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Migration patterns of Nordic Greylag Geese *Anser anser*

ÅKE ANDERSSON, ARNE FOLLESTAD & LEIF NILSSON & HAKON PERSSON

Abstract

Migration patterns of Nordic Greylag Geese *Anser anser* were studied by means of neck-collaring. A total of 4173 birds (738 breeders, 1999 goslings and 1436 moulters; most moulters subsequently identified as belonging to a specified breeding population) was marked throughout Norway, Sweden, Denmark and Finland during 1984–1994. This report is based on observations made up to 30 June 1995. In general, Norwegian Greylag Geese left their breeding areas rapidly for staging areas in Denmark and/or the Netherlands during the period late August – early September, but the most northerly breeding populations migrated south much later and not so rapidly. After a long refuelling period most Norwegian Greylags left the Netherlands for wintering areas in Spain during November. The Guadalquivir Marismas in the south-western part of the country was the main wintering area, but sites in the Duero Basin in the north-central part gained importance throughout the study period. Normally, the geese left Spain in February, for a long stop-over in the Netherlands. Breeders returned to Vega in Norway in April, but to Troms and Finnmark not until May. Most Greylags from Scania and Denmark, all belonging to the West Baltic population, remained in the breeding area until October, merging into larger and larger flocks, together with returning moulters and birds from more northern breeding grounds. The majority made only a short stop-over in the Netherlands en-route to their main winter quarter, the Guadalquivir Marismas, Spain. An increasing proportion wintered in the Dutch Delta. In general, West Baltic Greylags left their winter quarters during the first two weeks of February and migrated rapidly to the breeding grounds. Largely, Norwegian and West Baltic Greylags used different staging areas in the Netherlands and non-overlapping feeding areas in Spain. Outside the Atlantic flyway there is a few re-sightings from England of Norwegian and Swedish birds as well as one re-sighting each from Scotland and Hungary of a Swedish Greylag. Finnish reylags were found along both the Atlantic flyway, down to the Guadalquivir Marismas, and the Continental flyway, down to Tunisia and Algeria. Winter quarters of the two studied naturalised populations were situated apart from the main ones; Greylags from the Oslo area wintered in the Netherlands and the majority from Södermanland at Lac du Der, east of Paris.

Åke Andersson, Svenska Jägareförbundet, Forskningsavdelningen, Bäcklösavägen 8, SE-756 51 Uppsla, Sweden.
Arne Follestad, Norwegian Institute for Nature Research (NINA), Tungasletta 2, N-7485 Trondheim, Norway.
Leif Nilsson, Department of Ecology, Ecology Building, SE-223 62 Lund, Sweden.
Hakon Persson, Department of Ecology, Ecology Building, SE-223 62 Lund, Sweden.

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Introduction

Geese breeding in arctic or temperate zones generally have distinct migration patterns, characterized by fairly narrow migration routes, with few staging and wintering areas, which are used traditionally from year to year (som snart kommerOwen 1980, Rutschke 1987). Studies on arctic-breeding geese have revealed that different populations within a species often exhibit different migration patterns (Madsen et al. 1999).

Greylag Geese *Anser anser* in northern Europe had for a long time a patchy distribution caused by previous over-exploitation, but, like most other goose populations in the Western Palearctic, they have recovered substantially during the last three to five decades (e.g. Fog et al. 1984, Nilsson et al. 1999a). This recovery brought about an expansion of breeding range and rising number of geese, as well as increased damage on crops, and other complaints on nuisances (van Roomen & Madsen 1992). Previous studies of the migration of the Greylag Goose in northern

Table 1. Number of Greylag Geese marked with neck-bands in different areas in the Nordic countries, 1984 –1994.
Antal grågäss märkta med halsband inom olika områden av de nordiska länderna 1984–1994.

Area	Coordinates	Year	Ad	Juv	Moult	Total
Denmark						
Bygholm Vejle	5701/0904	94	11	31	0	42
Risö	5542/1207	90	17	0	0	17
		91	5	5	0	10
Rågö	5458/1118	86	2	3	0	5
Stigsnaes	5513/1118	87	5	26	0	31
		88	1	5	0	6
Vejlene	5704/0858	87	1	6	0	7
Total Denmark			***42***	***76***	***0***	***118***
Finland						
Dragsfjärd	5957/2213	89	2	1	1	4
Inko (released)	5955/2351	86	0	9	2	11
		87	0	0	2	2
		89	0	7	0	7
Kalajoki (released)	6412/2339	85	0	28	1	29
		86	0	35	0	35
Nagu	5948/2146	89	0	2	14	16
Nykarleby (released)	6338/2225	87	0	10	7	17
		89	0	9	0	9
Taivassalo	6034/2141	87	1	2	0	3
Total Finland	***Wild***		***3***	***5***	***15***	***23***
	Released		***0***	***98***	***12***	***110***
Norway						
Finnmark	7042/2549	90	0	3	3	6
		91	2	0	3	5
		92	0	1	1	2
		93	6	4	0	10
	Subtotal		*8*	*8*	*7*	*23*
Möre-Romsdal		88	0	0	1	1
		92	0	0	34	34
		93	1	0	29	30
	Subtotal		*1*	*0*	*64*	*65*
Nor-Tröndelag		86	11	9	9	29
		87	3	0	39	42
		88	7	33	126	166
		89	3	15	37	55
		90	0	2	0	2
		91	3	22	4	29
	Subtotal		*27*	*81*	*215*	*323*
Vega +Nordland		88	2	17	47	66
		89	6	23	70	99
		90	24	17	110	151
		91	5	43	105	153
		92	17	60	150	227
		93	22	33	156	211
		94	26	50	133	209
	Subtotal		*102*	*243*	*771*	*1116*
Oslo	5956/1043	90	14	11	4	29
		91	15	6	4	25
		92	1	0	0	1
		94	1	1	0	2
	Subtotal		*31*	*18*	*8*	*57*

Area	Coordinates	Year	Ad	Juv	Moult	Total
Sör-Tröndelag		86	0	0	38	38
		87	4	5	92	101
		88	14	56	60	130
		89	2	7	1	10
		92	0	1	23	24
		93	0	6	0	6
	Subtotal		*20*	*75*	*214*	*309*
Troms	6938/1802	90	6	12	0	18
Total Norway			***195***	***437***	***1279***	***1911***
Sweden						
Södermanland	5857/1709	84	11	17	3	31
		85	16	20	0	36
		86	30	16	1	47
		87	17	43	0	60
		88	12	35	0	47
		89	16	74	0	90
		90	7	46	3	56
		91	8	29	0	37
		92	1	0	0	1
	Subtotal		*118*	*280*	*7*	*405*
Scania	5530/1315	84	1	10	0	11
		85	22	103	1	126
		86	20	93	0	113
		87	71	127	0	198
		88	40	107	0	147
		89	37	128	0	165
		90	43	153	5	201
		91	18	44	0	62
		92	52	137	2	191
		93	35	71	0	106
		94	36	119	5	160
	Subtotal		*375*	*1092*	*13*	*1480*
Gotland	5706/1820	85	0	0	20	20
		86	0	0	28	28
		87	0	0	5	5
		88	1	6	20	27
		89	0	0	14	14
	Subtotal		*1*	*6*	*87*	*94*
Stockholm archipelago		85	0	1	1	2
(Gunnarstenarna)	5847/1804	86	2	0	4	6
		88	1	1	6	8
	Subtotal		*3*	*2*	*11*	*16*
Norrbotten (Rödkallen)	6522/2228	88	0	1	12	13
Tåkern	5828/1453	85	1	2	0	3
Total Sweden			***498***	***1383***	***130***	***2011***
Overall total			***738***	***1999***	***1436***	***4173***

Europe were based on analysis of leg-ring recoveries (Paludan 1965, 1973, Lund 1971, von Essen & Beinert 1982, Rutschke et al. 1982, Gromadzki & Majewski 1984), thus mainly illustrating the distribution and movements during the shooting season. The recent changes led to the demand for a deeper knowledge of philopatry and dispersal, the origin of flocks on staging and wintering grounds and moult movements, as well as the general migration pattern of the species.

Therefore, the Nordic Council for Wildlife Research initiated a common Nordic project in 1984. Within this project we marked Greylags on breeding or moulting sites in a number of places in the Nordic countries. We used neck collars in order to follow movements of individual birds within the populations studied. In this paper, we describe the geographical and temporal distribution patterns, using observations made up through June 1995.

