Bean Geese are recording (consistently) more geese, which is not replicated in the mid-winter count. This is probably not the case for birds from the Western MU. Telemetry tagged Western MU Taiga are known to associate with Central MU birds at staging areas, for instance in the Östen/Ymsen area in autumn and spring. However, Bean Geese were never found in large numbers in this area of Sweden during winter and the deficit between October counts and January counts is most certainly due to migration to northern Germany from Sweden.
- 4) The very mild weather conditions that prevailed prior to the mid-winter census might influence temperature-driven movements and an increasing number of birds may winter further up the flyway (for instance in Sweden or Norway).

Despite the potential gaps in survey coverage, the population level remains far below the short-term target (for the next 20 years) of 4,000 individuals, specified in the ISSAP (Marjakangas et al., 2015).

Country	Area	Period	Number	r of Bean	Geese	Deported by	
Country			Taiga	Tundra	Unidentified	Keported by	
Denmark*	NW Jutland	5-20 Jan 2020 (main 11-12 Jan)	1170	0	0	Preben Clausen & Tony Fox, Aarhus University	
UK	Slamannan, Scotland	24 October 2019	207	-	-	Carl Mitchell/	
	Norfolk, E England	5 January 2020	7	-	-	BGAG/RSPB	
TOTAL			1,384	0	0		

Table 1. Results of international count of Bean Geese in the Western MU in winter 2019/2020.

* Preliminary totals

3. Central MU

Population estimates in the 2019/2020 season were based on monitoring in October, January and again in early March. The different counts were performed at different sites (countries) to match the distributional movements during winter.

October population estimates for the Central MU of Taiga Bean Goose consist of counts in Sweden, where the majority of birds from the Central MU are found during October, with additional information from Finland and Denmark.

January population estimates for the Central MU of Taiga Bean Goose consist of counts from southern Sweden, the Netherlands and Denmark (i.e. including Vendsyssel, Himmerland and further south and east, but excluding the area northwest of Limfjorden in Jutland described above). All birds in Sweden and the Netherlands were regarded as Central MU birds. Geese from the Central MU also winter in north-central Germany, depending on the severity of winter weather. Since there are no official organized count, which discriminates subspecies nor birds from Taiga Goose management units in Germany, it has not been possible to obtain population estimates from Germany in January 2020.

The March population estimate is, as the October count, mainly comprised of data from Sweden with additional information from Norway, Denmark, Finland and Latvia. The timing of this monitoring is highly dependent on the advance of the spring. The optimal monitoring occurs when the vast majority of the birds are found in Sweden. This year it occurred during 29 February-3 March 2020.

Productivity data are also available from Sweden in autumn.

3.1. Population estimates

3.1.1.Sweden

The Bean Goose counts in Sweden are part of the contribution to international counts coordinated by Wetlands International, which are performed throughout the winter. In Sweden, the central counting areas are divided into south-west Scania, north-east Scania and north of Scania. In south-west Scania, Bean Geese have always been separated into sub-species, whereas in north-east Scania and north of Scania the observers have only recently (since 2014) been trained and asked to record numbers on the basis of this distinction.

Almost the entire population of the Central MU Taiga Bean Geese stages in Sweden in October and again in March, hence the logic of attempting full counts of geese from this MU at this time. The timing of the March survey depends on how cold and long the winter is.

In **October**, goose numbers in Scania were assessed during the designated mid-October count period, while those using the known staging areas in the provinces of Västergötland, Östergötland, Närke, Södermanland, Uppland and Västmanland were counted during a round trip between 14 and 29 October. In October, the Bean Geese of both sub-species were mainly found in south-central Sweden (Nilsson, 2020) and during the special survey, c. 54,700 Taiga Bean Goose were counted, together with 5,270 Tundra Bean Goose and 447 unidentified to sub-species (Kampe-Persson, 2020).

Bean Goose count data from the standard mid-monthly waterbird counts showed that several larger flocks of Bean Geese had already left some autumn staging areas (mainly around Tåkern and Hjälstaviken) before the special survey in October and were therefore not included in the survey counts, complicating the estimation of the total count. Assuming that this is a regular autumn feature of Taiga Bean Geese movements, to produce reliable and comparable counts to the preceding years, these 20,857 birds must in this specific year (in the special survey in October 2019) be added to the total counted during the special survey. Most probably, these unidentified Bean Geese counted in the mid-monthly counts were Taiga Bean Geese, raising the total number of Taiga Bean Geese to 75,557 (Table 2; Nilsson, 2020), which included an apparent influx of Bean Geese to Sweden from the NE (i.e. Finland, see below).

In **January**, the majority of the Taiga Bean Geese is usually found in the southernmost province of the country, Scania with additional regular flocks of wintering Bean Geese (mainly Taigas) in the province of Halland. In January 2020, which was an extremely mild winter, larger numbers of Bean Geese stayed north of Scania in January and were reported during the Midwinter counts of waterbirds

by observers who do not normally separate between the two forms of Bean Geese. Of the 38,000 Bean Geese counted, 12,719 were not separated to subspecies but it is highly probable that the vast majority of these Bean Geese were Taiga Bean Geese (Nilsson 2020). However, an attempt to assign all these to sub-species on the basis of the ratio of identified Taiga to Tundra Bean Geese, resulted in 11,866 were assigned to Taiga Bean Goose and 853 to Tundra Bean Goose and hence a total of 35,383 Taiga Bean Geese in Sweden.

