

Migration pattern of Finnish Bean Geese *Anser fabalis*

LEIF NILSSON & MATTI K. PIRKOLA

Abstract

From 1978 through 1988, 539 Bean Geese were marked with neck collars in the Oulu and Lapland districts of northern Finland. Forty-eight percent of these birds were later seen outside Finland, mainly in South Sweden, forming the basis of this analysis of the migration patterns of Bean Geese from Finnish breeding areas. The Finnish Bean Geese arrived in Sweden mainly during October and early November, the majority of them staying in South Sweden in normal winters, migrating to the SW in cold periods. Geese from both Lapland and the Oulu districts were found in all staging areas in South Sweden but in different proportions. In spring, the Geese were found in the same staging areas as in autumn. They were rarely found on the western shores of the Gulf of Bothnia, indicating that the main crossing to and from Finland is over the Åland

Sea. The results support the assumption that there are three populations using South Sweden for staging in the non-breeding season: (A) A western population wintering in Jutland and Britain, probably breeding in Swedish Lapland, (B) A population from Russian breeding areas that leaves Sweden early in the autumn, probably to eastern Germany or Poland, and finally (C) Finnish and possibly West Russian populations that winter in Skåne and leave Sweden for Denmark and the Netherlands only in severe winters.

L. Nilsson, Department of Ecology, Ecology Building, S-223 62 Lund, Sweden.

M. K. Pirkola, Game Research Department, Åbohusvägen 8, SF-00930 Helsinki, Finland.

Introduction

Bean Geese wintering in western and northwestern Europe are generally divided into two different groups: the Taiga Bean Goose *Anser f. fabalis* inhabiting the forest areas of northern Fennoscandia and NW Soviet Union, and the Tundra Bean Goose *Anser f. rossicus* breeding in the tree-less tundras of the western parts of the Soviet Union (Litzbarski 1974, Ogilvie 1978, Van Impe 1980, Van den Bergh 1985, Filchagov et al 1985, Huyskens 1986, Rutschke 1987). The geese, breeding in Fennoscandia and staging in Sweden, belong to the *fabalis* type, whereas *rossicus* occurs in South Sweden only in small numbers (Persson 1990). Counts during autumn show that the majority of the *fabalis* population is found on staging areas in southern Sweden, peak counts amounting to 75 000 individuals (Nilsson 1988a, 1991).

The general pattern of the Bean Goose migration in the Baltic area has been discussed earlier on the basis of the Nordic neck-banding programme (Lampio 1984, Nilsson 1984a, 1989, Pirkola & Kalinainen 1984, Tveit 1984, Nilsson & Pirkola 1986). When comparing our results with the results of neck-banding of Bean Geese

in the former GDR (Litzbarski 1979) we found that the Nordic and the East German marked Bean Geese, respectively, had entirely different migration patterns (Nilsson & Pirkola 1986, see also Huyskens 1986, Van Impe 1987). The Taiga Bean Geese migrates south through the Nordic countries, whereas the Tundra Bean Geese migrates east of the Baltic Sea through eastern Germany.

In a previous report (Nilsson & Pirkola 1986, see also Nilsson 1989) we split the Bean Geese passing Sweden into three groups:

A. Birds resting in western Sweden during autumn and leaving for Denmark in winter. During spring this group migrates north via inland staging areas at Östen and Kvismaren and then continues north along the Bothnian coast of Sweden. Spring numbers at Östen and Kvismaren were roughly equal to the numbers counted in spring staging areas along the west Bothnian coast, the time-table of the migration lending further support for this interpretation (Nilsson & Persson 1984).

B. Geese that stage in the Tåkern – Småland – Skåne region and leave the country early in the autumn with the first frost, and then most probably migrate

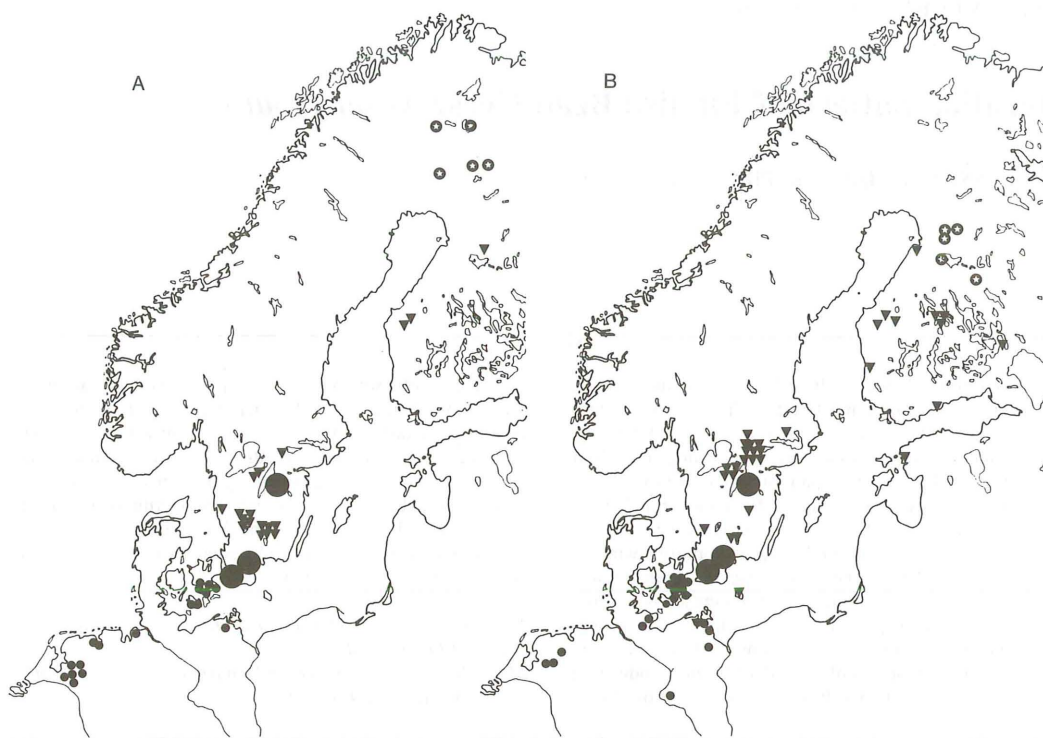


Fig. 1. Autumn (triangles) and winter (dots) observations of neck-banded Bean Geese from marking places in Lapland (A) and Oulu (B) districts of northern Finland (dots with stars). Observations in the three large staging areas in South Sweden (Tåkern, NE and SW Skåne) are marked with large dots (for details see Fig. 2).

