Satellite tracking of Bean Geese *Anser fabalis fabalis* and *A. f. rossicus* from spring staging areas in northern Sweden to breeding and moulting areas

*Satellitspårning av sädgäss (Anser fabalis fabalis och A. f. rossicus) från rastplatser i norra Sverige till häckningsområden och ruggningsplatser*

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In order to determine their breeding and moulting sites we fitted eight Taiga Bean Geese *Anser fabalis fabalis* and two Tundra Bean Geese *A. f. rossicus* with satellite transmitters in 2007–2009 at their spring roosting sites at Umeå and Luleå, Sweden. Nine of these transmitters transferred GPS positions for 1–4 months. All positions were N–ENE of the catching sites. The Tundra Bean Geese migrated to Finnmark in Norway and neighbouring parts of Finland. The Taiga Bean Geese migrated to sites near Övre Soppero (Sweden) and Kautokeino (Norway) in the west, through northern Finland, to Russian Karelia. Three of five Taiga Bean Geese with active transmitters flew to Novaya Zemlya to moult. Our results indicate that a significant proportion of the Taiga Bean Geese that migrate along the coast of northern Sweden in spring do not breed west of 20° E, and that many of them moult on Novaya Zemlya. The Tundra Bean Geese that pass through northern Sweden in spring belong to the Finnmark population that breeds slightly north of the Taiga Bean Geese.

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Introduction

The Bean Goose *Anser fabalis* is distributed over the northern Palearctic from Scandinavia to the far east of Russia. Within this large distribution, it is represented by four subspecies or 2–3 species, depending on the taxonomy used. Of these taxa, Taiga Bean Goose *A. f. fabalis* and Middendorff’s Bean Goose *A. f. middendorffi* are mainly found in taiga (i.e. northern boreal) habitats, while Western Tundra Bean Goose *A. f. rossicus* and Eastern Tundra Bean Goose *A. f. serrirostris* inhabit tundra habitats. *A. f. fabalis* and *A. f. rossicus* are the only taxa regularly observed in Europe (Nilsson et al 1999, Van den Bergh et al. 1999). In this article, *A. f. fabalis* will be referred to as Taiga Bean Goose and *A. f. rossicus* as Tundra Bean Goose.

In Sweden, the Bean Goose is represented by the Taiga Bean Goose *Anser fabalis fabalis*, breeding in the northernmost parts of the country. The national population has been estimated to be 650–1250 pairs (Nilsson 2007), and is considered as Near Threatened (Gärdenfors 2005). Outside the breeding season, large numbers of Bean Geese occur in Sweden, and the majority of the world population of Taiga Bean Goose *A. f. fabalis* is thought to pass through Sweden during autumn migration. There is some uncertainty about the taxonomy of many Bean Goose reports, however, and the proportion of Tundra Bean Goose *A. f. rossicus* reports has increased remarkably since the fabalis/rossicus issue was brought up (Heinicke 2010). Due to annual goose counts since 1977/1978, the staging areas, numbers and trends of Bean Geese outside the breeding season are well known (Nilsson & Persson 1984, Nilsson 2008). Thanks to earlier neck-banding programs in Finland and Sweden, even the movements in south and central Sweden are well documented (Nilsson 1984, Nilsson & Pirkola 1991). On the other hand, where the Bean Geese go and what they do between their departure from the spring-staging sites along the coast of northern Sweden and their return in autumn, is virtually unknown.

In the late 1990s, plans were presented for a railway passing an area south of Umeå, close to the
mouth of the Ume River. This area is one of the main spring staging areas of Bean Geese in northern Sweden (Nilsson & Persson 1984). A Control Program was launched to evaluate the possible effects of the railway construction on staging Bean Geese and other waterfowl. This program included regular spring counts, a study of habitat utilization, a neck-banding program for Bean Geese, and several other studies. The railway project also generated a number of compensatory measures, e.g. the construction of permanent and temporal ponds, food provisioning, removal of woodlots, and restoration of coastal meadows near roosting sites.

Unfortunately, the chances of neck-band sightings are futile when the Bean Geese are in their remote breeding and moulting areas. To overcome this problem, we used satellite transmitters to study the migration from the spring-staging sites to the breeding and moulting areas.

Methods

Bean Geese were caught with cannon nets at three locations: the Ume River Delta, Brattby near Vännäsbysjön, and Alvik SW of Luleå in 2005, 2007, 2008 and 2009. A total of 75 Bean Geese were neck-banded during these years, both Taiga and Tundra Bean Geese. Ten adult males (1 in 2007, 3 in 2008 and 6 in 2009) were supplied with satellite transmitters (Table 1). In 2007 and 2008 (one goose) we used 45 g Argos/GPS Solar PTTs, whereas we used 40g Battery Powered LC4s for the eight other birds. All transmitters were produced by Microwave Telemetry Inc. The transmitters were programmed to send one GPS position per day, and they had an estimated lifespan of one year. GPS positions were downloaded from the Argos website and plotted on adequate maps.

Only adult males were chosen, because (A) males are larger, (B) transmitters on the back of females may interfere in the act of mating, and (C) the ground tracking function of the transmitters can be triggered during long incubation periods of females and the bird might be assumed to be dead. We used harnesses (Teflon ribbon in 2007, leather in 2008 and 2009) to attach the transmitters on the back of the geese. Each transmitter goose was also neck-banded to ensure the bird could be identified even when it lost its transmitter.