In **March**, the majority of the Taiga Bean Geese stayed in south-central Sweden during a cold period, with very little northward movements to Finland after they had left the wintering grounds during the last half of February. The total number of Taiga Bean Goose counted was 65,213 birds at this time (Table 4).

Age structure among observed Bean Geese

The productivity was assessed in southern Sweden, where 1,616 Taiga Bean Geese were aged in late October. Of these, 435 were juveniles and 1,181 adults, i.e. the proportion of young birds was 26.9% in the flocks checked. This is much higher than the 7% in 2017 and 8% in the 2018 autumn based on similar assessments (Kampe-Persson, 2018, 2020; Nilsson, 2019, 2020) but comparable with the percentages (c. 17-28%) recorded in central and southern Sweden in October 2009-2013 (Marjakangas et al., 2015).

When trying to assess the annual rate of production, several sources of bias need to be considered. For example, there is a risk that the timing of migration of successful pairs (with juveniles) differs from that of unsuccessful pairs and non-breeders. In addition, when sampling of birds for aging is only possible in restricted parts of a flock, this may result in a higher ratio of juvenile birds than if all birds in a flock are checked and the age-ratio may also depend on the flock size. However, in the case of the information presented here, the experienced observers generating these assessments know all this and will try to take such factors into consideration in the field. Nevertheless, within a season, age ratios vary over space, time, with flock size, and with potentially other variables. Thus getting reliable, comparable data from year to year is extremely challenging regardless of the expertise of observers.

TBG from two managements units are staging in Sweden during autumn and spring

Both October and March counts are valuable, because the great majority of the Taiga Bean Geese from the Western and Central MUs stage simultaneously in Sweden during those periods. The great majority of these birds belong to the Central MU but a lesser number belong to the smaller Western MU. These are not possible to separate from each other and it is thought that sometimes they occur in mixed flocks. In addition, the estimations are complicated by variation in the timing of the migration, so that Western MU TBG some years are probably in Sweden during the counts but not in other years.

3.1.2.Finland

In October, casual records from Tiira.fi were used to estimate the numbers of staging Taiga Bean Geese in Finland.

There are two major concentrations of Bean Geese in Finland (considered to be Taiga Bean Geese) that generated multiple observations within the Tiira.fi portal. During the period 15–27 October, 1,500–3,500 Bean Geese were reported from around Liminganlahti near Oulu with a peak observation of 3,500 birds on 18 October. A second concentration was reported from Huittinen-Kokemäki, which generated a few observations of 2,000–2,800 Bean Geese during 18–25 October, peaking on 19 October.

Besides these two congregations, there were three observations of 160–440 Bean Geese from elsewhere, with peak numbers observed at Somero on 22 October, which may have included Tundra Bean Geese.

Altogether, the total number of Taiga Bean Geese in Finland was judged at 6,300 birds during October. Unfortunately, it is impossible to separate these from the numbers in Sweden, since both counts overlapped and covered a relatively long time period.

3.1.3.Denmark

In Denmark, there was no coordinated count in October. Instead, we used casual records from DOFbasen.dk from a week before and a week after the preferred counting weekend, 12-13 October 2019, hence 6-20 October 2019. If there were multiple counts from the same site, we used the numbers closest to the preferred weekend. The October 2019 count in Denmark recorded only 17 Taiga Bean Geese and 68 Tundra Bean Geese (Table 2).

The January 2020 count in Denmark (excluding the region used by the Western MU) recorded 2,982 Taiga Bean Geese, 4,854 Tundra Bean Geese and 242 unidentified Bean Geese. In an attempt to assign the unidentified Bean Geese to sub-species, the following methods have been applied:

- The Bean Geese unidentified to sub-species from north-eastern Jutland are usually assigned to Taiga Bean Geese on the basis of the study of sub-species within this particular region (Brandt et al., 2017). However, in January 2020, all were identified to sub-species.
- The remainder of the unidentified Bean Geese in 2020 elsewhere in Denmark were only found in SE Denmark (former Storstrøms Amt: Municipalities of Vordingborg, Guldborgsund and Lolland), or adjacent areas. These were all assigned to sub-species on the basis of the ratio of identified Taiga to Tundra Bean Geese in the total annual counts in the former Storstrøms Amt; hence 49 were assigned to Taiga Bean Goose and 193 to Tundra Bean Goose.

The total number of Taiga Bean Geese in Denmark in January 2020 was thus judged to be 3,031 (Table 3).

3.1.4.The Netherlands

The national goose counts in the Netherlands, including those for Bean Geese contribute to the international counts coordinated by Wetlands International and are performed during monthly counts from September to May. Specifically, for Taiga Bean Goose, also non-systematic observations from the portal <u>www.waarneming.nl</u> have been used. The January total from the Netherlands was 0 in 2020 (Table 3).

Tundra Bean Goose have shown a tendency during 2017-2019 to arrive later in The Netherlands in autumn (in contrast to a general advancement of arrival of larger numbers in previous two decades), resulting in total numbers counted in October comprising only around one third of the 50,000 birds observed in previous years. January numbers also tended to be lower than those observed in years before 2018 (2018 and 2019 were about similar).