Observationer höst- (trianglar) och vinter- (prickar) av halsmärkta sädgäss från märkplatser i Lapland (A) och Oulu (B) i norra Finland (svarta prickar med stjärna). Observationer på de tre stora rastplatserna i södra Sverige (Tåkern, NE och SV Skåne) markeras med stora fyllda cirklar (för detaljer se Fig. 2).

south to the northern parts of eastern Germany or Poland. This group probably migrates north on the eastern side of the Baltic.

C. Birds staging in the same general areas as B, but remaining in South Sweden as long as the weather conditions in winter are benign. In very cold winters they migrate southwest to Denmark, western Germany or the Netherlands. These geese apparently return north through Sweden in spring.

Since the studies started in 1977 a marked change in the distribution of staging Bean Geese within Sweden occurred (Nilsson 1988a, 1991). October numbers in SW Scania have been decreasing, whereas November numbers have remained on the same level. During the same period the number of Bean Geese staging further north in South Sweden (especially at Lake Tåkern) has increased, at the same time as new staging areas have been established.

Against this background it is of great interest to compare the detailed migration patterns of Bean Geese from different parts of the breeding area to see whether the patterns observed in the staging and wintering areas can be related to the occurrence of geese of different origin. The Finnish marking programme offers such an opportunity as the catching of Bean Geese has been undertaken in two widely separated breeding areas: Finnish Lapland and the Oulu district. In this paper we analyse the observations of these neck-banded geese with the aim to elucidate the detailed use of the staging and wintering areas. Detailed studies of site tenacity and turnover rates for Bean Geese using SW Skåne, southern Sweden, as a staging and wintering area has been reported in a companion paper (Nilsson & Persson 1991).

Table 1. Monthly distribution of observations of neck-banded Bean Geese from Finnish Lapland (198 marked) made outside Finland 1979/80–1988/89. Staging areas in Sweden are kept separate or grouped according to province. One observation for each individual and month and area included. Number of individuals that have been seen at least once in the different areas are shown as total and per cent of the total marked. Total number of individuals seen outside Finland is 97 (49 % of those marked).

Månadsfördelning av observationer av sädgäss märkta i finska Lappland 1979/80–1988/89 (198 märkta) från områden utanför Finland. Rastplatser i Sverige redovisas antingen separat eller landskapsvis. En observation per individ, månad och lokal redovisas. Dessutom anges antal individer som vid åtminstone ett tillfälle setts i de olika områdena både som summa och i procent av antalet märkta. Totala antalet individer sedda utanför Finland är 97 (49 % av de märkta).

Area/Locality Område	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Total Summa	% seen % sedda
<i>Sweden Sverige</i>											
Norrbotten	0	0	0	0	0	0	0	1	2	2	1
Västmanland	0	0	0	0	0	0	0	1	0	1	+
Kvismaren	0	0	1	0	0	0	2	1	0	4	2
Hjälstaviken/Alstasjön	0	0	0	0	0	0	0	5	0	5	3
Östen	0	0	2	0	0	0	5	2	0	5	3
Tåkern	1	30	7	0	0	0	2	6	1	45	23
Halland	0	0	1	0	0	0	0	0	0	1	+
Småland	0	6	9	1	0	1	3	6	0	13	7
NE Skåne	0	1	17	7	6	2	12	5	0	32	16
SW Skåne	0	13	52	47	25	37	8	1	0	66	33
<i>Other countries Andra länder</i>											
Denmark	0	0	0	0	3	4	4	0	0	7	4
East Germany	0	0	0	0	1	0	0	0	0	1	+
West Germany	0	0	0	1	0	0	0	0	0	1	+
The Netherlands	0	0	0	0	5	0	1	0	0	8	4

Material and methods

Traditional ringing had yielded few recoveries of Bean Geese from the Nordic countries. There were some recoveries available from ringing of moulting geese in northern Norway (Tveit 1984) and from ringing of wintering geese in the Netherlands (Perdeck & Clason 1980) but in common with traditional ringing most recoveries were from the hunting seasons.

A Nordic Bean Goose Programme was therefore initiated in 1975 aiming at marking Bean Geese in breeding areas in Finland, moulting areas in Norway and staging areas in South Sweden with individually coded neck collars that could be identified from a distance in the field. The method had already been used on Bean Geese in the former DDR for some years (Litzbarski 1979). The Nordic Programme was terminated in 1980. The results were reported by Nilsson (1984a); see also Lampio (1984), Pirkola & Kalinainen (1984) and Tveit (1984).

Neck-banding of Bean Geese in Finland started in 1978 (Pirkola & Kalinainen 1984, Nilsson & Pirkola 1986) and continued after the termination of the Nordic programme at various breeding localities in Finnish Lapland and Oulu county (Fig. 1). In this paper we include birds marked through the summer of 1988 and observed before 30 June 1989. In all, 341 individuals

were marked in the province of Oulu, and 198 were marked in the Lapland localities. All Bean Geese were marked with orange neck collars with three digit codes. From 1987 onwards the design of the collars was changed, which improved readability significantly.

Regular searches for neck-banded Bean Geese were organized on all important staging and wintering areas in South Sweden from the arrival of Bean Geese in the autumn until they left in the spring. A large number of Bean Geese were also checked in connection with other studies, especially in Skåne. Moreover, a network of observers was established in important staging and wintering areas in other countries. Detailed maps of the staging areas in Sweden are found in Nilsson & Persson (1984).

Results

Forty-eight percent of the 341 Bean Geese marked in the Oulu district produced 1265 readings (on average 8 per goose reported), whereas 49 % of the 198 Bean Geese from Lapland yielded 530 readings (5 per goose reported). In all, 54 % of the Bean Geese not reported shot in Finland in the season of banding produced observations outside Finland. Moreover, 706 observations were reported without the code numbers.

Table 2. Monthly distribution of observations of neck-banded Bean Geese from the district of Oulu, Finland (341 marked) made outside Finland 1979/80–1988/89. Staging areas in Sweden are kept separate or grouped according to province. One observation for each individual and month and area included. Number of individuals that have been seen at least once in different areas are shown as total and per cent of the total marked. Total number of individuals seen outside Finland is 166 (48 % of those marked).

Månadsfördelning av observationer av sädgäss (341) märkta i Oulu län i Finland 1979/80 – 1988/89 från områden utanför Finland. Rastplatser i Sverige redovisas antingen separat eller landskapsvis. En observation per individ, månad och lokal redovisas. Dessutom anges antalet individer som vid åtminstone ett tillfälle setts i de olika områdena både som summa och procent av antalet märkta. Totala antalet individer sedda utanför Finland är 166 (48 % av de märkta).