Study areas and study populations

All sites where Greylag Geese have been marked with neck-bands are listed in Table 1, where we also list the years when geese were banded and the numbers banded in each year. The location of the sites is shown on the map of Figure 1.

Figure 1. Geographical position of marking areas for breeding Greylag Geese *Anser anser* in the Nordic countries, 1984–1994.
Geografiskt läge för märkplatser av grågäss Anser anser *i de nordiska länderna 1984–1994.*

Scania

The main study area comprised five lakes (Yddingen, Fjällfotasjön, Klosterviken, Börringesjön and Björkeåkrasjön) in the southernmost part of Sweden (55°30'N, 13°15'E). Moreover, catching was undertaken at Lake Snogeholmssjön (55°33'N, 13° 44' E) in two years. The lakes, surrounded by areas grazed by cattle, are situated in a rolling agricultural landscape also including some small woodland areas. The agriculture was dominated by grain culture, mainly winter wheat. The area was described by Nilsson (1995), Nilsson & Persson (1992, 1994, 1998) and Nilsson et al. (1997),) who also presented data on the different use of fields around the lakes.

The vegetation period in south-western Scania normally starts around 1 April and lasts for approximately 230 days (Nilsson 1990). The mean ice-coverage of the lakes is from 5 December to 20 March (Ångström 1974). However, whereas 1984–1986 were relatively normal years and 1987 was a cold winter with a late spring, the following years had very mild winters and early springs. The lakes were accordingly ice-covered for only short periods in the winters 1988–1995, or not at all.

The Greylag Goose in the study area breeds in eutrophic lakes, either on small islands or in reed-beds. The study population increased from 120 breeding pairs in 1985 to 530 in 1994 (Nilsson 1995). Since 1989 hunting has been allowed from 20 July to 15 September to protect crops, and in 1992, an open season was introduced from 16 September to 31 October. The shooting was, however, of little importance during the period covered in this study and did not influence the migration pattern.

Södermanland

This study area (centered at two lakes in the inner part of the county at 58°57'N, 17°09'E and 59°04'N, 17°13'E) is situated in the boreo-nemoral zone, south of the northern border for winter grains. The landscape is a mosaic of lakes, agricultural and forested areas where cultivated and grazed land together constituted about 26% of the total land area (Bernes & Grundström 1991, Statistiska centralbyrån 1993). Winter and spring grains, peas and hay were important crops. The vegetation period in Södermanland normally starts around 15 April and lasts for about 200 days, i.e. about one month shorter than in

Scania (Nilsson 1990). In normal years, the lakes are ice-covered from about 25 November to 20 April (Ångström 1974).

The Greylag Geese bred in eutrophic lakes partly surrounded by shore meadows grazed by cattle or horses, or in small man-made lakes created for waterfowl. Some pairs nested in marshes or on islands in oligotrophic lakes, but most of them took their broods to the eutrophic lakes. There were small moulting places for Greylag Geese within the area, but almost all birds ringed as non-breeders were later identified as belonging to the local breeding population (Andersson 1992).

This population originates from reestablishments at Öster-Malma in central Södermanland during 1970–1975 (Fabricius 1983). Eggs were taken from south-eastern Sweden and placed in nests of Canada Geese *Branta canadensis*, which thus acted as foster parents. Furthermore, a small number of wild Greylag Geese was released after a few years in captivity. The very few Greylag Geese paired with Canada Geese during our study period have been excluded from the material treated here; observations of neck-banded Greylags from mixed pairs indicate migration habits similar to the local Canada Geese, according to information from a Canada Goose neck-banding project carried out by one of us, ÅA.

During the study period the population increased with roughly 10% annually to about 150 breeding pairs in 19941. Simultaneously, there was a geographical dispersal leading to a more or less continuous breeding range in the province. The hunting rules were the same as those described for Scania.

Norway

The Norwegian study area comprised several localities along the coast of western and northern Norway, from Haram in the south (62°42N, 6°22E) to Store Tamsöy in the north (70°42N, 25°49E). The study area is thus situated in all of the three boreal zones (Moen 1998). The main study area was the island of Vega (65°42 N, 11°51 E) and the surrounding archipelago on the Helgeland coast.

The agriculture was dominated by grass production with almost no grain cultures. The vegetation period varies from 210 days in the southern part of the study area to 120 days in the far north (Moen 1998): the main part of the west coast shows only slight variation being close to 200 days, whereas the situation changes markedly north of Lofoten. The day length varies also, the geese north of the polar circle (66°33N) have midnight sun for part of the breeding season.

The study area included the main breeding area for the Greylag in Norway (Follestad 1994a, 1994b), as well as most of the moulting sites for non-breeding Greylags in Norway (Follestad et al. 1988). The Greylag mainly breeds on islands with grass and heather along the outermost coast (Follestad 1994a, 1994b). In the northern parts of Troms and in Finnmark, the main part of the population seems to breed on islands or on bogs in the fjord areas, often several kilometres from the seashore (Follestad & Golovkin 2000). Greylags may breed in birch forests and several nests have even been found in old crow nests (Strann pers. comm.), perhaps to avoid predation from foxes and American Mink *Mustela vison*. In the last few years, there has been an increasing tendency for the geese in the southern part of the study area to breed in spruce plantations.

The hunting season started on 21 August during the first years of the study, but due to changed timing of the Greylag migration of geese breeding in southern Norway and at the Helgeland coast (Follestad 1994b, 1996), the hunting season changed and the opening date now varies from 10 August in southern Norway (approx. south of 62° N) to 21 August (approx. north of 66°45N).

Supplementary study populations

On Gotland, the main moulting area for Greylag Geese in Sweden, non-breeding adults were caught on islands (57°04'N, 18°10'E and 57°08'N, 18°30'E), long known as moulting sites for Greylags from a wide area in North Europe (e.g. Rutschke 1987). One family was neck-banded in an eutrophic lake on South Gotland (56°59'N, 18°18'E). The open season for Greylag hunting starts on 20 July.

In the Stockholm archipelago, Sweden, breeding and non-breeding geese were neck-banded on the outermost islets (58°47'N, 18°04'E). In Norrbotten (65°22'N, 22°28'E), north of the border for winter grains, non-breeding geese were caught during the moult in archipelagoes where no agriculture or stock-raising occur.

Danish localities (55°13' N, 11°18'E and 5°04'N, 08°58' E) used during the 1980s and Lake Tåkern, in South Sweden (58°28'N, 14°53'E) are all eutrophic lakes situated in agricultural areas. Geese caught there were all in families. In 1990–1991, Greylag Geese were also caught by cannon netting at a staging area by Risö, in Denmark (55°42'N, 12°07'E).

In Finland, wild Greylag families and non-breeding adults were neck-banded in the archipelago in south-

west (59°48'N, 21°46'E), where suitable late-summer and autumn feeding areas only can be found on the mainland. Furthermore, reared Greylag Goose fledglings without foster-parents, were neck-banded and released on different places along the Finnish west and south coast, where native Greylag Goose populations exist (59°55'N, 23°51'E, 63°38'N, 22°25'E and 64°12'N, 23°39'E). These released birds are treated seperately in the analysis, but are presented together with the other Finnish birds in the tables in the appendix.

In Oslo, Norway, (59°53'N 10°50'E), breeding birds were neck-banded mostly within parks in the city. These birds are introduced and originate from eggs taken from western Norway and Sweden (Follestad 1994b).

Among the non-breeding Greylags neck-banded in Finland, in Norrbotten, at Risö and in Oslo, both local and foreign origin was proved.

Methods and Material

Catching and marking

Greylag Goose families were caught when the parents were unable to fly due to wing feather moult and their offspring still had undeveloped wings. In inland habitats, they were rounded up when they were grazing on pastures and forced into nets which had been mounted in advance (Persson 1994a). In coastal habitats, most families and moulting non-breeding birds were taken in a sweep-net after short pursuits with a fast boat (Andersson 1990). In both types of habitats, observations after ringing were carried out in order to reveal family affiliation.

In Norway, birds caught on moulting grounds, where large numbers of geese concentrate well separated from the local breeding birds, were classified as non-breeding. This category includes both subadults and adults without young. In breeding areas, a few subadults may also have been ringed, but due to lack of regular observations on several of the breeding grounds they are all classified as breeders. In Scania and Södermanland, geese without young caught on breeding grounds were defined as non-breeders if observations during or after ringing showed that they were subadults or unpaired adults. In this paper, however, they are treated as adults.