3.1.5.Latvia

Latvia is at present not an official range state for the Central MU. However, Kampe-Persson & Boiko (2019) describe how Taiga Bean Geese from the Central MU stage in the westernmost part of the

country in early spring, while birds from the Eastern1 MU stage in the eastern part of the country about one month later. There are no systematic goose counts in the country but during the period 29 February – 3 March 2020, 1,000 Taiga Bean Geese were observed in the southwestern parts of the country (Table 4). Kampe-Persson & Boiko (2019) recommend to initiate a national species-specific monitoring programme in Latvia, based on regular counts throughout the spring staging period and a focus on neck-collared and ringed birds to establish the origin of birds migrating through Latvia.

3.1.6.Russia

In spring 2019 (21 April – 15 May), Russian scientists studied migrating Bean Geese near Olonets (between Lake Ladoga and Lake Onega). Of the 4,646 Bean Geese identified to subspecies level, 308 individuals (6.6%) were Taiga Bean Geese (Artemyev et al., 2019). Assuming this ratio to be representative, this ratio enabled an estimation of the numbers of this subspecies among all Bean Geese that used the site.

The spring census counted the numbers of Bean Geese present during the period 29 February -3 March, when almost all Taiga Bean Geese of the Central MU were concentrated to spring staging sites in south-central Sweden. This resulted in an estimated 60,000 Taiga Bean Geese in Sweden and 1,000 in Finland, a number similar to the previous year (Heldbjerg et al., 2019). During the same period, the total number of Taiga Bean Geese in the Central MU in Denmark was 213.

Weather conditions during the nominated spring census period were very good for monitoring the population. Cold weather returned around the counting weekend, stopping any movements further north, so we can be confident that the geese remained in Sweden at that time.

The estimated March total of c. 61,000 Taiga Bean Geese in the Central MU (and an additional 1,000 in Latvia, which was only recorded in the 2020 spring) was comparable to the similar numbers in 2017-2019 and it seems that the number of Bean Geese has increased since 2015 (57,500). In 2012-2013 the number was as low as c. 44,200 (Skyllberg, 2015).

A total of 1,145 to 3,745 Tundra Bean Geese were reported during the spring count at the sites Östen, Tåkern and Kvismaren in 2010-2012 (Thomas Heinicke & De Jong, 2013), while up to 3,000 Tundra Bean Geese are known to pass through northern Swedish spring staging sites (Thomas Heinicke, 2010). Also, approximately 4,000 Tundra Bean Geese have been reported to winter in north-east Scania in the last couple of years (see discussion in Skyllberg, 2015). For these reasons, we consider it reasonable to subtract 4,000 Tundra Bean Geese from our total Bean Goose counts to yield an estimate for the numbers of Taiga Bean Geese present at that time. **Table 2.** Results of international counts of Bean Geese in the Central MU in October 2019. Figures which are based on professional judgement (called Estimated) are shown in Italic. Due to movements of geese between countries, the total is not the sum of all rows. See comments in the text.

Country	A	Daniad	Num	ber of Bea	Depented by		
Country	Area	reriou	Taiga	Tundra	Unidentified	Reported by	
		14-29 October	54,700	5,270	447	Kampe-Persson 2020	
Sweden	Sweden	October	54,700	5,270	20,857	NI:1 2020	
		Estimated	20,857			Nilsson 2020	
	Total		75,557				
Finland	Finland	15-27 October	6,300	NA	850	Tiira.fi, Antti Piironen	
Denmark	Lille Vildmose	12-13	0	1	0	DOFbasen.dk, Preben Clausen	
	Outside Lille Vildmose	(6-20) October	17	67	0		
Germany	North- Central Germany	NA					
The Netherlands		October	0	16,182		www.waarneming.nl (Taiga BG only) Kees Koffijberg	
Total	Estimated		75,574				

¹Preliminary figures

Table 3. Results of international counts of Bean Geese in the Central MU in winter 2019/2020. Figures which are based on professional judgement (called Estimated) are shown in Italic, based on the ratio of Bean Geese identified to Taiga Bean Goose and Tundra Bean Goose.

Country	Area	Daviad	Numb	er of Bear	Demonstrad has		
Country		Period	Taiga	Tundra	Unidentified	Keported by	
	South Sweden	January	23,517	1,690	12,719	Leif Nilsson	
Sweden		Estimated	11,866	853			
		Total, SE	35,383	2,543			
Denmark*	NE-DK	Iomuomy	1,730	3	0	Preben Clausen & Tony	
	SE-DK	January	1,252	4,851	242		
	DK	Estimated	49	193		Fox	
	DK	Total, DK	3,031	5,047			
Germany	North- Central Germany	NA					
The Netherlands*		January	0	138,231		www.waarneming.nl (Taiga BG only) Kees Koffijberg	
Total estimated		38,414	145,821				

* Preliminary totals

a	Period 29 February – 3 March	Nur	mber of Bean G		
Country		Taiga	Estimated Tundra	Unidentified	Reported by
Finland		1,000	??	??	
Sweden				64,000	Ulf Skyllberg
	Estimated	60,000	4,000		
Denmark		213	431	0	Preben Clausen
Latvia		1,000	23,539	720	Hakon Kampe-Persson
Total	Estimated	62,213	27,970	720	

Table 4. Results of international counts of Bean Geese in the Central MU in spring 2020. Figures which are based on professional judgement (called Estimated) are shown in italics.