Area/Locality Område	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Total Summa	% Seen % Sedda
<i>Sweden Sverige</i>											
Tämnaren	0	0	0	0	0	0	0	8	0	8	2
Kvismaren	0	1	8	0	0	0	5	0	0	12	4
Hjälstaviken/Alstasjön	1	0	0	0	0	0	0	4	0	5	1
Östen	0	2	2	0	0	0	7	5	1	12	4
Tåkern	4	113	30	1	1	0	1	18	0	90	26
Halland	1	0	1	0	0	0	0	0	0	1	+
Småland	0	1	1	0	0	4	1	1	1	8	2
NE Skåne	0	9	34	33	44	13	16	6	0	71	21
SW Skåne	0	42	103	79	53	61	19	5	0	121	35
<i>Other countries Andra länder</i>											
Estonia	1	0	0	0	0	0	0	0	0	1	+
Denmark	0	0	1	1	3	4	6	0	0	8	2
East Germany	0	1	0	1	0	3	0	0	0	5	1
West Germany	0	0	0	0	1	1	0	0	0	2	+
The Netherlands	0	0	0	0	1	2	1	0	0	4	1

Autumn migration

Few autumn observations of neck-banded geese have been obtained from Finland outside the marking areas, but a number of birds have been shot during the hunting season (Fig. 1). Most Bean Geese seem to migrate through the western part of Finland, reaching Sweden via the Sea of Åland. There is however one observation from eastern Finland and one from the south coast that together with one record from Estonia indicate a more

easterly migratory route into the Baltic republics. Also, one bird marked in SW Skåne was recovered in Latvia during autumn migration in a later year. From the Baltic states the geese may either follow the eastern Baltic coast or cross the sea to Sweden.

The first Finnish Bean Geese arrive in Sweden in September and especially in early October. Very few observations of neck-banded geese have been obtained from Sweden before October (Tables 1 and 2). During October and November large numbers have been reported from resting places in South Sweden (Figs. 1 and 2), especially from the three main staging areas Tåkern, NE and SW Skåne. The number of neck-bands read at Tåkern is lower than the number read in SW Skåne, even though the peak autumn population at Tåkern is much higher (Nilsson 1988a). The difference is probably due to the more intensive observations carried out in SW Skåne but also to the more difficult conditions for observation at Tåkern, where the geese generally feed in larger fields further away from roads than in SW Skåne.

The earliest neck-banded Bean Geese were reported from Tåkern in the last third of September but the median arrival was in the second third of October for geese from Oulu and in the last third of October for geese from Finnish Lapland (Table 3). Among the

Table 3. First observations at Tåkern of Bean Geese marked in Finnish Lapland and Oulu districts. $\chi^2 = 5.2$, n. s.

Första observationer vid Tåkern av sädgäss märkta i finska Lappland och Oulu län. $\chi^2 = 5.2$, ej signifikant.

Month, 10 days period Månad, 10-dagarsperiod		Lapland	Oulu
September	I	1	4
October	I	3	20
	II	22	41
	III	25	45
November	I	4	10
	II	1	4
	III	0	1

Table 4. First observations at staging areas in SW and NE Skåne of Bean Geese marked in Finnish Lapland and Oulu districts. *Första observationer på rastplatser i SW och NE Skåne av sädgäss märkta i finska Lapland och Oulu län.*

Month and 10 days period <i>Månad och 10-dagarsperiod</i>		NE Skåne		SW Skåne			
		Lapland	Oulu	Seen in other areas before SW Skåne <i>Sedd på andra lokaler före SW Skåne</i>		SW Scania first staging area <i>SW Skåne första rastplats</i>	
				Lapland	Oulu	Lapland	Oulu
October	I	0	4	0	0	0	3
	II	0	0	0	0	5	7
	III	1	4	3	1	5	3
November	I	6	12	1	3	9	14
	II	3	7	7	21	15	40
	III	3	9	7	13	7	11
December	I	1	6	1	4	4	13
	II	1	3	2	11	9	9
	III	1	7	0	3	1	2

earliest arrivals at Tåkern, geese from Oulu dominated markedly. Twenty-four out of 125 geese from the Oulu district seen at Tåkern arrived during the period 21 September – 10 October compared to 4 out of 56 from Lapland, the difference being significant ($\text{Chi}^2 = 4.29$, $P < 0.05$, $\text{df} = 1$).

The Bean Geese mainly left Tåkern during November. After that month few geese remained in Sweden north of Skåne although a flock was seen at Tåkern in early January in the mild winter of 1989. Outside Sweden one observation from eastern Germany and three from Denmark (two without reading the codes) were the only ones reported before December with the exception of the recovery from Estonia in September.

The first observations in Skåne (both NE and SW) were made during the first ten-day period of October for geese from Oulu and in the second ten-day period of October for geese from Lapland (Table 4). The median arrival time for marked geese from both areas was the second third of November. For SW Skåne the observations were split according to whether there were earlier observations on other Swedish staging areas or not. 25 out of 56 (45 %) Oulu geese that had been seen at other localities in the same season before their arrival in SW Skåne were seen before the last third of November compared to 67 out of 102 (66 %) that had not been seen; the difference was significant ($\text{Chi}^2 = 6.58$, $P < 0.02$, $\text{df} = 1$). No such differences were found for geese from Finnish Lapland ($\text{Chi}^2 = 0.56$, n. s., $\text{df} = 1$).

The number of staging Bean Geese in October in SW Skåne has decreased significantly since 1977 whereas no such trend has been noted in November counts (Nilsson 1988a). The arrival data were therefore split into the two periods 1979–84 and 1985–88. First

arrivals of Oulu geese were significantly later in the second than in the first period, whereas no such difference was found for Lapland geese (Table 5).

Comparing the monthly patterns of occurrence in the three main staging areas, no significant differences were found between geese from Oulu and Lapland in Tåkern and SW Skåne, whereas the patterns were significantly different in NE Skåne (Tables 1 and 2; $\text{Chi}^2 = 17.3$, $p < 0.01$, $\text{df} = 8$). In NE Skåne, the highest number of geese from Oulu was found in January but from Lapland in November.

Use of autumn staging areas

Bean Geese from the two marking districts in Finland were seen at all staging areas in South Sweden during

Table 5. First observations in SW Skåne of Bean Geese from the two districts in northern Finland during the first and last years of the study.

Första observationer i SW Skåne av sädgäss från märkplatserna i Lapland och Oulu län i norra Finland under de första och sista undersökningsåren.