The neck collars were manufactured of laminated plastic of an UV-resistent quality. The collars were blue with a three-digit code engraved in white (or black; in Scania, from 1993 on some neck collars). Letters and numbers most liable to mis-identification were omitted. In good light conditions, the codes were possible to read at a distance of 500–600 meters. The geese were also marked with a metal ring from the national ringing center. In one locality (Södermanland), colour leg rings were added, making individual recognition possible also after loss of the neck collar. Hardly any bird lost its neck collar within one year of marking. In Scania, the annual neck collar retention rate was 97.1(0.7% (based on 590 collar years), with marked differences related to sex, age of bird at collar placement and wintering area (Persson 2000).

Observations

In the three main study areas, observation programmes were organized with at least weekly visits to important sites during the period when Greylag Geese were present. In connection with other studies on the marked geese, more intensive controls were undertaken during some periods. Information about the project, both in the Nordic countries and abroad, was presented in notes and articles in magazines, and directly to bird clubs and

Figure 2. Geographical position of important staging and wintering areas for Greylag Geese mentioned in the text.
Geografiskt läge för viktiga rast och övervintringslokaler för grågäss nämnda i texten.

Table 2. Number of reported observations of neck-banded Greylag Geese from the marking areas in different countries up to 30 June 1995.
Antal rapporterade observationer i olika länder av halsmärkta grågäss från de olika märkområdena till och med 30 juni 1995.

	Marking areas							
Observation country	SW Scania	Söder-manland	Gotland	Small sites in Sweden	Norway	Denmark	Finland	Total
Norway	9	1	1	0	2940	1	0	2952
Finland	0	0	1	1	0	0	103	105
Sweden	49342	5349	285	155	64	41	27	55263
Denmark	814	44	32	2	2047	619	0	3558
Germany east	189	11	201	17	21	21	1	461
Germany west	112	62	26	4	180	11	3	398
The Netherlands	4726	2890	254	79	29016	226	16	37207
Belgium	125	6	1	0	12	6	0	150
England	10	1	0	0	3	0	0	14
Scotland	1	0	0	0	0	0	0	1
France	109	4434	6	4	87	4	0	4644
Spain	2918	133	123	68	5558	184	23	9007
Portugal	0	0	0	0	2	0	0	2
Morocco	9	0	0	0	0	0	0	9
Estonia	0	0	0	0	0	0	2	2
Poland	0	0	0	0	0	0	47	47
The Czech Republic	0	0	2	0	0	0	0	2
Austria	0	0	8	0	0	0	31	39
Hungary	1	0	13	0	0	0	7	21
Italy	0	0	0	0	0	0	4	4
Tunisia	0	0	1	0	0	0	1	2
Algeria	0	1	1	0	0	0	1	3
Total	58365	12932	955	330	39870	1113	266	113891

individual ornithologists. Our commitment to give fast feed-backs to all reporting observers successfully tempted many observers abroad to contribute. Sightings and recoveries of neck-banded geese reported to the national ringing centers have been passed over to us and are included in the analysis.

The observation intensity as well as the interest among observers to read and report neck collars differed markedly between areas. We have concentrated our own efforts to the two main Swedish study areas (south-west Scania and Södermanland), the Vega area in Norway, and the Guadalquivir Marismas in south-western Spain. Outside the Nordic countries we obtained good coverage of important areas in the Netherlands (Dollard, Lauwersmeer, Flevoland and the Delta area (Figure 2), but also from smaller sites) via contacts with numerous amateurs and Dutch goose workers. Other areas with good coverage were the areas around Rügen on the German Baltic coast and Lac du Der in France (Figure 2). The coverage in Spain varied markedly between years, seasons as well as areas. The spontaneous reporting frequency was relatively low due to few local observers, whereas our own field work by necessity had to be concentrated to different areas in different years and seasons. The best overall coverage was obtained in the winters 1989/1990 and 1990/1991. Finland, eastern and southern Europe (except traditional sites in Spain), North Africa and also parts of north-western Germany may be mentioned as areas with lower reporting frequency than expected. This also applies to parts of Sweden outside the main study areas as well as to parts of Denmark. The number of observations reported to us from different countries of Greylag Geese marked in the different areas is shown in Table 2.

Mis-identification of neck collars occurs due to circumstances prevailing at the observation. False readings in areas with many sightings have a marginal effect on the results, but incorrect single sightings of

Table 3. Per cent of Greylag Geese from the main marking areas (of those actually seen during the first year) seen in different countries, others than where marked (=M), during the first year after marking for geese marked during 1985–1994.
Procent av märkta grågäss från de viktigaste märkområdena (av dem sedda under första året) som setts i olika länder utöver märklandet(=M) under första året efter märkningen för gäss märkta under 1985–1994.

Observation areas	Marking category and area							
	Adults			Young birds			Moulters	
	Scania	Sörml.	Norway	Scania	Sörml.	Norway	Gotland	Norway
Finland	0	0	0	0	0	0	1	0
Norway	0	0	M	+	0	M	0	M
Sweden	M	M	1	M	M	0	M	1
Denmark	3	0	16	7	2	13	1	20
Germany east	1	0	0	1	+	0	34	+
Germany west	1	4	4	2	5	2	3	3
The Netherlands	45	31	81	39	48	72	41	90
Belgium	1	0	0	1	0	+	0	+
England	0	0	0	0	1	+	0	+
France	3	48	0	3	30	2	0	1
Spain	33	2	36	24	1	25	25	46
Algeria	0	0	0	0	0	0	1	0
Seen in country other than marked	68	80	89	60	88	72	70	99
Total number observed	373	95	164	895	267	314	71	566
marked	374	107	199	1082	292	437	87	631

geese in the periphery of the distribution area may influence conclusions. We have excluded obvious mis-identifications and all sightings with incomplete codes.

Material

In the present study, we analyse data resulting from the marking of Greylag Geese undertaken in the Nordic countries during the years 1984–1994 (Figure 1). Observations made up to 30 June 1995 are included in the analysis In some cases we have included observations made in later years but due to the time-lag in reporting of observations especially from abroad all reports have not yet been obtained from foreign countries, thus leading to biased results if the analysis included later data. In some special cases, e.g. for smaller marking areas with few marked individuals, we have included incomplete data from later years in some analysis to make the picutre more complete. Many of the analyses are, however, based on various sub-sets of the total data-base, for reasons presented in each special case.

In all, 4173 Greylag Geese were neck-banded in the Nordic countries during 1984–1994 (Table 1). Between 80 and 97% of the geese from different marking areas were seen after marking (Appendix 1) and no less than between 58 and 85% were seen in another country than that of marking (excluding Finnish geese with a high proportion of released birds). Of the Finnish-marked geese, only 50% were seen after marking, half of which also being seen abroad. The re-sighting frequency of the naturally produced geese was much higher than that of the released birds. Most of the geese not seen were marked as young. In Scania, where intensive field-work was undertaken on the breeding grounds, 18.0 % of the marked goslings were not seen fledged. In all, about 62,000 observations outside the marking areas were obtained during the period considered in this report (Table 2). A very large number of observations was also made in the marking areas, e.g. about 49,000 in SW Scania during the period considered here up to an including 1991.

The frequency of resighting varied markedly between the different study areas (Table 1), but in general it has been high for all areas with the exception of released Finnish Greylag of which only 16% were

seen abroadThe highest re-sighting frequency abroad was noted for Greylag Geese marked during the moult in Norway, 94% of which were later recorded at least once in another country. For adults marked in Scania and Södermanland, the re-sighting frequencies abroad were 88% and 85%, respectively. For both these groups there were just one individual in each sample that was not seen after marking. A high proportion of the geese was re-sighted during the first year after marking (Table 3).

The proportion of neck-banded individuals within the different study populations is markedly different. In the relatively small population at Öster-Malma in Södermanland, about 25% was marked with neck collars in 1991. Similarly, a quite high proportion of the Greylag Geese in the study area in Scania was wearing neck collars after some years. In 1991, 23% of all breeding pairs in the area had one or both individuals in the pair neck-banded. The proportion of neck-banded individuals in the Norwegian study population was, however, much smaller, these marked birds being representative of much larger populations than the two Swedish study populations. An exception to this is, however, the local breeding population on Vega, where up to 20% of the population was neck-banded in some years.