3.2. Harvest

Taiga Bean Geese from the Central MU were hunted in Sweden, Denmark, Finland, Latvia, Russia and Germany in 2019/2020.

3.2.1.Sweden

The open hunting season for Bean Geese in Sweden extends from 1 October until 31 December, but is restricted only to the counties of Skåne and Blekinge. In addition, under derogations ('skyddsjakt') permitted under two different legal instruments and reporting systems (Jensen et al., 2017), Bean Geese can be shot to prevent damage to crops outside the normal open season and permitted areas. Derogation shooting on Bean Goose is to prevent damage on agricultural crops, however only c. 2% of the total compensation for damage on crops is related to Bean Geese (Frank et al., 2019).

The Bean Goose harvest is reported on a voluntary basis to the Swedish Association for Hunting and Wildlife Management. Such data originate from defined geographical areas and so are used to extrapolate the levels of reported harvest to unreported areas to generate estimates for entire counties and scaled up nationally.

Proportion of Tundra and Taiga Bean Geese in Swedish harvest 2019/2020

During winter 2017/18 a targeted sampling of shot Bean Geese in Skåne was launched, funded by Swedish Environmental Agency and Swedish Association for Hunting and Wildlife Management (Jensen et al., 2018; Liljebäck & Ohlsson, 2018). The first year this sampling campaign resulted in 233 heads examined for determination of the ratio between Taiga Bean Goose and Tundra Bean Goose. After the starting year, the campaign continued but with very limited funding. In season 2018/2019, a total of 504 heads was collected and in season 2019/2020 the number of heads have not been determined yet, but a rough estimate is about 100 less than in 2018/2019. Unfortunately, there was no state funding for 2018/2019 or 2019/2020 and the analysis of harvested birds to subspecies is therefore still lacking but the campaign to collect heads have continued giving some additional data.

Of the 233 collected birds in 2017/2018, 44% were shot during regular hunting, i.e. open season, and 56% were shot during the period 1 January to 15 March when derogation shooting to prevent damage

on agriculture crops is allowed without specific licence from authorities. Corresponding numbers for 2018/2019 (n = 504) were 60% (regular hunting) and 40% (derogation) respectively. Data for 2019/2020 is not yet available. When hunters were asked, they confirmed that the birds shot during derogation shooting are reported to the Swedish Game Survey, i.e. they make no distinction between birds shot during regular hunting and derogation shooting when reporting the yearly bag (Jensen et al., 2018).

When Swedish harvest data for Bean Geese in earlier years was revisited, it became clear that the total harvest had included a significant (but unknown) proportion of individuals shot during derogation shooting (Bergqvist pers.comm.). Swedish hunters were therefore encouraged to report all individuals shot during protective hunting (of all species) to the system for bag statistics in Sweden (Bergqvist pers.comm.) starting with reporting in the hunting season 2018/2019 (Jensen et al., 2018).

The age of harvested birds can be determined based on coloration of inside of the upper mandible. Ageing based on the use of aging characteristics from collected wings from harvested birds was used in some older studies (Jensen et al., 2018). Corresponding data for 2018/2019 was 31% juveniles (of the abovementioned 504 geese) but for season 2019/2020 age ratio data is still not available.

Total harvest in Sweden

During the 2018/2019 hunting season, the total hunting bag of Bean Geese was 3,547 birds (<u>https://rapport.viltdata.se/statistik/</u>, accessed 19. April 2020; Table 5), which is 79% higher than the previous year. According to Swedish Association of Hunting and Wildlife Management this increase can be explained with the fact that hunting in 2017/2018 was heavily influenced by weather and in fact most game species (birds and mammal) hunted in agricultural areas resulted in low harvest numbers in 2017/2018.

Harvest data for 2019/2020 were not available at the time of writing this report. The number of Bean Geese shot under special licences issued by statutory authorities to reduce agricultural damage are not currently gathered and collated, but the numbers are considered to be small compared to those shot under recreational hunting.

3.2.2.Denmark

There is no national hunting season in Denmark for Bean Geese but in certain areas, they can be hunted legally from 1 September until 30 November. Hunting has, since 2014, only been allowed in south-east Denmark in the municipalities of Vordingborg, Guldborgsund and Lolland. The spatial restrictions on hunting were initially established to protect Taiga Bean Geese of the Western MU in North Jutland, but later expanded to most of the country to protect Taiga Bean Geese in general.

Harvest of Bean Geese is reported by hunters through the mandatory Hunting Bag Statistics (administrated by the National Environmental Agency). Furthermore, hunters may, on a voluntary basis, submit wings from shot geese to the Danish Wing Survey. These wing samples contribute to the knowledge of the temporal hunting bag variations, as well as knowledge of age ratio.

In the 2019/2020 hunting season, the total hunting bag of Bean Geese consisted of 447 birds (preliminary data but only small subsequent changes are expected; Table 5), much lower than the previous year (692 birds), which may have been due to a late arrival with the majority arriving after the hunting season. This is the lowest annual harvested Bean Geese number in Denmark in the last 10 years. The number of wings submitted was also very low; only 10 wings received of which one was from a juvenile bird. The wing survey data show that the juvenile percentage during the last c. 10 years have been below the 1986/87-2018/19 mean juvenile/adult ratio of c. 0.25, although based on very few birds in some years (Christensen, 2020).