Month <i>Månad</i>	Lapland		Oulu	
	79 – 84	85 – 88	80 – 84	85 – 88
October	10	3	11	5
November	31	15	13	87
December	16	6	9	33
Chi ² for difference between periods	0.52 n. s.		25.95 P < 0.001	
<i>Chi² för skillnad mellan perioderna</i>				

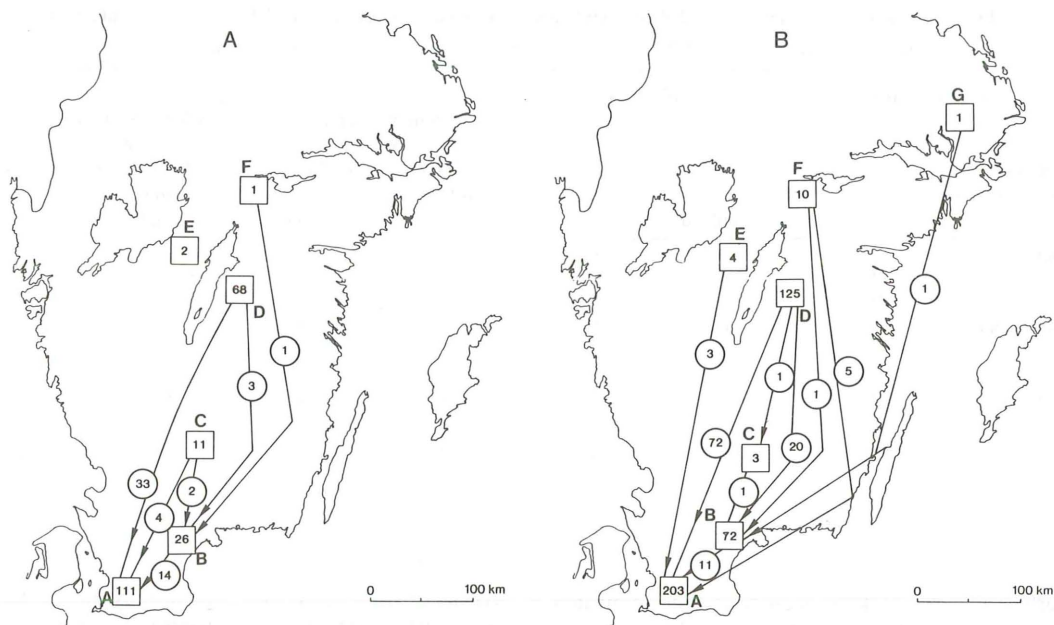


Fig. 2. Number of marked Finnish Bean Geese seen on staging areas in South Sweden during the autumn (numbers in squares) together with the numbers seen on more than one locality during the same season (numbers in circles on arrows between areas). One observation per area and season included for each individual. Map A = marked in Lapland, Map B = marked in Oulu district. The most important staging areas (squares) are A SW Skåne, B NE Skåne, C Småland, D Tåkern, E Östen, F Kvismaren and G Hjälstaviken.

Antal märkta finska sädgäss sedda på rastplatser i södra Sverige under hösten (antal i fyrkanter) tillsammans med antalet sädgäss sedda på mer än en lokal samma säsong (antal i cirklar på pilar mellan lokalerna). En observation per område, säsong och individ. Karta A = märkt i Lapland, karta B = märkt i Oulu län. Kvadraterna utmärker de viktigaste lokalerna, A SW Skåne, B NE Skåne, C Småland, D Tåkern, E Östen, F Kvismaren och G Hjälstaviken.

— autumn migration (Tables 1 and 2). But the geese from Oulu and Lapland showed a significantly different distribution among the eight main staging areas (Fig. 2; $\chi^2 = 18.1$, $P < 0.003$, $df = 7$). More observations of geese from Lapland than from Oulu were made in Småland, whereas the opposite tendency was noted in NE Skåne. On the other hand, in SW Skåne and at Lake Tåkern the number of observations were in proportion to numbers marked.

Comparing the two main areas of Skåne (Table 6), a significantly higher proportion of geese from the Oulu district than from Lapland was found in NE Skåne during January – February, whereas no such differences were found for the autumn and spring periods.

The majority of the Bean Geese probably utilized more than one staging area in Sweden during autumn/winter (Fig. 2) and probably stayed for a period at Tåkern, where recent peak counts of up to 45 000 out of a Swedish total of 60 000 – 75 000 have been made in October (Nilsson 1988a, 1991). Of the geese read at

Tåkern, 54 % were later seen in SW Skåne. Of the geese seen both at Tåkern and in SW Skåne, similar proportions in both staging areas came from Lapland and Oulu. On the other hand, 16 % of the Oulu geese but only 4 % of the Lapland geese seen at Tåkern were later in the season found in NE Skåne ($\chi^2 = 4.59$, $P < 0.05$, $df = 1$). Some of these birds were, however, seen in NE Skåne during spring migration. Considering the vastly different chances of a goose being seen and read in Skåne and Tåkern (intensive field work in SW Skåne versus observations mainly during weekends at Tåkern and more difficult conditions for observations in the latter area) it seems probable that a very high proportion of the marked geese staging in Skåne had actually also been staging at Tåkern.

No marked Bean Geese seen at Östen, Kvismaren and Hjälstaviken, i. e. the three more northerly autumn staging areas, were later seen at Tåkern, but some of them were later seen in Skåne in the same season. No marked birds were reported from both Kvismaren and

Table 6. Number of neck-banded Bean Geese from Lapland and Oulu seen in different parts of Skåne during different parts of the year. One observation per individual, period and area included.

Antal halsmärkta sädgäss från Lappland och Oulu län sedda i olika delar av Skåne under olika delar av säsongen. En observation per individ, period och område ingår.

Part of Skåne <i>Del av Skåne</i>	Sep – Dec <i>Lapland Oulu</i>	Jan – Feb <i>Lapland Oulu</i>	Mar – May <i>Lapland Oulu</i>
NE Skåne	16 48	3 39	14 20
NE+SW Skåne	2 9	2 2	0 0
SW Skåne	77 157	30 53	9 25
Chi ² for difference <i>Chi² för skillnaden</i>	2.32 n.s.	9.56 P < 0.02	1.64 n.s.

Östen in the same season. Finally, no marked geese reported from the staging areas in the province of Småland had been seen on staging areas further north in the same season, but some of them were later seen in Skåne. There are field observations of Bean Geese migrating south through the province of Östergötland without staging at Tåkern (T. Tyrberg in litt.).

Wintering areas

Skåne formed an important winter area for Bean Geese from Finland with total January populations amounting to about 25 000 – 30 000 individuals in normal winters (Nilsson 1988a). In cold winters most of these birds left Skåne probably for areas to the southwest.

Observations of neck-banded geese in the months December – February were generally made in Skåne and in areas further to the SW (Denmark, West Germany and the Netherlands) (Tables 1 and 2). Observations in the staging areas in Småland were made during the mild winters of 1988 and 1989, when spring migration was well under way already in February.