Migration, arrival an departure

Scania

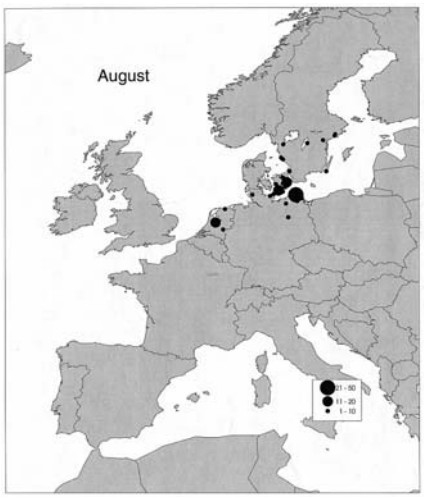
Overall, 67% of 1480 Greylag Geese marked in Scaniaseen after marking were recorded at least once in another country than Sweden. Excluding goslings not seen fledged, the percentage increases to just over 77%. The highest number of foreign records was obtained from the Netherlands, 741 individuals compared to 541 in Spain (Appendix 1, Figure 3). The chances for a goose to be reported are, however, much higher in the Netherlands than in Spain. Quite a number of geese was also reported from Denmark, Germany and France, with single observations from Norway, Belgium, England, Scotland, Morocco and Hungary.

During late summer and early autumn Greylag Geese marked in Scania mostly remain in the local area (Figure 3, Appendix 2). This applies both to breeding and non-breeding birds marked in former years, the geese making quite extensive movements between different roosts in the region (Nilsson & Persson 1992). A concentration of the Greylags to coastal sites is going on throughout the autumn, as the inland gathering places are evacuated in relation to the ploughing of the main inland feeding areas (Nilsson & Persson 1998). About 10% left during August – September.

During July – September a number of Greylag Geese was found in the Netherlands, Germany and Denmark. Summer observations in the Netherlands are related to the moult migration (Nilsson et al. 2001). Some of the observations during summer in the western part of Germany and in Denmark were of geese on return movement to Scania after moult in the Netherlands, whereas most individuals seen in the eastern part of Germany were subadults, that did not turn up later in Sweden. Some families left Scania soon after that the young had fledged and were seen in Denmark in early autumn. Danish observations from late spring and early summer in the most recent years are related to the newly established moulting area on Saltholm (Fox et al. 1995, Nilsson et al. 2001). Movements between roosts in East Denmark and SW Scania have been recorded on a number of occasions, geese passing back to Scania from Zeeland as late as mid-October.

The main departure from Scania was in October (Figure 4), and only small numbers remained in early November. Even if the general pattern was similar, differences in details were found among years. Thus, the main departure was about ten days earlier in 1986 than in the other years considered. On the other hand, a few birds remained longer in 1986. A large number of observations was obtained from the Netherlands during October and November, whereas much smaller numbers were recorded in December. The first Scanian Greylag Geese were reported from the Guadalquivir Marismas in south-western Spain during the first week of October, but most first-sightings were made in November (see below).

The migration between Scania and the Netherlands could be followed in detail due to intensive observations in both areas during some years. The departure from Scania and the arrival in the Netherlands fits well with a direct migration of most Greylags between the two countries (Figure 4). Some geese do probably stay unseen on staging areas between Scania and the Netherlands; only about 10% had been seen in the Netherlands when about 40% had left Scania (Figure 4). Actually, the interval between the last sighting in Scania and the first observation in the Netherlands was less than 10 days for 34% of the individuals recorded in the Netherlands during the autumn. A proportion of the Greylag Geese from Scania stays for the winter in the Netherlands, mainly in the Delta area (Figure 3).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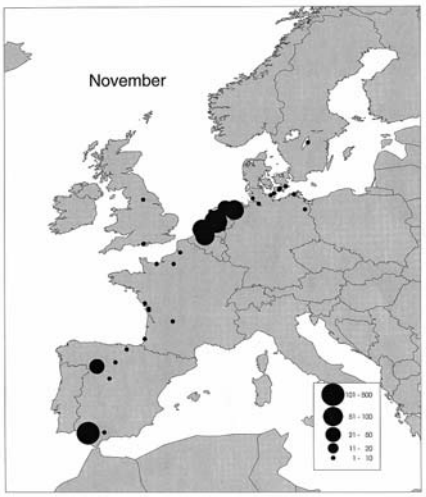
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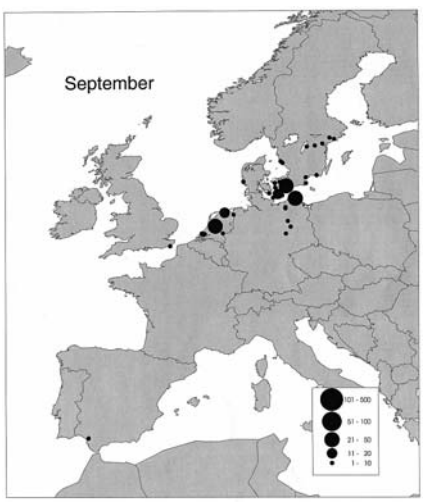
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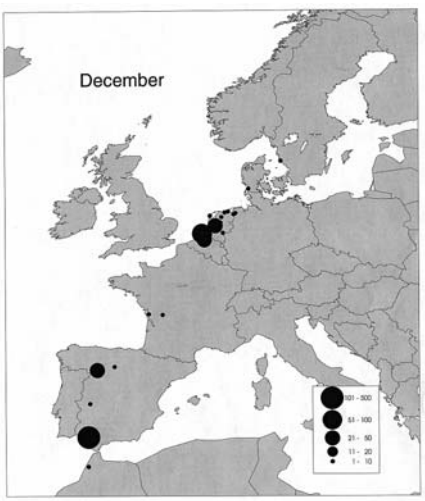
December
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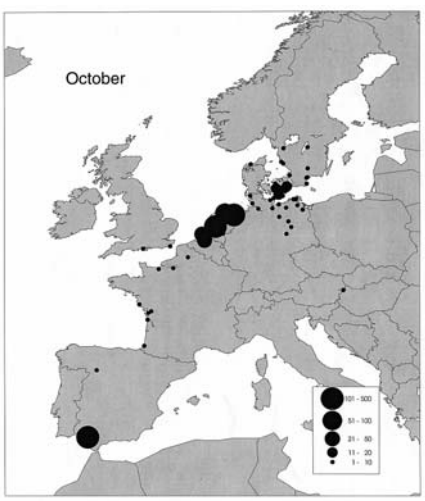
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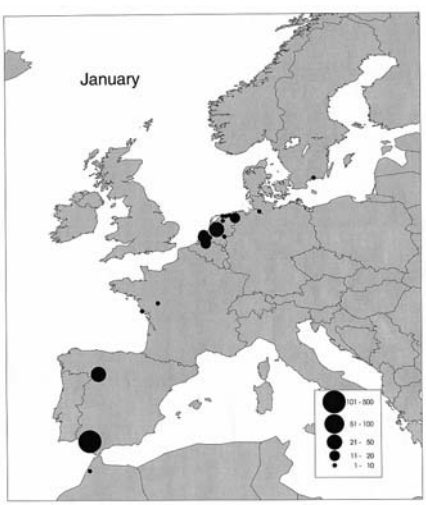
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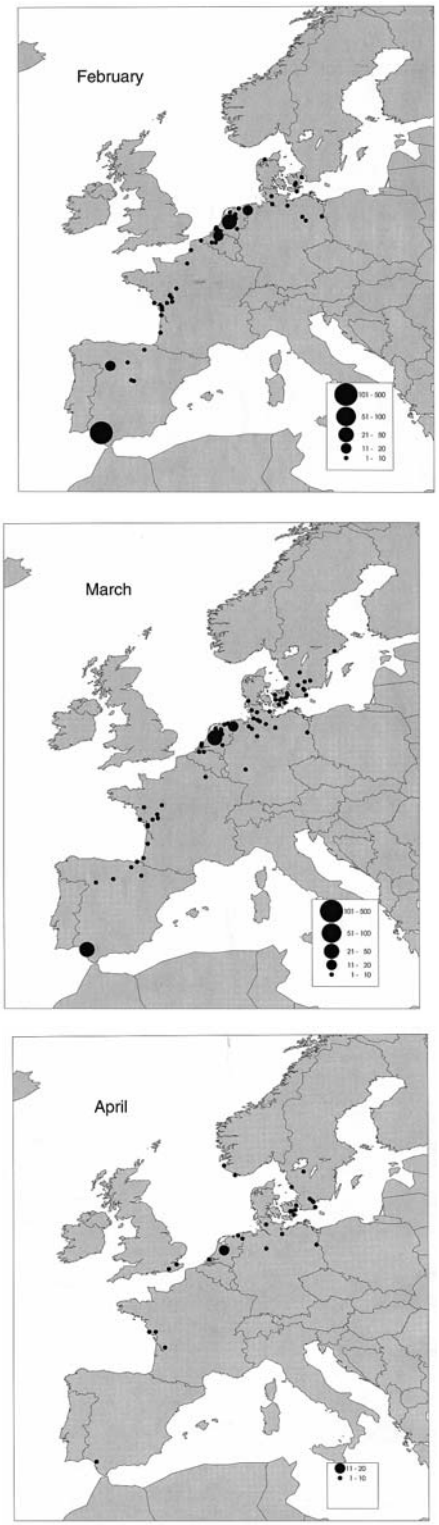


The other birds continue their migration to Spain after a short stay (Figure 5). The majority of these birds have left the Netherlands in early to mid-November (Figure 6).

