ORNIS SVECICA 20: 184–189, 2009 https://doi.org/10.34080/os.v20.22621

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*

LEIF NILSSON, ADRIAAN DE JONG, THOMAS HEINICKE & KJELL SJÖBERG

Abstract

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.

Leif Nilsson, Ecology Building, S-223 62 Lund, Sweden, leif.nilsson@zooekol.lu.se
Adriaan de Jong, Vilt, fisk och Miljö, SLU, S-901 83 Umeå, Sweden, Adriaan.de.jong@vfm.slu.se
Thomas Heinicke, Chausseestr. 1, D-18581 Vilmnitz, Germany. thomas.heinicke@gmx.net
Kjell Sjöberg, Vilt, fisk och Miljö, SLU, S-901 83 Umeå, Sweden, Kjell.Sjoberg@vfm.slu.se

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 Geese *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 neckbanding 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

Table 1. Summary data for the Bean Geese (*Anser fabalis fabalis* and *A. f. rossicus*) marked with satellite transmitters in northern Sweden in 2008 and 2009.
*Sammanfattande uppgifter för de sädgäss (*Anser fabalis fabalis *och* A. f. roisscus*) som märktes med satellitsändare i norra Sverige under 2008 och 2009.*

PTT	Neck-band *Hals-band*	Taxon	Marking date *Märk-datum*	Marking site *Märkplats*	Start of migration *Flytt-start*	Last signal *Sista signal*	Breeding area, country *Häcknings-område*	Moulting area *Ruggnings-område*	Seen in autumn/ winte- *Sedd vinter/höst*
			2008		2008	2008			
34294	YME	Taiga	April 20	Umedeltat	May 4	May 20	Soppero, SE		
34295	OXG	Taiga	April 19	Umedeltat	April 29	Aug 17	Karelia, RU	Novaja Zemlja	
34297	OXN	Taiga	April 20	Umedeltat	May 7	Aug 17	Soppero, SE		X
			2009		2009	2009			
90822	ECP	Taiga	April 19	Umedeltat	May 10	June 30	Finnmark, N		
90823	ECV	Taiga	April 19	Umedeltat	April 30	Aug 5	Lapland, SF	Novaja Zemlja	X
90820	EER	Taiga	April 26	Alvik	May 4	June 14	Soppero, SE		X
90821	E00	Taiga	April 26	Alvik	May 6	Aug 27	Soppero, SE	Novaja Zemlja	X
90824	EZX	Tundra	April 28	Alvik	May 10	Aug 29	Finnmark, N		X
90825	EZA	Tundra	April 28	Alvik	May 11	June 16	Lapland, SF		X

mouth of the Ume River. This are 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 Vännäsby, 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

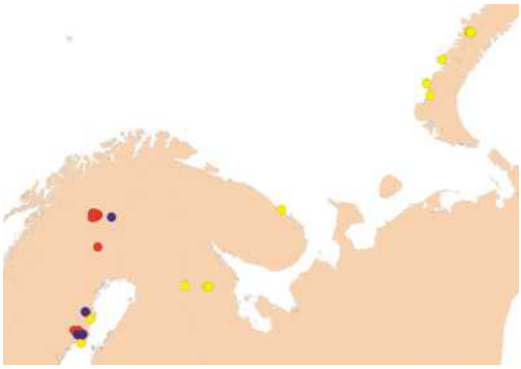

Figure 1. Satellite positions of three Taiga Bean Geese *Anser fabalis fabalis* marked in the Ume River delta in 2008.
Satellitpositioner för tre taigasädgäss Anser fabalis fabalis *från Umedeltat märkta 2008*.

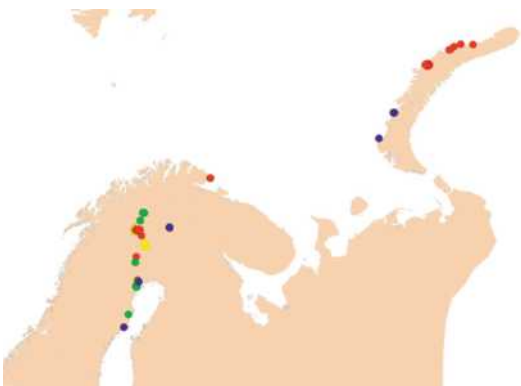

Figure 2. Satellite positions of four Taiga Bean Geese *Anser fabalis fabalis* marked in the Ume River delta and the Alvik area, Luleå in 2009.
Satellitpositioner för fyra taigasädgäss Anser fabalis fabalis *från Umedeltat och Alviksområdet, Luleå märkta 2009*.

that the geese got so slim during moult that they could slide out of the harness or they managed to destroy the harness with their strong beaks. For long-term transmitter studies of Bean Geese, the harnesses we used are clearly unsuitable.