Based on the mandatory Hunting Bag Statistics, it has become clear that more than half of the reported Bean Geese were shot outside the municipalities where hunting is allowed (Sørensen & Madsen, 2017), which was also the case in 2019/2020 (51%). It is unclear to what degree this results from incorrect determination of shot geese to species, limited hunter knowledge of the species or of the hunting regulations related to this species. Whatever the explanation, to mitigate any unintentional illegal hunting, the Danish Hunting Association and the Danish Wing Survey have, since 2017/2018, increased the awareness of hunters to the status of "Grey Geese" and encouraged them to submit the head and tail of shot Bean Geese, or photos of these (Sørensen & Heldbjerg, 2019; Sørensen & Madsen, 2017). These body parts enable differentiation of Taiga from Tundra Bean Geese, to obtain better information relating to the size and distribution of the hunting harvest of the two sub-species. Data for the 2019/20 season are not yet available. During the coming hunting season, the Danish Hunters' Association will collect heads again, this time combining volunteer contributions with a coordinated effort to acquire heads from professional game meat handlers (Iben Hove Sørensen, pers. comm.).

3.2.3.Netherlands

Bean Geese are protected in the Netherlands but may be subject to scaring and shooting at local level, with permission from the local statutory authority (filed as derogations). No licenses were issued in the reporting period within the only area where Taiga Bean Geese occur (Table 5).

3.2.4.Finland

In Finland, hunting on Bean Goose was reopened 2017 in a 'Tundra Bean Goose' zone in south-east Finland after a 3-year total moratorium. Recreational hunting was restricted to October-November (as no derogation shooting was allowed) and there was a mandatory requirement to report the harvest bag.

The Finnish Wildlife Agency received mandatory reports indicating a harvest of 77 Bean Geese in 2019, compared to 49 Bean Geese in 2018 and 176 in 2017. To gain information about the distribution of the harvest of the two sub-species, the hunters were asked to voluntarily e-mail pictures of their bird and identify them as either Taiga or Tundra Bean. In addition, hunters were asked to collect head samples during 2018 and 2019 for visual and DNA-analysis. The results of DNA-analysis are expected before the end of 2020. Based on the collected heads of Bean Geese, it was estimated by the Finnish Wildlife Agency that 65 (85%) of the birds shot were Tundra Bean Geese. This estimate might be improved based on DNA-analysis. This translates to a total of 12 Taiga Bean Geese that were shot out of a total of 77 Bean Geese. Only 1.4% of the Finnish Taiga Bean Goose quota was used. There continues to be a moratorium on hunting of Bean Goose in areas where harvest would focus on the Finnish breeding population in order to strengthen the Finnish breeding segment of this Management Unit.

3.2.5.Latvia

The open hunting season for Bean Geese in Latvia is 15 September–30 November. In 2014, Linda Dombrovska initiated a hunting bag study, in which hunters were asked to submit photo images of the Bean Geese they had shot. The submitted images have enabled a calculation of the proportion of Taiga Bean Geese among the shot and bagged Bean Geese (Kampe-Persson, 2019; Kampe-Persson & Boiko, 2019). In 2019, 0.9 % of the Bean Geese were Taiga BG.

In 2020, Latvia issued for the first time ever licences to shoot geese for mitigation of crop damage. During the period 15 March–31 May, 140 farmers were allowed to shoot a total of 1,000 geese.

Allowed species were Bean Goose, White-fronted Goose and Canada Goose. Preliminary data showed that less than 100 geese will be shot. As the farmers were obliged to submit a photo image of every shot bird, we should learn some time in summer if any Taiga Bean Geese were shot.

3.2.6.Russia

In Russia, the "official" hunting bag statistics of geese consist of mandatory hunting bag reports, but we have received no data from Russia for the last years. Taiga Bean Geese are protected in some districts and regions covering the Central MU, e.g. Archangelsk district.

In spring 2019 in the Olonets District of Karelia, Russia, the total hunting bag was 1,370 *Anser* geese, of which c. 37% were Bean Geese. Out of 36 Bean Geese bagged in 2013–2019, two of them (5.6%) were identified as Taiga Bean Geese. Based on this ratio, c.30 Taiga Bean Geese were shot in the Olonets District during spring 2019. To reduce the accidental shooting of Taiga Bean Geese, as well as protecting other goose species, it has been recommended that the dates of the spring hunting season be delayed to a later period. To greatly improve the conservation of Taiga Bean Goose, it is also necessary to ban hunting at overnight roosting sites and to change the status of the areas important to geese, currently subject to hunting bans, to that of strictly protected area status.