Most observations of neck-banded Bean Geese (76 %) southwest of Sweden occurred during cold winters (mean January temperature at Malmö < -2°) as is shown in Table 7, which also includes observations of geese caught with cannon nets in SW Skåne in 1977–1980 and neck-banded geese that could not be read (if it could be excluded that they had also been reported as read). The geese from SW Skåne can be included in the analysis as they most certainly belong to the Finnish breeding population (Nilsson 1984a, 1989, Nilsson & Pirkola 1986).

During the first cold winter, 1978/79, no less than 23 individuals out of a possible maximum of 114 were noted in countries to the southwest. The relatively cold winters of 1982 and 1985 produced only few observa-

Table 7. Number of neck-banded Bean Geese seen in different countries southwest of Sweden in winter. Bean Geese marked in SW Skåne and Bean Geese whose neck collars were not read (if there was no risk of double counting) are also included. Each individual included once per winter (no individuals being reported from two countries during the same winter). The table also shows the estimated number of marked individuals available for observation in the population with an estimated annual mortality of 40 % (Nilsson unpubl). Moreover January mean temperatures for Malmö, south Sweden are shown.

Antal halsmärkta sädgäss observerade i olika länder sydväst om Sverige under vintern. Sädgäss märkta i Skåne samt sädgäss där numret ej kunnat läsas (om risk för dubbelräkning ej föreligger) innefattas också. Varje individ medräknad en gång per vinter (observationer av samma individ från två länder en och samma vinter saknas). Tabellen visar också uppskattat antal märkta i beståndet med en årlig dödlighet på 40 % (Nilsson opubl). Dessutom visas medeltemperaturerna för Malmö i januari.

Winter <i>Vinter</i>	Estimated number of marked in population <i>Uppskattat antal märkta i populationen</i>	Denmark <i>Danmark</i>	West Germany <i>Västtyskland</i>	The Netherlands <i>Nederländerna</i>	France <i>Frankrike</i>	Mean temperature <i>Medeltemperatur</i>
1978/79	114	4	8	10	1	-3.8
1979/80	106	6	1	4	0	-2.6
1980/81	136	5	0	4	0	-0.7
1981/82	112	4	1	2	0	-3.4
1982/83	135	4	0	0	0	4.8
1983/84	110	1	0	1	0	1.3
1984/85	112	6	0	3	0	-5.2
1985/86	125	2	0	4	0	-1.0
1986/87	121	17	1	7	0	-5.9
1987/88	150	0	0	0	0	3.5
1988/89	159	0	0	0	0	4.6

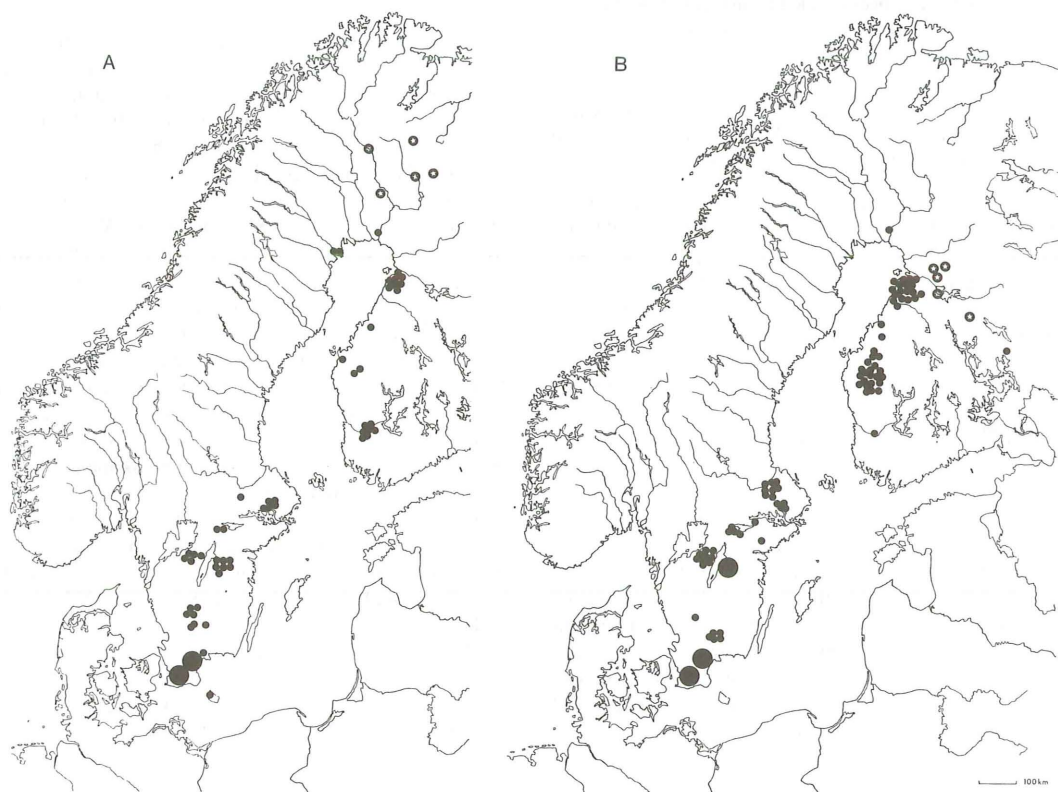


Fig. 3. Spring observations (March – May) of neck-banded Bean Geese from Lapland (A) and Oulu district (B) in northern Finland. Observations in the three main staging areas in South Sweden are marked with large dots (for details see Fig. 4.). Observations from the Finnish breeding areas have not been included.

Vårobservationer (mars – maj) av halsmärkta sädgäss från Lappland (A) och Oulu län (B) i norra Finland. Observationer på de tre stora rastplatserna i södra Sverige markeras med stora fyllda cirklar (för detaljer se Fig. 4.). Observationer från de finska häckningsområdena har ej medtagits.

tions southwest of Sweden, whereas 25 were noted during the very cold winter of 1987. The distribution pattern of the observations was markedly different in the 1978/79 and 1986/87 winters. In the first of these winters only few remained in Denmark, whereas the majority was found there during the second winter. For the difference between Bean Geese seen in Denmark and those seen in the Netherlands and West Germany during these two winters, see Table 7 ($\chi^2=11.8$, $P<0.001$, $df=1$).

The number of observations was too small to study possible differences in the distributions of geese from Oulu and Lapland in the areas south of Skåne. In Skåne, during normal winters, there was however a marked difference in their distribution. Eighty-five % of the Lapland geese seen in Skåne during January–February

were noted only in the SW, whereas this proportion for the birds from Oulu was only 57 %, the difference being highly significant (Table 6). NE Skåne is thus appreciably more important for geese from Oulu than for geese from Lapland. Of the 41 geese marked in Oulu and wintering in NE Skåne no less than 12 had been seen in SW Skåne in December of the same season, moving northwards already in January as a response to mild winter weather.