It seems as if a few geese migrate more or less directly from Scania to Spain, while the majority stage for a period in the Netherlands. Generally, Greylag Geese from Scania passed France rapidly during autumn migration. In three cases, the interval between the last sighting in Scania and the first observation in Spain was less than five days, 17% with time intervals of less than 10 days. Accordingly, few neck-band readings have been reported from autumn migration in France, but there are a number of recoveries of shot birds.

The arrival of Greylag Geese in the Guadalquivir Marismas was followed in detail during the autumns of 1989 and 1990 (Persson 1993). Most of them arrived here during November (Figure 7). In some years, a number of Greylag Geese arrived in Doñana, apparently found the situation bad and returned north to Villafáfila, arriving there in the north-central part of Spain already in the end of November.

During the winter (December – JanuaryFebruary) observations were generally restricted to Spain and the Netherlands. When the study started, the majority was reported from the Guadalquivir Marismas, but an increasing number was reported wintering in the Dutch Delta. Small numbers were noted from other areas in the Netherlands. Moreover, some33 wintering birds were noted from Villafáfila, a new wintering area of importance for Greylag Geese in north-central Spain. In Morocco, one of the southernmost sites for the species, one pair and one subadult were sighted during the 1989/1990 season, the latter bird also during two subsequent winters. In the mild winters of the 1990s, a small number of Greylag Geese (ca 100 – 200 individuals) including a few of the neck-banded ones stayed over winter in southernmost Sweden.

Among breeding Scanian Greylag Geese with known winter quarters, the proportion wintering in the Netherlands increased from 9% (N=35) in 1986 to 50% (N=160) in 1995 (Figure 7), the remainder using the traditional wintering area in southern Spain.

Figure 3. Geographical distribution of observations of neck-banded Greylag Geese from Scania during August–April, 1984/1985–1994/1995. Observations in the marking area are excluded. Each individual included once per locality and month.

Geografisk utbredning av observationer av halsmärkta grågäss från Skåne augusti–april 1984/1985–1994/1995. Observationer i märkområdet visas ej. Varje individ räknas en gång per lokal och månad.

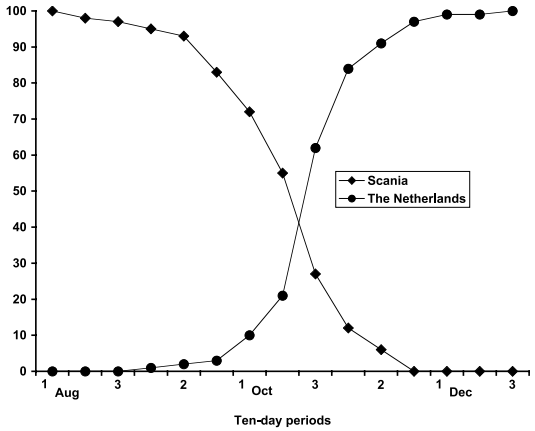


Figure 4. Departure from SW Scania and arrival into the Netherlands of neck-banded Greylag Geese from Scania in the autumns of 1988–1990. Departure is shown as the percentage of the total sample remaining per ten-day period, whereas arrival is shown as the cumulative number arrived per ten-day period as per cent of the total number seen in the country during the autumn.
Bortflyttning från sydvästra Skåne och ankomst i Nederländerna för halsmärkta grågäss från Skåne höstarna 1988–1990. Bortflyttningen visas som procentandelen kvarvarande gäss av totalantalet sedda beräknat per tiodagarsperiod, medan ankomsten visas som den ackumulerade summan av alla ankomna gäss per tiodagarsperiod i procent av det totala antalet sedda gäss under hösten.

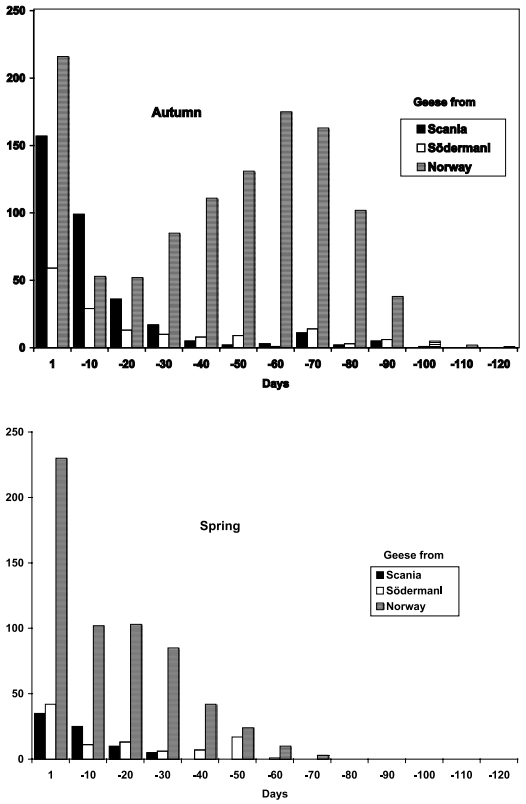


Figure 5. Length of stay (in days) for Greylag Geese neck-banded in Scania, Södermanland and Norway on staging areas in the northern part of the Netherlands in autumn and spring, respectively, for individuals seen on at least two occasions in the Netherlands during the same season. Accumulated totals for 1988–1990 and 1989–1991, respectively. In addition the numbers seen on only one occasion are shown.
Vistelsetidens längd (i dagar) för grågäss märkta i Skåne, Södermanland och Norge på rastplatser i norra delen av Nederländerna höst och vår för individer som setts vid minst två tillfällen samma säsong. Ackumulerade summor för 1988–1990 and 1989–1991, respektive. Dessutom visas antalet gäss som endast setts vid ett tillfälle.

In 1986 – 1995, the wintering areas were known for 92.6% of all marked experienced breeders in the Scanian study area (Nilsson et al. 1997).

Spring migration of Scanian Greylag Geese was fast and the number of individuals seen abroad is much smaller than during autumn migration (Figure 3, Appendix 2). Geese wintering in the Guadalquivir Marismas started to leave during the second half of January, some of them staged at Villafáfila in the Duero Basin, whereas others went more directly.

During spring, a number of Greylag Geese was reported on staging areas along the French Atlantic coast. Thirty individuals were recorded during February over the years, of which 50% were seen in Spain during the winter. Seventeen observations were made in March in France. On the other hand, there were only two records of Scanian Greylag Geese from France in January, one of them seen in south-western Spain during the winter, strongly indicating that Scanian geese do not winter in France.

The majority of spring observations from the Netherlands were made in Flevoland, in the Netherlands with some individuals staging in Lauwersmeer and Dollard (Figure 3). The spring staging was of short duration (Figure 5). Most Dutch wintering birds left the Netherlands for Scania during February (Figure 8), whereas birds from Spain passed the Netherlands during February and early March.