Country	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Sweden (Bean)	1,675	1,582	2,212	>1977	3,547**	NA
Sweden (Taiga)			NA	NA	NA	NA
Denmark (Bean)	1,296	1,440	1,301	822	692	477**
Netherlands	0	0	0	0	0	0
Finland (Taiga)	0	0	0	24	15	12
Latvia (Taiga)***	17	20	10	0	17	NA
Latvia (Tundra)	1,196	1,403	685	1,238	1,339	NA
Russia*	NA	NA	NA	NA	NA	NA
TOTAL (Bean)	>4,184	>4,445	>4,208	>4,037	>5,610	

Table 5. Bean Goose hunting bag during the hunting seasons 2014/15-2019/2020

* The region of Karelia, Murmansk and Arkhangelsk

** Preliminary data

*** Numbers for the whole of the country, i.e. both the Central MU and the Eastern1 MU (Kampe-Persson & Boiko 2019).

3.3. Conclusions for the Central MU

A total of 38,414 Taiga Bean Geese were counted in January 2020 compared to 41,927 in January 2019, 38,717 Taiga Bean Geese in January 2018, and 56,792 Taiga Bean Geese in January 2017. None of these estimates include counts from Germany. Nevertheless, given the population estimates from the last few years, the Central MU appears to have either declined significantly during the last years or the mid-winter counts are incomplete. For two major reasons, the latter seems most realistic:

- 1) It has not been possible to obtain population estimates from Germany, hence we know that the January count is biased low.
- 2) Counts of Taiga Bean Geese from the Central MU during autumn and spring have been consistently higher than the January counts. As was seen in the previous years, the total numbers counted in October 2019 and in early March 2020 were both much higher than the number of Taiga Bean Geese in January. The number in October 2019 was c. 75,574 and that in March 2020 was c. 62,213 (inclusive 1,000 from Latvia) (Table 2-4).

The autumn count indicates a large increase in the population over previous years, which corresponds to a much higher production of juveniles in the 2019 breeding season (26.9%) compared to those in previous years (7-8%). See also the TBG harvest assessment (Johnson et al., 2020).

Counting the Bean Geese in the period when there are movements between countries complicates the estimation of the population number. In October 2019, Bean Geese from Finland migrated into Sweden during the survey period; hence a shorter period with coordinated counts would be preferable.

The hunting bag data from the Central MU Range States shows that at least 5,610 Bean Geese were shot in 2018/2019, whereas the data from 2019/2020 is still unavailable from the main contributors. The application of the harvest management programme for the Central MU of the Taiga Bean Goose requires the availability of robust estimates of population size and harvest bag data separated into the two subspecies (Taiga and Tundra Bean Geese). These two variables are the prerequisite for assessing the population response to management actions.

In 2019/2020, it has been possible to obtain reasonable count data from Denmark, Sweden and the Netherlands, but unfortunately not from Germany. In addition, while it has been possible to obtain subspecies specific harvest data from Finland for the most recent hunting season, it has not been possible to separate the harvested Bean Geese into the two sub-species in either Denmark or Sweden. Finally, hunting data from other Range States continues to be lacking (e.g. from Russia and Germany).

For these reasons, the successful implementation of an AHM framework for the Central Taiga Bean Goose MU cannot occur until the following data have been made available:

- 1) Reliable annual population estimates, and
- 2) Up to date sub-species specific hunting bag data from all Range States (particular Sweden, Finland, Denmark, Russia (by region) and Germany).

Jensen et al. (2018) recommended investigating a viable alternative to assessing annual abundance from the January counts, which included using existing Swedish count data series from autumn/spring going back several year to generate more reliable population consensus estimates. These counts were again undertaken this year and the data are described in the present report. The additional counts have proven to provide more reliable estimates than the January counts. The Taiga Bean Goose Task Force have agreed to maintain all three seasonal counts at least through 2021, when a more informed decision about monitoring efforts can be made.

The information from this report is included in the Taiga Bean Goose harvest assessment report. The harvest assessment report presents the first results from an integrated population model (IPM), developed for the purpose of further improving harvest management. Integrated population models represent an advanced approach to modeling, in which all available count and demographic data are incorporated into a single analysis. The IPM estimates the present population size in the Central MU is at 80,700 in October 2019, 77,000 in January 2020, and 75,200 in March 2020 (Johnson et al., 2020). However, these estimates still include a small proportion of Tundra Bean Geese, which were not discriminated in the counts. To improve the population estimation by use of the IPM, additional data on key demographic parameters

such as survival and reproduction would be helpful. Moreover, identification of the subspecies in both the counts and harvests should continue to be improved.

In the spring of 2020, an initiative was undertaken by the TBG Task Force to produce a leaflet describing how to identify Tundra Bean Geese and Taiga Bean Geese in the field (AEWA EGMP, 2020). The aim was to draw attention to the features that enable the identification of the two subspecies in the field and during hunting. At present, it is available in English, Danish, Finnish and Ukrainian languages.

4. Eastern1 MU

4.1. Population estimates

The Taiga Bean Geese of the Eastern1 MU winters in north-east Germany, north-west Poland, in lower numbers in southern Sweden and only in small numbers in The Netherlands. In this report, all the birds in Sweden and the Netherlands were identified as Central MU birds in the absence of better information (and latest ring sightings from The Netherlands suggest a link with the Central MU). Until we understand better the distribution, abundance and phenology of these Taiga Bean Geese, we are forced to consider that this wintering element has contracted its wintering range eastwards into eastern Germany and Poland. However, as there have been no goose counts from Germany and Poland in January 2020 that have been made available, it is not possible to estimate the population size for the Eastern1 MU. Wintering Bean Geese were counted in Germany in winter 2019/2020 but these data have not yet been made available to this process.