Breeding areas

As all transmitter birds were adults, we assume that the birds were within their breeding area when the positions "settled" after spring migration. The breeding areas of the Taiga Bean Geese (n=7) were 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

Moulting 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 in northern Sweden to use this eastern moulting 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

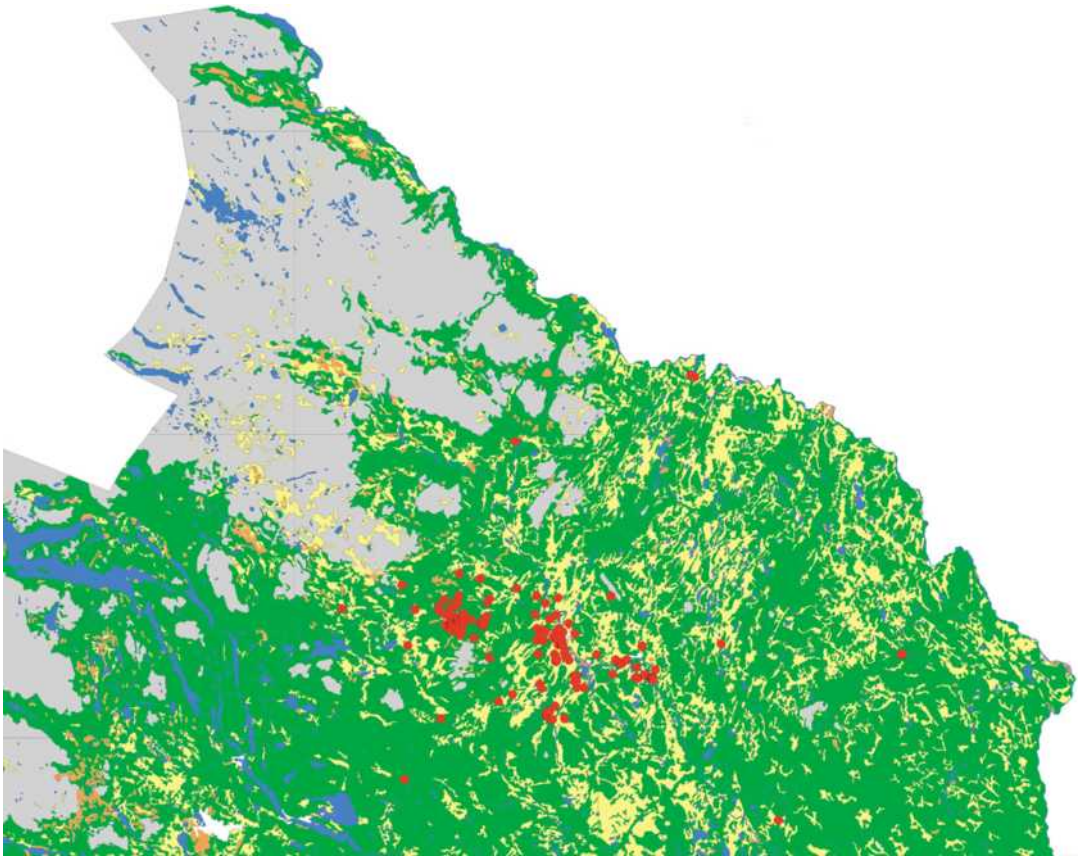

Figure 3. All satellite positions obtained from the breeding areas in northernmost Sweden from four Taiga Bean Geese *Anser fabalis fabalis* marked in the Ume River delta and in Alvik 2008 and 2009.
C Lantmäteriet Gävle 2010. Medgivande I 2010/1578.
Samtliga satellitpostioner för fyra taigasädgäss Anser fabalis fabalis *från Umedeltat och Alviksområdet, Luleå, märkta 2008 och 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

Figure 4. Satellite positions of two Tundra Bean Geese *Anser fabalis rossicus* marked in the Alvik area in 2009.
Satellitpositioner för två tundrasädgäss Anser fabalis rossicus *från Alviksområdet, Luleå, märkta 2009.*

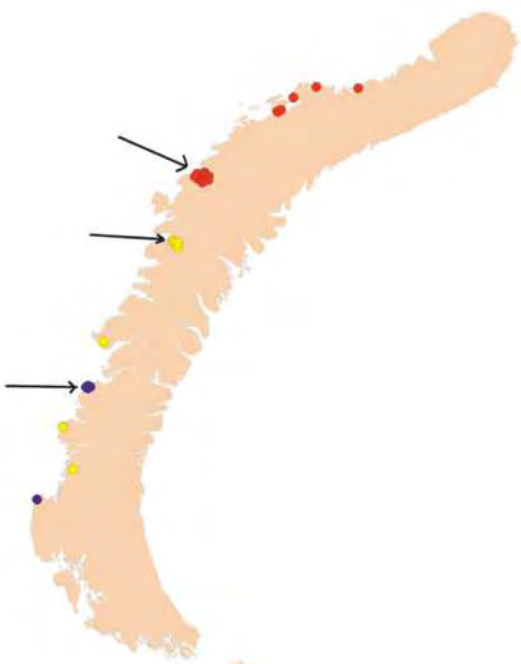

Figure 5. Satellite positions of three Taiga Bean Geese *Anser fabalis fabalis* on Novaya Zemlya the summers 2008 and 2009.
Satellitpositioner för två taigasädgäss Anser fabalis fabalis *på Novaya Zemlya somrarna 2008 och 2009.*

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

Alpheraky, S. 1905. *The Geese of Europe and Asia*. London, Rowland Ward, Ltd.: 1–198.

de Jong, A. 2010. Sädgåsfångst på Varanger. *Vår Fågelvärld* 69(5): 38–39.