The arrival in the breeding area in Scania varied among years in relation to the weather situation (Nilsson & Persson 1994, and unpubl.). Thus, after the mild winters and early springs of 1989 to 1991 about 40% of the Greylag Geese were back by late February (Figure 8), the first arrivals being noted in January, when both the numbers staging at the south-western coast of Scania and the number of neck-

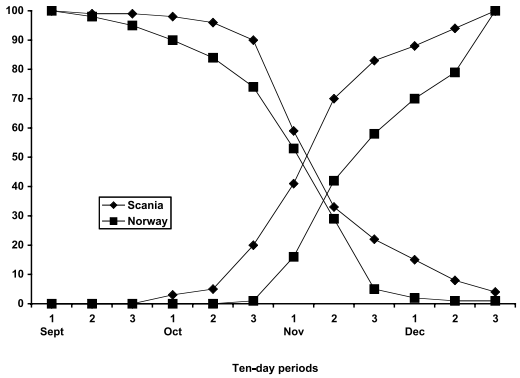


Figure 6. Departure from the Netherlands and arrival into Spain of neck-banded Greylag Geese from Scania and Norway in the autumns of 1988–1990. Departure is shown as the percentage of the total sample remaining per ten-day period, whereas arrival is shown as the cumulative number arrived per ten-day period as per cent of the total number seen in the country during the autumn.
Bortflyttning från Nederländerna och ankomst i Spanien för halsmärkta grågäss från Skåne och Norge höstarna 1988–1990. Bortflyttningen visas som procentandelen kvarvarande gäss av totalantalet sedda i resp. land beräknat per tiodagarsperiod medan ankomsten visas som den ackumulerade summan av alla ankomna gäss per tiodagarsperiod i procent av det totala antalet sedda gäss under hösten.

banded geese increased. The extreme was a family leaving Scania in September 1994, being seen for some weeks in the Dutch Delta in late September and October, being back in Scania by mid-November, staying in Sweden over the winter proper.

Breeders wintering in the Dutch Delta arrived in Scania earlier than those wintering in Spain. Geese wintering in the Netherlands arrived 4.0±1.72 (N=80)

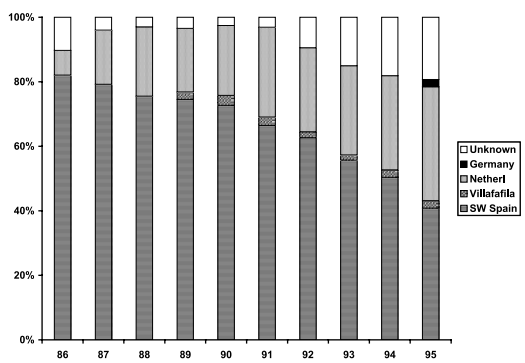


Figure 7. Percentage distribution of Greylag Geese marked in Scania on different winter areas in 1986–1995.
Procentuell fördelning av halsmärkta grågäss från Skåne på olika vinterområden 1986–1995.

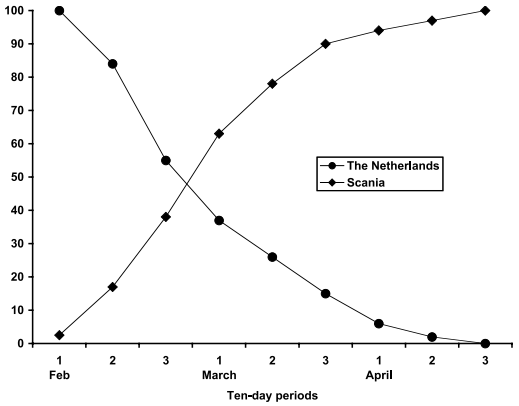


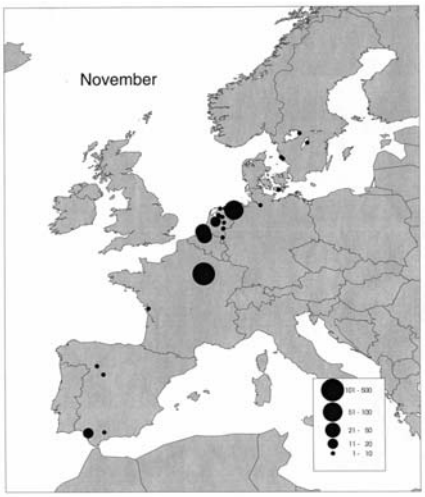
Figure 8. Departure from the Netherlands and arrival into SW Scania of neck-banded Greylag Geese from SW Scania in the springs of 1987–1991. Departure is shown as the percentage of the total sample remaining per ten-day period, whereas arrival is shown as the cumulative number arrived per ten-day period as per cent of the total number seen in the country during the spring.
Bortflyttning från Nederländerna och ankomst i SV Skåne för halsmärkta grågäss från Skåne vårarna 1987–1991. Bortflyttningen visas som procentandelen kvarvarande gäss av totalantalet beräknat per tiodagarsperiod, medan ankomsten visas som den ackumulerade summan av alla ankomna gäss per tiodagarsperiod i procent av det totala antalet sedda gäss under våren.

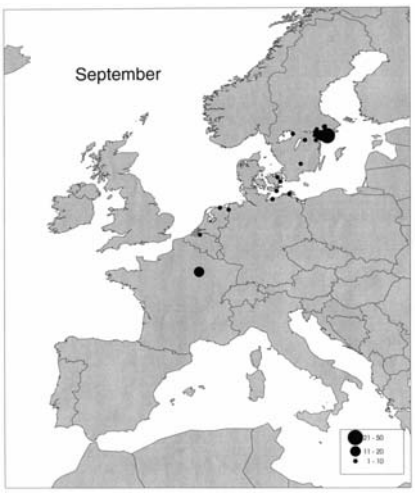
days before the adjusted mean arrival for all marked pairs, whereas first-arrivals for geese wintering in Spain was 1.72±0.89 days (N=257) after the mean arrival, the difference being significant (t=3.08, P=0.002). The first individuals re-sighted during the winter in Spain arrived in Scania from early February.

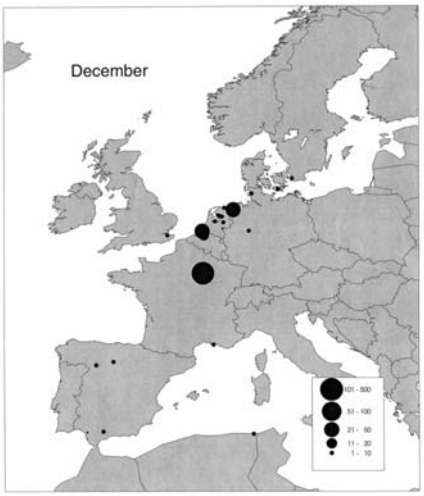
Södermanland

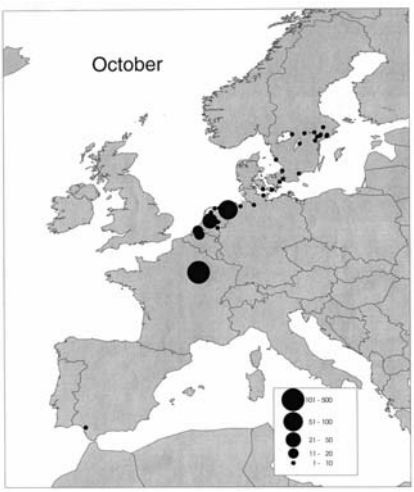
The Netherlands and France are the main staging and wintering areas, 56% of all individuals being seen in France compared to 52% for the Netherlands (Figure 9, Appendix 1). Nine per cent of the geese from Södermanland were recorded in Spain in winter. Records from Denmark and West Germany were relatively few, most of them from the northward migration in February and March. Eight birds were seen in the northern part of East Germany Both were recorded in September one year old and apparently attracted by those moving between Scania or Gotland and east Germany. One of them was later seen in The Netherlands. The only record along the Central European flyway was a four-year old female which was seen in Algeria one winter. Single birds showed up in England, Belgium and Norway.