There is still a need for improved information on the wintering areas, staging areas and migration routes of the two Eastern MU's, and any new investigation will add to improving our knowledge and understanding of the species. In other countries, such as Ukraine, counts and publications about the spatial and temporal patterns of this species are lacking, but an initiative has now been taken to collect all available information (Kostiushyn et al., in prep.). Bean Geese mainly occur in Ukraine during migration and although the ratio of Taiga Bean Goose is unknown, Tundra Bean Goose is the more common of the two subspecies. In spring, migrating Bean Geese enter Ukraine through the Transcarpathian region and after crossing the Carpathians, they fly east and northeast, through northern and central Ukraine, ultimately towards their nesting sites in Western Siberia. The autumn migration follows the same route in the opposite direction, but is less concentrated, likely because the geese head north of Ukraine directly to the wintering quarters (Information from several references by Vasiliy Kostiushyn).

Ornitela GPS loggers fitted to Taiga Bean Geese in Germany generated good data about migration routes and staging sites, especially to identify important staging sites. A new key staging area was found in Baykalovsky district (Rozenfeld et al., 2020). Information on birds followed remotely to Yugansky state reserve in Russia, added greatly to the knowledge we have about these birds, their movements and the needs for protection (Fig. 2), (T. Heinicke et al., 2020; Rozenfeld & Strelnikov, 2019).



Figure 2. Migration paths of a female Taiga Bean Goose (B01_003) in 2019 and 2020, equipped with an Ornitela GPRS tag in Oder valley Germany in the autumn of 2018 (T. Heinicke et al., 2020). The spring 2019 migration route is shown in green, autumn 2019 in yellow and spring 2020 in white. The bird spent the summer 2019 at Yugansky state reserve, indicated by red colour (information from Evgeny Strelnikov and Sonia Rozenfeld).

4.2. Harvest

It is known that the Taiga Bean Geese from the Eastern1 MU were hunted in Germany, Belarus, Latvia, Russia and Poland in 2019/2020, but the bag sizes in these states are unknown. In the federal state of Brandenburg, Germany, hunting on all Bean Geese has been banned since autumn 2019.

In Russia, the Taiga Bean Geese of Eastern1 and Eastern2 MUs are now included in the federal Red Data Book. The intention is to protect them from hunting throughout their range in the Russian Federation and that areas of important habitat for the birds should be completely protected under state legislation (Order # 162 from 24 March 2020 of the Ministry of Natural Resources and Ecology of Russia, registered by the Ministry of Justice 02 April 2020). This represents a very important increase in the level of protection for the subspecies in Russia. However, Taiga Bean Goose is only fully protected in regions, which themselves have included it in their regional Red Books, e.g. the 3 west Siberian regions Yamalo-Nenets, Khanty-Mancy and Novosibirsk.

4.3. Information material

The Ukrainian version of the Bean Goose identification guide, which was published in the spring of 2020 (AEWA EGMP, 2020) was warmly welcomed in the professional community of ornithologists of Ukraine and some neighbouring countries.

Information about identification of the two subspecies is also presented at the Russian website <u>https://goosemania.ru/kak-otlichit-krasnoknizhnogo-gumennika/.</u>

5. Eastern2 MU

The Eastern2 MU winters in South-east Kazakhstan, Eastern Kyrgyzstan and North-west China, it has however not been possible to get population estimates nor harvest data from these countries.

Russian scientists have tagged Taiga Bean in the eastern part of the Yamal-Nenets Autonomous Okrug to identify the main staging, moulting, nesting and wintering sites used by birds from this flyway. The results are still providing new and exciting results about the migratory routes and the wintering sites used in NW China (Fig.3) (Rozenfeld et al., 2018). A grant from Yamal-Nenets Autonomous Okrug Administration has provided funding to look for nesting areas used by Taiga Bean Geese from this flyway in the western part of Yamal-Nenets Autonomous Okrug and in the Yougansky State Reserve, with the prospect of more possible tagging of nesting birds in this area in 2020.



Figure 3. Satellite tracking data analysis of Eastern2 subpopulation (Rozenfeld et al. 2018).