Results and discussion

The 2007 goose lost its transmitter after a few days and will not be discussed any further. The other transmitters were transferring positions regularly, but ceased to do so after one to four months (Table 1). The very last signals were received on 29 August, before the start of southward migration of most Bean Geese. Six of the transmitter birds were later identified in southern Scandinavia, and were found to carry neither transmitter nor harness. How the birds lost the transmitters is unclear. It may be
N–ENE of the catching sites (Figure 1 and 2). Five (71%) of them headed for the region between Övre Soppero in northernmost Sweden and Kautokeino in Norway, almost due north of the Alvik catching site near Luleå (Table 1). The wetland region around Övre Soppero (Figure 3) was the same area as where relatively high densities of Bean Geese were found during aerial surveys of breeding waterfowl in 1972–1975 (Nilsson unpubl.).

The other two Taiga Bean Geese had more easterly goals for their spring migration: the 2009 Alvik bird went to central Finnish Lapland and the 2008 Ume River Delta bird to Russian Karelia N of Kalevala (Figure 1 and 2). The latter bird may have flown across the Gulf of Bothnia between a staging site near Skellefteå and its final destination, but the intervals between the GPS positions were too large to confirm this (Figure 1).

The Tundra Bean Geese (n=2) migrated slightly further north than the Taiga Bean Geese into tundra habitats in Norwegian Finnmark and adjacent parts of Finnish Lapland (Figure 4). These areas and their habitats do differ from the breeding areas of the Taiga Bean Geese in this study, but it is still unclear whether the populations of these two taxa are geographically and/or ecologically isolated or overlapping.

Spring migration strategy

The pattern of migration between the catching site and the breeding areas differed between Taiga and Tundra Bean Geese. Whereas the Tundra Bean Geese flew virtually non-stop to their breeding grounds (Figure 4), the Taiga Bean Geese stopped at one or several staging sites along the way (Figure 1 and 2). Also, our data confirm that Taiga Bean Geese use multiple staging sites along the coast of the Gulf of Bothnia during a single season (Nilsson, de Jong & Heinicke 2009).

Moult migration of Taiga Bean Geese

Moult of Taiga Bean Geese on Novaya Zemlya has been reported already in the early 20th century (Alpheraky 1905), and a Taiga Bean Goose marked in Finnish Lapland in August 1985 was shot during moult on Novaya Zemlya in the summer of 1996 (Ström et al. 1997). Despite this, we did not expect spring-staging Taiga Bean Geese to use this eastern moult site at a regular basis. Instead, we thought of the 2008 Karelian bird that migrated to Novaya Zemlya as of an odd bird with odd behaviour. The fact that two of the 2009
Taiga Bean Geese also chose to moult on Novaya Zemlya forced us to change opinion. With three (60%) out of five birds with active transmitters (Table 1) choosing Novaya Zemlya, this behaviour appears to be normal rather than exceptional. The positions for the three tagged Bean Geese on Novaya Zemlya were well spread along the west coast of the island, all three birds visiting different sites before settling at the moulting sites (Figure 5).

The reason why these birds prefer this remote site over other moulting sites, e.g. on Varanger Peninsula (Norway) and in southern Swedish Lapland, is not obvious (Nilsson, de Jong & Sjöberg 2008, de Jong 2010). In this context, the GPS position of the 2009 Övre Soppero bird on the NE coast of Varanger Peninsula is noteworthy. For migrating geese, this position should be within “scanning distance” from one of the Varanger moulting sites. This position and the position on the coast of the Kola Peninsula for the 2008 bird, show that the geese make a short stop before crossing the Barents Sea (Figure 1 and 2).

**Local movements within the breeding area**

Within their breeding area, the birds show considerable local movements. It should be remembered, though, that our data are 100% male biased. Not
surprisingly, the birds were more mobile early in the season, but even in the middle of the breeding season considerable movements occurred. The full temporal pattern of these movements and the habitat preferences they express are planned to be presented elsewhere.

Obviously, our data stem from a limited number of Bean Geese and limited time-frames; goose-catching and transmitters are highly resource consuming. Despite this, our findings result from two catching sites, two years and two Bean Goose taxa, and show consistency over these factors.

Conclusion

Our study shows that (1) Taiga Bean Geese commonly use multiple spring-staging sites in northern Sweden before reaching their breeding area, (2) a significant proportion, maybe the majority, of the Taiga Bean Geese staging along the coast of the Gulf of Bothnia during spring migration breed east of longitude 20°E in Sweden, Norway, Finland, and probably even Russia, (2) Tundra Bean Geese of the Finnmark population in (predominantly) Norway use staging sites in northern Sweden during spring migration, and (4) Taiga Bean Geese that use the spring-staging areas near Umeå and Luleå, commonly fly to Novaya Zemlya, Russia, to moult.

Acknowledgements

Grants for this study were obtained from Carl Tryggers Foundation for Scientific Research, the Swedish Environmental Protection Agency, and the Swedish Ornithological Society (Alvin’s foundation). Goose catching was financed with support from the Swedish Transport Administration (formerly Swedish Rail Administration) in 2005–2007, and by Stiftelsen Naturvård vid Nedre Umeälven in 2008–2009. We want to thank the landowners and the field staff for making the catching of Bean Geese possible. Also, we would like to thank bird-watchers around the country for sending us their observations of neckbanded Bean Geese.

Permission for canon-netting was given by the Swedish Environmental Protection Agency (412-1004-07) and the Västerbotten County Board (521-4697-2007, 521-4916-2008 and 521-4636-2009), and for using neckbands and transmitters by the Umeå Ethical Committee on Animal Experiments (A19-07). The map in Figure 3 is based on “Översiktskartan” (Permit I2010/1578, Lantmäteriet i Gävle 210).
References


Sammanfattning.