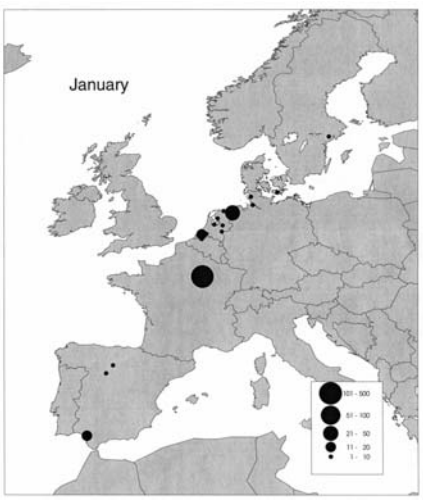

August

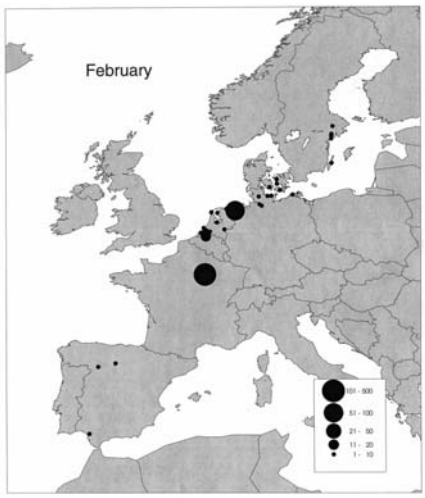

November

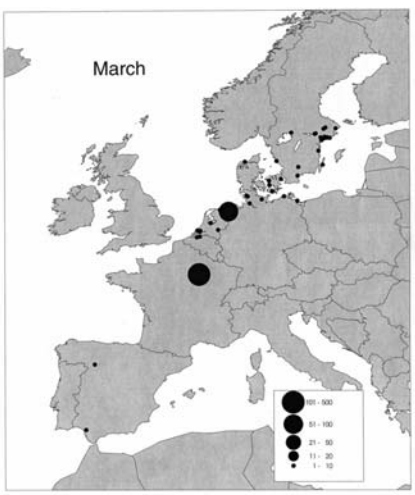

September


December


October


January





In autumn, the geese move around in an area measuring about 20 x 30 km. Flocks may for shorter periods visit localities in the periphery or even outside this area. During the first years some families were seen on a coastal staging area ca 25 km east of the marking locality. Otherwise, only single birds or pairs were observed further away in the province before autumn migration. The Greylag Geese in this part of Södermanland usually left the breeding area in the second half of September (Figure 10). Also in 1989 and 1990, the geese were present in the area in late September, but observations were undertaken less frequently. In 1991, about half the local population remained as late as 14 October.

Few observations of geese staging between the marking area and the Netherlands have been reported. Some families have been observed in SW Scania, where the observation activity was intense. Very few, usually single individuals, were recorded in the province of Halland on the Swedish west coast. Greylag Geese from Södermanland arrived in the Netherlands in small numbers in the beginning of September and commonly in October, with 80% seen before the end of the month during most years (Figure 11).

The newly created reservoir Lac du Der (Figure 2) in northern France is the most important winter area for Greylag Geese in France (Mouronval et al. 1996). In all, 52% of all Greylag Geese marked in Södermanland (N = 405) were recorded here, several of them for a number of seasons. A number of the Greylags wintering in Lac du Der stayed for a period in the Netherlands before reaching their ultimate destination, whereas some birds migrated more or less directly from Sweden to Lac du Der. The first Greylag Geese arrived at Lac du Der in September, but the main arrival was in October and November, some not seen until December (Figure 11).

Very few Greylag Geese from Södermanland migrated further than Lac du Der. A total of 44 individuals (=11%) migrated to Spain, of which nine returned there for more than one winter. It is interesting to note that of the 37 Greylags marked as goslings and later reported from Spain only two were seen there during their first winter. One was

Figure 9. The geographical distribution of observations of neck-banded Greylag Geese marked in Södermanland during August–April, 1984/85–1994/95. Observations in the marking area are excluded. Each individual included once per locality and month.
Geografisk utbredning av observationer av halsmärkta grågäss från Södermanland augusti–april 1984/85–1994/95. Observationer i märkområdet visas ej. Varje individ räknas en gång per lokal och månad

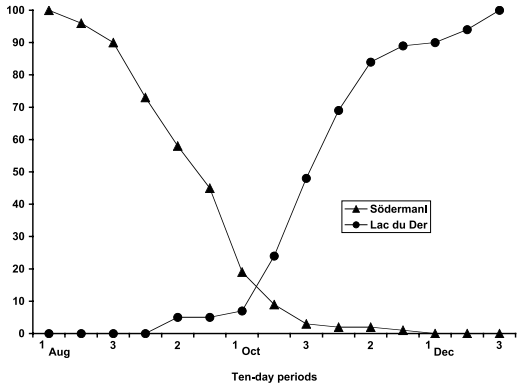


Figure 10. Departure of neck-banded Greylag Geese from the breeding area in Södermanland and arrival into the winter area at Lac du Der, France, in the autumns 1986–1990. Departure is shown as the percentage of the total sample remaining after each ten-day period, whereas arrival is shown as the cumulative number arrived per ten-day period as per cent of the total number seen in the country during the autumn.
Bortflyttning för halsmärkta grågäss från häckningsområdet i Södermanland och ankomst i vinterområdet i Lac du Der, Frankrike, höstarna 1986–1990. Bortflyttningen visas som procentandelen kvarvarande gäss av totalantalet beräknat per tiodagarsperiod, medan ankomsten visas som den ackumulerade summan av alla ankomna gäss per tiodagarsperiod i procent av det totala antalet sedda gäss under hösten.

reported from the Camargue, South France, during winter.

Spring migration for the majority of Dutch wintering geese from Södermanland started in February (Figure 12), whereas only a small proportion of those wintering in Lac du Der left the area during February (Figure 13). Most Greylag Geese from Södermanland returned to the breeding area during March. After the first third of April 80–90% had arrived in four of the five years studied (Figure 13). As for the autumn migration a few Greylag Geese was recorded back quite soon after the last observation in France and the Netherlands, respectively, but normally, the time interval between the observations was longer.

Central Norway

Overall, 84% of 1911 Greylag Geese marked here were recorded at least once in another country than Norway. It was not possible to correct this percentage by excluding goslings not fledged, but data from Vega indicate that the number of unfledged was fairly low. The highest number of foreign records was obtained from the Netherlands, 1494 individuals compared to 917 for Spain (Figure 14, Appendix 1). Quite a number of geese was also reported from Denmark, Germany (west coast) and France, with single observations from Sweden, Belgium, England and Portugal.

Breeding Greylag Geese from Central Norway mostly remained in the breeding area during late summer before autumn migration (Figure 14, Appendix 2). Non-breeding birds, however, could return from the moulting sites to their breeding grounds. From the southern moulting area, from Smöla to Bjugn, most of the birds returned to more southern breeding areas. From the Helgeland coast, including Vega, most of the birds returned to more northern breeding areas. From the southern part of the Helgeland coast, including Vikna, some birds returned to breeding areas in the Baltic area, including South Sweden.

The Greylag Geese in Central Norway left much earlier than the Greylag Geese marked in Scania and Södermanland. Already in August a large number of neck collars was reported from Denmark and the Netherlands (Figure 14, 15). The main arrival period in the Netherlands for Norwegian Greylags was in late August and early September (Figure 11, 15). High numbers of Norwegian Greylags remained in Denmark during September, whereas only few remained in October, when peak numbers were recorded in the Netherlands.

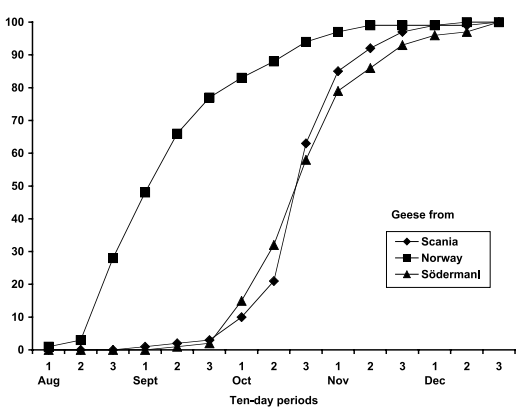


Figure 11. Cumulative number of first-sightings per ten-day period in the Netherlands for Greylag Geese neck-banded in Scania, Norway and Södermanland as per cent of the totals from each area seen in the autumns of 1988–1990.
Ackumulerat antal första-observationer per tiodagarsperiod i Nederländerna för grågäss halsmärkta i Skåne, Norge och Södermanland som procent av totala antalet från resp. märkområde sedda under höstarna 1988–1990.

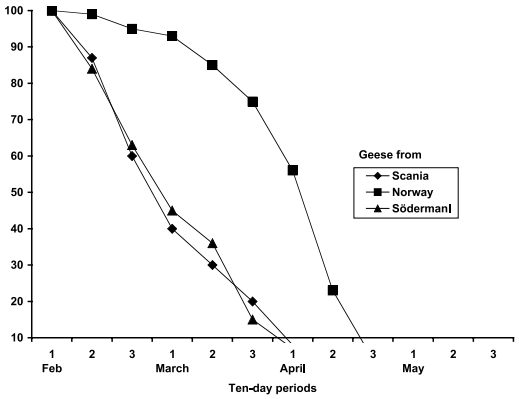


Figure 12. Spring departure of Greylag Geese neck-banded in Scania, Norway and Södermanland from the Netherlands, as per cent of the total remaining in different ten-day periods. Accumulated totals for the years 1989–1991.
Bortflyttning under våren från Nederländerna av grågäss halsmärkta i Skåne, Norge och Södermanland som procent kvarvarande per tiodagarsperiod. Ackumulerade summor för 1989–1991.