Nearly all marked Finnish Bean Geese observed in Denmark were seen in the southeastern part of the country (Fig. 1). Several of these birds were also seen in SW Skåne before arriving in Denmark. A number of neck-banded Bean Geese have also been seen in Jutland but only three of them were with certainty marked in Finland.

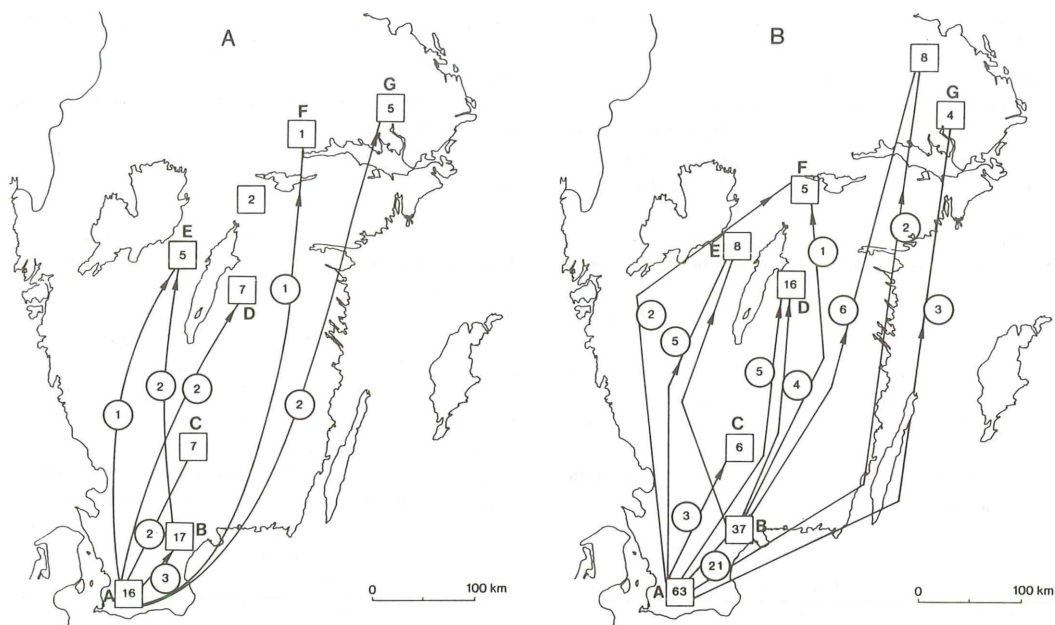


Fig. 4. Number of marked Finnish Bean Geese seen on staging areas in south Sweden during the spring (numbers in squares) together with the number of Bean Geese seen on more than one locality during the same season (numbers in circles on arrows between areas). One observation per area and season included for each individual. A = marked in Lapland, B = marked in Oulu district.

Antal märkta finska sädgäss sedda på rastplatser i södra Sverige under våren (antal i fyrkanter) tillsammans med antalet sädgäss sedda på mer än en lokal under samma säsong (antal i cirklar på pilar mellan områdena). En observation per område, säsong och individ har medtagits. A = märkt i Lappland, B = märkt i Oulu län.

Spring migration

Bean Goose spring migration starts early. In mild years some marked geese were seen in staging areas in Småland already in February, but the main spring migration started in March (Tables 1 and 2). Most geese had left the staging areas in South Sweden by late April. In mild winters a movement from SW Skåne to the northeast was noted already in December and January (12 Oulu birds mentioned above).

During spring migration the geese were encountered in the same staging areas in South Sweden as during autumn migration (Figs. 3 and 4). In the first years of the study, Hjälstaviken, Kvismaren and Östen were almost exclusively used in spring, but in later years they had become important in autumn as well.

In spring, a number of observations of both Lapland and Oulu geese were obtained from the western part of Finland indicating a gradual northward migration with important staging concentrations in the Liminka area in Oulu county and, at least for geese from the Oulu marking areas, also in the county of Vasa. On the other

hand, only two geese marked in Lapland and none marked in the Oulu district were read on the Swedish side of the Bothnian Bay even though a significant northward migration of Bean Geese is found there.

As in autumn, a number of Bean Geese were noted on more than one staging area during the same spring season indicating a gradual northward migration with birds staging in different areas for periods of varying length (Fig. 4). No significant differences were found in the pattern of use of different spring staging areas by geese from the two marking districts ($\chi^2=10.4$, $P=0.10$, $df=6$).

Discussion

The general pattern of migration for Finnish Bean Geese fits well with group C, i. e. staging in south Sweden and staying for the winter when the weather permits, otherwise leaving for the SW. Observations of neck-banded Bean Geese in south Sweden presented here show that the majority of them remained until

December or January if not staying the entire winter. Thus they are present in South Sweden at least another month after the main autumn exodus of Bean Geese that occurs before mid-December (Nilsson 1988a).

Observations from eastern Germany of Bean Geese neck-banded in Finland are few. As extensive marking programmes have been running in eastern Germany for long periods it could be expected that many more observations should have been reported if larger numbers of Finnish Bean Geese migrated there. The Bean Geese leaving the Swedish staging areas early (group B) thus apparently came from more easterly breeding areas and did not include any marked birds.

The westerly migrating group (A) is most probably not recruited from the Finnish breeding areas considered here. Some Bean Geese from Finnish Lapland certainly take this route as indicated by two observations during spring migration on the Swedish side of the Gulf of Bothnia. Many more marked Bean Geese have been seen here on spring migration but in those cases where the codes could be read they had been marked in staging areas in SW Skåne (Nilsson 1984a, 1989, Nilsson & Pirkola 1986). A few of the Bean Geese marked in SW Skåne have also been seen in breeding areas in Swedish Lapland in addition to a larger number being seen in north Finnish breeding areas. Moreover a few Finnish birds were seen without having their codes read. The A group is thus probably recruited from Swedish breeding areas and the western part of Finnish Lapland.

There has also been new evidence that Bean Geese from western breeding areas in Sweden migrate west. A new moulting place was recently found in the southern part of Swedish Lapland (Eriksson & Henricsson 1990). Neck-banding of some individuals from this area showed a migration to wintering grounds in England via staging areas in Jutland in Denmark, whereas some individuals migrated to SW Skåne (Å. Andersson unpubl., Parslow-Otsu 1991).