Gärdenfors, U. (ed.) 2005. *Rödlistade arter i Sverige 2005 - The 2005 Red List of Swedish Species*. Artdatabanken, SLU, Uppsala.

Heinicke, T. 2010. Tundra Bean Geese *Anser fabalis rossicus* during spring migration in northern Sweden – rare visitor or regular passage migrant? *Ornis Svecica* 20: 174–183.

Nilsson, L. & Persson, H. 1984. Non-breeding distribution, numbers and ecology of Bean Goose, *Anser fabalis*, in Sweden. *Swedish Wildlife Research* 13(1): 107–171.

Nilsson, L. & Pirkola, M. 1991. Migration pattern of Finnish Bean Geese *Anser fabalis* in southern Sweden. *Ornis Svecica* 1: 69–80.

Nilsson, L. 1984. Migrations of Fennoscandian Bean Geese, *Anser fabalis*. *Swedish Wildlife Research* 13(1): 83–106.

Nilsson, L. 2007. Sädgås *Anser fabalis*. Pp. 140–144 in *Artfakta.Rödlistade ryggradsdjur i Sverige* (Tjernberg,M. & Svensson, M., red). Aartdatabanken, SLU, Uppsala.

Nilsson, L. 2008. Recent changes in numbers and distribution of Taiga Bean Goose *Anser fabalis fabalis* in southern Sweden during 1977– 2005. *Vogelwelt* 129: 263–267.

Nilsson, L., de Jong, A. & Heinicke, T. 2009. De svenska sädgässens flyttningsvanor. *Vår Fågelvärld* 68(6): 22–24.

Nilsson, L., de Jong, A. & Sjöberg, K. 2008. De svenska sädgässen. Ny forskning avslöjar okända vanor. *Vår Fågelvärld* 67(6): 6–10.

Nilsson, L., van den Bergh, L. & Madsen, J. 1999. Taiga Bean Goose *Anser fabalis fabalis*. – Pp. 20–36 in *Goose populations of the Western Palearctic. A review of status and distribution* (Madsen, J., Cracknell, G.S. & Fox, A.D., eds.). Wetlands International Publ. No. 48. Wetlands International, Wageningen, The Netherlands. National Environmental Research Institute, Rönde, Denmark.

Strøm, H., Øien, I. J., Opheim, J., Khakhin, G. V., Cheltsov, S. N. & Kuklin, V. 1997. *Seabird Censuses on Novaya Zemlya 1996*. Norwegian Ornithological Society, NOF report 1-1997.

Van den Bergh,L., Saralova,A., Dick, G., Dyrcz, A., Engel, J., Farago, S., Hudec, K., Kuijken, E., Mikuska, J., Mooij, J.H., Persson, H., Riols, C. & Syroechkovsky,E.V. 1999. Tundra Bean Goose Anser fabalis rossicus. Pp. 38–66 in *Goose populations of the Western Palearctic. A review of status and distribution* (Madsen, J., Cracknell, G.S. & Fox, A.D., eds.). Wetlands International Publ. No. 48. Wetlands International, Wageningen, The Netherlands. National Environmental Research Institute, Rönde, Denmark.

Sammanfattning.

I samband med diskussionerna kring Botniabanans dragning i anslutning till Umedeltat, en av de viktigaste vårrastplatserna för sädgås i norra Sverige, uppkom ett behov av ökad kunskap rörande sädgässen häcknings- och ruggningsplatser. Då chansen är liten att sädgäss med halsringar blir sedda i dessa glest befolkade trakter försågs 10 sädgäss (8 taigasädgäss och 2 tundrasädgäss) med satellitsändare under 2007–2009. Nio av dessa sändare producerade användbara data (Tabell 1). Resultaten av satellitspårningarna illustreras i kartor i Figur 1–5. Tyvärr hade samtliga sändare slutat fungera innan gässen började sin höstflyttning.

Fyra av sju taigasädgäss flyttade till myrområdena runt Övre Soppero i nordligaste Norrbotten. En av dessa taigasädgäss flyttade senare till Novaja Zemlja i Ishavet norr om Sibirien för att rugga. De övriga tre taigasädgässen fördelade sig på södra Finnmark i Norge, finska Lappland och ryska Karelen. De sistnämnda ruggade båda på Novaja Zemlja. De båda tundrasädgässen flyttade till norska Finnmark och angränsande delar av Finska Lappland. Tundrasädgässens flyttningsstrategi tycks skilja sig från taigasädgässens, då de flög nästan non-stop till sina häckningsområden medan taigasädgässen rastade på ett eller flera ställen under flyttningen genom nordligaste Sverige.