6. References

- AEWA EGMP. (2020). Identification of Tundra and Taiga Bean Goose. Leaflet. https://egmp.aewa.info/sites/default/files/download/population_status_reports/Taiga_and Tundra Bean Goose Identification Guide.pdf
- Artemyev, A. V., Matantseva, M. V., & Simonov, S. A. (2019). Taiga Bean Goose (Anser fabalis fabalis) on spring stopover site near Olonets, Republic of Karelia, Russia. Casarca, 22, 1–9.
- Brandt, T., Lund, T., Sørensen, D., Sørensen, F., Skyllberg, U., Therkildsen, O. R., & Fox, A. D. (2017). Recent status and changes in abundance of Taiga Bean Geese wintering in NE Jutland. *Dansk Orn. Foren. Tidsskr*, 111, 138–146.
- Christensen, T. K. (2020). SÆDGÅS (Anser fabalis). Vingeundersøgelsen 2019/20. https://fauna.au.dk/fileadmin/fauna.au.dk/Vinger/2019 pdf arter/Saedgaas2019.pdf
- Frank, J., Månsson, J., & Höglund, L. (2019). Viltskadestatistik 2018. Skador av fredat vilt på tamdjur, hundar och gröda. Rapport från SLU, Viltskadecenter 2019-1. Viltskadecenter, Institutionen för ekologi, Sveriges Lantbruksuniversitet. isbn: 978-91-984194-7-4.
- Heinicke, T., Polderdijk, K., Kölzsch, A., Rozenfeld, S., Cao, L., & Fox, A. D. (2020). Taiga Bean Geese Anser fabalis of the management unit E1 in the Lower Odra national park. 19th Edition of the Goose Specialist Group Meeting Leeuwarden, The Netherlands, 6–7. 19th Edition of the Goose Specialist Group Meeting Leeuwarden, The Netherlands, 6–7.
- Heinicke, Thomas. (2010). Tundra bean goose *Anser fabalis rossicus* during spring migration in northern Sweden Rare visitor or regular passage migrant? *Ornis Svecica*, 20(3–4), 174–183.
- Heinicke, Thomas, & De Jong, A. (2013). Tundra Bean Geese *Anser fabalis rossicus* in central and southern Sweden autumn 2009-spring 2012. *Ornis Norvegica*, *36*, 32–37.
- Heldbjerg, H., Fox, A. D., Christensen, T. K., Clausen, P., Kampe-Persson, H., Koffijberg, K., Liljebäck, N., Mitchell, C., Nilsson, L., Skyllberg, U., & Alhainen, M. (2019). Taiga Bean Goose Population Status Report 2018/2019. AEWA EGMP Technical Report No. 14. Bonn, Germany.
- Jensen, G. H., Fox, A., Christensen, T. K., Clausen, P., Koffijberg, K., Liljebäck, N., Madsen, J., Mitchell, C., & Nilsson, L. (2017). Taiga Bean Goose population status report 2015/16 and 2016/17. AEWA EGMP Technical Report No. 1. Bonn, Germany.
- Jensen, G. H., Fox, A. D., Christensen, T. K., Clausen, P., Koffijberg, K., Liljebäck, N., Mitchell, C., Nilsson, L., & Alhainen, M. (2018). Taiga Bean Goose Population Status Report 2017-2018 (Anser fabalis fabalis). AEWA EGMP Technical Report No. 6. Bonn, Germany.
- Johnson, F. A., Jensen, G. H., & Heldbjerg, H. (2020). Harvest Assessment for Taiga Bean Geese in the Central Management Unit. AEWA/EGMIWG/5.11.
- Kampe-Persson, H. (2018). Inventering av rastande taigasädgäss, tundrasädgäss och spetsbergsgäss i Sverige hösten 2018. Unpublished report.
- Kampe-Persson, H. (2019). Zosis Latvijā un tu medības. Medības, 3, 44–45.
- Kampe-Persson, H. (2020). Count of staging Taiga Bean Geese, Tundra Bean Geese and Pink-footed Geese in Sweden in October 2019. Unpublished report.
- Kampe-Persson, H., & Boiko, D. (2019). The Taiga Bean Goose Anser fabalis fabalis in Latvia: occurrence, origin and hunting. *Environmental and Experimental Biology*, 17(2), 91–95. https://doi.org/10.22364/eeb.17.09
- Liljebäck, N., & Ohlsson, T. (2018). Analysis of Bean Goose Harvest in County of Skåne, winter 2017/2018. Manuscript of technical report to Swedish Environmental Agency.
- Marjakangas, A., Alhainen, M., Fox, A. D., Heinicke, T., Madsen, J., Nilsson, L. &, & Rozenfeld, S. (2015). International Single Species Action Plan for the Conservation of the Taiga Bean Goose (Anser

fabalis fabalis). AEWA Technical Series No. 56.

- Nilsson, L. (2019). Staging and wintering Taiga Bean Geese Anser fabalis fabalis in south Sweden 2016/17 2018/19. Lund University.
- Nilsson, L. (2020). Staging and wintering Taiga Bean Geese Anser fabalis fabalis in south Sweden 2016/17 2019/20. Lund University.
- Rozenfeld, S. B., Bayanov, E. S., Bogomyakova, N. G., & Strelnikov, E. G. (2020). On the value of the migration stop of the Taiga bean goose *Anser fabalis fabalis* in the Sverdlovsk Oblast, detected using a female marked with a GPRS transmitter. *The Russian Journal of Ornithology*, *29*, 2333–2337.
- Rozenfeld, S. B., & Strelnikov, E. G. (2019). New data about the wintering of Taiga bean goose *Anser fabalis fabalis* nesting in Yougansky State reserve (In Russian). *Russian Ornithological Revue*, 28(1858), 5683–5687.
- Rozenfeld, S. B., Zamyatin, D.O. Vangeluwe, D., Kirtaev, G. V., Rogova, N. V., Cao, L., & Popovkina,
 A. B. (2018). The Taiga Bean Goose (Anser fabalis fabalis) in Yamalo-Nenets autonomous Okrug. Casarca, 20, 28–52.
- Skyllberg, U. (2015). Numbers of Taiga Bean Geese *Anser f*. *fabalis* utilizing the western and central flyways through Sweden during springtime 2007 2015. *Ornis Svecica*, 25, 153–165.
- Sørensen, I. H., & Heldbjerg, H. (2019). Tajga eller tundra? Sådan bidrager du til bedre forvaltning af sædgæs. *Jæger*, (10): 2-3.
- Sørensen, I. H., & Madsen, J. (2017). Bliv klogere på de grågæs: Fokus på sædgåsen. Jæger, (9): 30-31.