During the early part of the study (Nilsson & Persson 1984), Kvismaren and Östen were mostly used only as spring staging areas, the numbers of geese being similar to the numbers migrating north along the coasts of the Gulf of Bothnia (group A). In later years, as a part of the changes in the autumn distribution of Bean Geese in South Sweden (Nilsson 1988a), Kvismaren and Östen have also been established as autumn staging areas of increasing importance. Finnish Bean Geese use both these areas in autumn but in spite of this there has been very few observations on the Swedish west coast or in Jutland. Observations of marked individuals instead indicate that they mostly fly to Skåne after leaving Kvismaren and Östen.

Also the spring totals at Östen and Kvismaren have increased in recent years, and observations of marked Finnish Bean Geese show that in spring these areas are

used also by geese of group C and not, as in the earlier part of the study, mainly by geese of the western segment (group A).

It is possible that a large proportion of the geese with changed habits comes from the Oulu district as a significant delay of the arrival in SW Skåne in recent years was found only for this group (Table 5). It may however be noted that geese from both marking districts in Finland occur in the new autumn staging areas. Thus, Bean Geese from Finland arrive in Sweden mainly in the province of Uppland passing the Sea of Åland. They then distribute themselves over the staging areas in the northern part of South Sweden with the majority at lake Tåkern but with increasing numbers using the other newly established staging areas. A small number of these geese apparently migrate directly to staging areas in the province of Småland. Whether some of them go directly to Skåne through Sweden is unknown. Observations of Finnish marked Bean Geese in NE Skåne, seen shortly before on Bornholm or in SW Skåne early in the same autumn, may rather indicate arrivals directly over the Baltic.

Later in autumn most Finnish Bean Geese leave the staging areas north of Skåne, and in December they concentrate in Skåne, where they stay for the winter if it is not too cold. Movements of Bean Geese of the *fabalis* type into the Netherlands have been reported during cold winters (Van den Bergh 1985), when neck-banded geese from Finland and Sweden have been seen there. The majority of Bean Geese wintering in the Netherlands does however come from more easterly areas (Smit & Burgers 1987). A high proportion of the geese staging north of Skåne has regularly been seen in Skåne later in the season but there is little evidence of individuals using different staging areas north of Skåne in the same season (one marked individual after the period considered in this paper). There is on the other hand a considerable exchange of individuals between the staging areas in SW and NE Skåne.

The Finnish Bean Geese use the same staging areas in spring as in autumn, the spring staging areas on the Swedish Bothnian coast apparently being only rarely used (probably only birds from Finnish Lapland). In spring the geese leave the wintering areas in SW Skåne early and move to NE Skåne, where spring counts have generally yielded much higher figures than autumn counts (Nilsson 1979, 1981, 1984b, 1986, 1988b, 1991).

Acknowledgements

Financial support for the study during 1977–1980 was obtained from the Nordic Council for Wildlife Research. The field work in Sweden was directly supported by the National Swedish Environment Protection Board during the first years. In later years many observations were obtained during other

studies financed by the same agency which also supported the analysis for this paper through grants to L. Nilsson. We also wish to thank all those observers who year after year have checked the goose flocks in different areas for the occurrence of marked geese.

References

- Eriksson, P. & Henricsson, T. 1990. Bean Goose, *Anser fabalis*, in the south of Swedish Lapland. *Vår Fågelvärld* 49:7–14. In Swedish with English summary.
- Filchagov, A. V., Bianki, V. V. & Mikhailov, K. T. 1985. Bean Goose on the Kola Peninsula. *Ornitologiya* 20:26–32. In Russian with English summary.
- Huyskens, P. R. G. 1986. The Bean Goose Problem in Europe. *Oriolus* 52:105–256.
- Lampio, T. 1984. On the spring migration of the Bean Goose, *Anser fabalis*, in Finland. *Swedish Wildlife Research* 13:59–72.
- Litzbarski, H. 1974. Taxonomische und biometrische Untersuchungen an der Saatgans *Anser fabalis* (Latham 1787). *Beitr. Vogelkunde* 20:394–411.
- Litzbarski, H. 1979. Erste Ergebnisse der Beringung und farbigen Kennzeichnung von Saatgänsen, *Anser fabalis*, in der Deutschen Demokratischen Republik. *Beitr. Vogelkunde* 25:101–123.
- Madsen, J. 1987. Status and Management of Goose Populations in Europe, with Special Reference to Populations Resting and Breeding in Denmark. *Dan. Rev. Game Biol.* 12:4:1–76.
- Nilsson, L. 1979. Goose counts in Sweden September – April 1977–78 and 1978–79. *Anser* 18:263–278. In Swedish with English summary.
- Nilsson, L. 1981. Goose counts in Sweden in October – April 1979–80 and 1980–81. *Anser* 20:221–226. In Swedish with English summary.
- Nilsson, L. 1984a. Migrations of Fennoscandian Bean Goose, *Anser fabalis*. *Swedish Wildlife Research* 13:83–106.
- Nilsson, L. 1984b. Counts of geese in Sweden in October – April 1981–82 and 1982–83. *Anser* 23:101–108. In Swedish with English summary.
- Nilsson, L. 1986. Goose counts in Sweden in October – April 1983–84 and 1984–85. *Anser* 25:1–10. In Swedish with English summary.
- Nilsson, L. 1988a. Staging and wintering goose populations in South Sweden 1977–78 to 1986–87. *Wildfowl* 39:88–97.
- Nilsson, L. 1988b. Goose counts in Sweden in October – April 1985–86 and 1986–87. *Anser* 27:117–124. In Swedish with English summary.
- Nilsson, L. 1989. Über den Zug schwedischer Graugänse, *Anser anser*, und Saatgänse, *Anser fabalis* – ein vorläufiger Bericht. *Beitr. Vogelkunde* 35:126–132.
- Nilsson, L. 1991. Goose counts in Sweden in October, November and January 1987–88 to 1989–90. *Anser* 30:101–110. In Swedish with English summary.
- Nilsson, L. & Persson, H. 1984. Non-breeding distribution, numbers and ecology of Bean goose *Anser fabalis* in Sweden. *Swedish Wildlife Research* 13:107–170.
- Nilsson, L. & Persson, H. 1991. Site tenacity and turnover rate of staging and wintering Bean Geese *Anser fabalis* in southern Sweden. *Wildfowl*. 42: in press.
- Nilsson, L. & Pirkola, M. K. 1986. The migration pattern of Bean Geese *Anser fabalis* in the Baltic area. *Vår Fågelvärld*, Suppl. 11:147–153.
- Ogilvie, M. A. 1978. *Wild Geese*. Poyser, Berkhamsted.
- Parslow-Otsu, M. 1991. Bean Geese in the Yare Valley, Norfolk. *British Birds* 84:161–169.
- Perdeck, A. C. & Clason, D. 1980. Some results of waterfowl ringing in Europe. *IWRB Special Publication No 1*.
- Persson, H. 1990. Occurrence of the Tundra Bean Goose *Anser fabalis rossicus* in Sweden. *Anser* 29:237–244. In Swedish with English summary.
- Pirkola, M. K. & Kalinainen, P. 1984. The status, habitats and productivity of breeding populations of Bean Goose *Anser f. fabalis* in Finland. *Swedish Wildlife Research* 13:9–48.
- Rutschke, E. 1987. *Die Wildgänse Europas*. VEB Deutscher Landwirtschaftsverlag, Berlin.
- Smit, J. J. & Burgers, J. 1987. Vangst en herkomst van in Nederland overwinterende ganzen. *Het Vogeljaar* 88:179–185.
- Tveit, G. 1984. Autumn migration, wintering areas and survival of Bean Geese, *Anser fabalis*, marked on the moulting grounds in Finnmark, North Norway. *Swedish Wildlife Research* 13:73–82.
- Van den Bergh, L. M. J. 1985. Occurrence of the European Bean Goose *Anser fabalis fabalis* in the Netherlands. *Limosa* 58:17–22. In Dutch with English summary.
- Van Impe, J. 1980. Étude de deux populations de l'oie des moissons *Anser fabalis*. *Alauda* 48:1–20.
- Van Impe, J. 1987. La migration d'automne, les quartiers de hivernage et de reproduction de *Anser fabalis fabalis* et de *Anser fabalis rossicus* en relation avec la loi de Bergmann. *Le Gerfaut* 77:63–88.

Sammanfattning

Flyttningsmönster hos finska sädgäss *Anser fabalis*

1975 startade halsmärkning av sädgäss på rastplatser i Skåne, ruggningslokaler i Norge samt häckningsområden i Finland inom ramen för ett nordiskt projekt med syfte att i detalj kartlägga rörelsemönstret hos de nordiska sädgässen. Sedan detta avslutades (Nilsson 1984, 1989, Tveit 1984, Nilsson & Pirkola 1986) har märkningarna fortsatt i de finska häckningsområdena. I denna rapport summerar vi de observationer av halsmärkta sädgäss som erhållits fram till och med juni 1989.

Material och Metodik

Märkningarna i Finland startade 1978 och till och med sommaren 1988 hade 341 individer märkts i Oulu län och 198 i finska Lappland (Fig. 1 och 3). Samtliga sädgäss märktes med orange halsringar med treställig kod.

Regelbundna kontroller av rastande flockar i södra Sverige organiserades. Viktiga områden genomsöktes speciellt i samband med månatliga inventeringar. Tätare kontroller organiserades på flera lokaler. Dessutom hade ett internationellt kontaktnät organiserats. Totalt kontrollerades 48 % av de 341 sädgässen från Oulu län vid sammanlagt 1265 tillfällen, medan 49 % av de 198 sädgässen från Lappland kunde avläsas vid 530 tillfällen till och med juni 1989. Därutöver rapporterades 706 observationer utan avläst nummer.

Höstflyttning

Få observationer erhöles från Finland utanför märkområdena, men ett antal individer rapporterades skjutna. Fynden tyder på flyttning efter Finlands västkust och passage över Ålands hav till Sverige, men ett par observationer föreligger öster om Östersjön (Fig. 1). Flertalet sädgäss anländer till Sverige i oktober (Tabell 1 och 2). Från oktober och november föreligger ett betydande antal avläsningar från rastplatser i södra Sverige (Fig. 1 och 2). Förstaobservationerna av sädgäss under hösten inom de tre viktigaste rastområdena i Sverige framgår av Tabell 3–5. I Skåne anlände sädgäss från Oulu län signifikant senare under 1985–88 jämfört med 1980–84, medan sådana skillnader saknades för gäss från Lappland.

Sädgäss från båda märkområdena i Finland observerades på samtliga rastlokaler i södra Sverige, men i signifikant skilda proportioner. Sålunda sågs i Småland proportionellt fler sädgäss från Lappland än från Oulu, medan förhållandet var det omvända i NE Skåne (se även Tabell 6). Flera sädgäss observerades på mer än en rastlokal i södra Sverige (Fig. 2). Sålunda observerades 54 % av de sädgäss som setts vid Tåkern senare samma säsong i SV Skåne. Inga av de gäss som rastade vid Kvismaren och Östen noterades vid Tåkern samma höst, medan åtskilliga senare sågs i Skåne.

Vinterområden

Skåne är ett viktigt vinterområde för sädgäss från Finland, medan få sädgäss sågs längre norrut i landet efter december. Vinterbeståndet i Skåne uppgår till 25–30 000, vilka i huvudsak flyttar mot SV under kalla förhållanden (Tabell 7). Den kalla vintern 1978/79 noterades merparten av sädgässen i Holland, medan merparten endast flyttade till Danmark 1986/87.

Vårflyttning

Vårsträcket startar tidigt. Vissa år har gässen nått Småland i februari (Tabell 1 och 2). Milda vintrar konstaterades flera märkta sädgäss flytta från SV till NE Skåne redan i december och januari.

Under vårflyttningen besöker sädgässen samma lokaler som under höstflyttningen (Fig. 3 och 4). På den finska sidan noteras betydande ansamlingar i bl. a. Liminkaområdet i trakten av Oulu. Observationer av finska sädgäss på den svenska sidan av Bottenviken är sparsamma.

Diskussion

Tidigare urskildes tre grupper av sädgäss i Sverige på basis av observationer av halsmärkta gäss samt inventeringar (Nilsson 1984, 1988, 1989, Nilsson & Pirkola 1986): (A) En grupp som passerar västra Sverige och flyttar till Danmark. Under våren flyttar dessa norrut via Östen, Kvismaren och svenska Bottenvikskusten; (B) En grupp som rastar vid Tåkern och i Småland och Skåne, och som lämnar landet troligen mot östra Tyskland eller Polen i samband med kallare väder i november; (C) En grupp som rastar i samma områden som B under hösten, men som stannar i landet tills vintern tvingar bort dem, varvid de flyttar mot SV (hårda vintrar).

Grupp C härrör från de finska häckningsområdena och omfattar enligt räkningarna ca 25 000–30 000 individer, medan gruppen B förmodligen härrör från östligare områden. Detta förklarar det ringa antalet märkta gäss från Finland i forna DDR om hösten och vintern. De märkta sädgäss som setts i Skåne har dessutom funnits kvar i Skåne långt efter den stora utflyttningen under senhösten.

Resultaten från senare år förstärker den bild som erhöles tidigare. Under de senaste åren har dock Kvismaren och Östen i betydande omfattning även utnyttjats som höstlokaler samtidigt som lokalernas betydelse som vårlokaler ökat. Dessa gäss torde också härröra från Finland (grupp C).