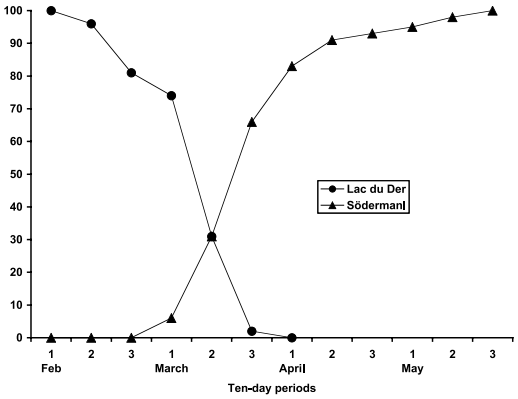


Figure 13. Departure of neck-banded Greylag Geese from the winter area at Lac du Der, France, and arrival in the breeding area in Södermanland, in the springs 1987–91. Departure is shown as the percentage of the total sample remaining after each ten-day period, whereas arrival is shown as the cumulative number arrived per ten-day period as per cent of the total number seen in the country during the season.
Bortflyttning för halsmärkta grågäss från vinterområdet i Lac du Der, Frankrike och ankomst till häckningsområdet i Södermanland, vårarna 1987–1991. Bortflyttningen visas som procentandelen kvarvarande gäss av totalantalet beräknat per tiodagarsperiod, medan ankomsten visas som den ackumulerade summan av alla ankomna gäss per tiodagarsperiod i procent av det totala antalet sedda gäss under hösten.

Greylag Geese from northern Norway (Troms and Finnmark counties) mainly migrated from early September and during October, accordingly arriving later in Denmark and the Netherlands.

Norwegian Greylag Geese to a large extent left the Netherlands during November (Figure 6), the numbers seen in the country being much lower during the winter than in late autumn (Appendix 1). They passed France rapidly with only a few readings reported, but a number of geese were reported shot. Arrival in Spain was mainly during November and early December when about 70% had arrived in the Guadalquivir Marismas. A number of Greylag Geese from Norway also stayed at wintering sites in north-central Spain, such as Villafáfila and Laguna de la Nava, these sites also functioning as staging areas.

Wintering Norwegian Greylags left Spain during February, about 25% remained in early March, but very few were seen after mid-March (Figure 16). A few birds were seen staging in France on spring migration before arriving in the Netherlands. Spring departure from the Netherlands started in March, but 50% were still in the Netherlands in early April, leaving before the end of the month. On Vega, with a high observation frequency, the breeding population returned during April (Figure 17). The few birds marked in Troms and Finnmark arrived in the breeding areas during May, probably after having staged somewhere along the Norwegian coast.

Denmark

Danish Greylag Geese showed a similar pattern of distribution as the geese from Scania (Figure 18, Appendix 1 and 2). The majority remained in Denmark until September (Figure 18, Appendix 2), then most Greylags left and in November, only five observations were reported from Denmark. Danish Greylag Geese were seen in the Netherlands in most months but mainly in September–November and March and in the Guadalquivir Marismas during October–February.

Gotland

Neck-banding of a Greylag Goose family on the south-eastern part of Gotland yielded observations in Germany, the Netherlands and Spain. Also geese ringed on moulting areas on Gotland and later on observed on Gotland under circumstances indicating breeding were recorded in these countries. This indicates that the breeding population on Gotland follows the Atlantic flyway (Appendix 1).

In total, 70 of the 87 Greylag Geese marked as moulters on Gotland were recorded on the Atlantic flyway (sightings in September – April in the

Netherlands and Spain), whereas only four were seen along the Continental flyway (Figure 18, Appendix 1 and 2): one was seen in Algeria, two in Hungary and and onethe other in Austria, the Czech Republic and Tunisia; the latter apparently breeding in Austria.

Breeding as well as moulting Greylag Geese left Gotland already in July and very few were present towards the end of August. They appeared in Scania and along the Baltic coast of Germany in late summer and early autumn (Figure 18, Appendix 2). The geese stayed in Scania and northern Germany for some months. Their pattern of apparence during autumn and winter was similar to that of Scanian Greylags.

Other Swedish sites

Thirteen out of 15 geese (two breeders and 13 moulters) from the Stockholm archipelago were seen along the Atlantic migration route. Another one was found dead on its nest in Brandenburg, Germany, close to the Polish border almost two years after ringing. Likewise, two out of three Greylags marked at Lake Tåkern were observed along the Atlantic flyway.

Of 13 Greylag Geese neck-banded in Norrbotten (one breeder and 12 moulters), six were later seen in the Netherlands and three of them also in Spain. One goose was seen at Liminka in central Finland during the autumn following ringing, and later in Sweden. During the first autumn migration following ringing birds from Norrbotten were recorded on staging areas in east-central Sweden.

Oslo

Greylag Geese from this area left late in autumn, staged in western Jutland and wintered in the Netherlands (Figure 18). A few birds were reported from sites in north-western Germany, but only one was found further south than the Dutch Delta, at Villafáfila.

Finland

Of 23 wild Greylag Geese ringed in south-western Finland (eight breeders and 15 moulters), 13 were observed outside Finland. Observations were obtained from the Netherlands, Spain, Estonia, Poland, Hungary, Austria, Italy, Tunisia and Algeria. Three of them apparently followed the Atlantic flyway, whereas the other ten were seen along the geese were seen along the flyway through western Europe (in total 5 observations) and seven along the Continental flywayin total 11 observations (Figure18, Appendix 1 and 2). One of the latter was found breeding in Poland, and re-sighted on migration in Hungary and Italy.

Reared Greylag Geese were released mainly as juveniles (without foster-parents) on three different localities along the Finnish coast. Of 20 geese from Inkoo (Table 1) on the south coast, three were observed abroad, in Spain, Austria and Poland respectively, while the others were only seen locally in Finland. Of the 27 geese released at Nykarleby (Table 1) on the west coast, a group of six was seen in Austria and two birds were recorded in the Netherlands, one of them also sighted several times in Germany and Sweden. A total of 64 Greylag Geese was released at Kalajoki (Table 1) further north on the west coast. Four of them were seen in Denmark, western Germany, the Netherlands and Spain along the Atlantic flyway and four in Austria-Hungary along the Continental (Appendix 1 and 2).

Important staging and wintering areas

Denmark

The western coast of Jutland is an important staging area for Norwegian Greylag Geese, mainly in autumn but also to some degree in spring. In fact, 649 different individuals were actually re-sighted in western Jutland, i.e. probably more than 50% of all available marked Greylag Geese (taking numbers marked, mortality rate and observation frequency into account). During the first years of the project, few observations were reported from the west coast, probably due to a low observation frequency. During the last three seasons a high number of individual neck collars was reported from here due to intensive field-work in the main staging area. A few Norwegian-marked Greylags observed in eastern Denmark may be West Baltic birds, caught on moulting grounds on the Helgeland coast south of Vega.

Eastern Denmark, mainly the three islands Själland, Lolland and Falster, was regularly frequented by geese from the marked population in Scania, both during migration periods and moult. A large proportion of the observations (Appendix 1 and 2) came from the moulting places at the Maribo lakes and on Saltholm (Nilsson et al. 2001). Very few individuals from Södermanland and Gotland were reported from Denmark.

The Netherlands

This was the most important country for staging Nordic Greylag Geese. Moreover, parts of the country were also important as winter areas. In all, 37,207 observations of neck-banded Greylag Geese from the Nordic countries were reported from the Netherlands during the period considered here. During the five seasons 1986/87–1990/91 37 % (of 307), 52% (of 641), 70% (of 1037), 66% (of 1261) and 60% (of 1397) of the Greylag Geese seen were recorded in The Netherlands.

The proportion of marked Greylag Geese seen in the Netherlands differed among the different marking areas (Table 3). In the first season after marking, 81% of allthe adult Greylag Geese from Norway seen abroad were actually recorded in the Netherlands, whereas the corresponding figures for Greylag Geese from Scania and Södermanland were 45% and 31%, respectively. Most Scanian Greylag Geese probably passed the Netherlands en route to Spain, but several were probably overlooked as they only staged for a short period. Most Södermanland geese wintering in France probably moved directly to this country.

Temporal pattern

Greylag Geese from the three main marking areas showed different temporal patterns of appearence in the Netherlands (Figure 19). The first Greylag Geese from Norway arrived in the Netherlands during August and September, whereas geese from Södermanland and Scania arrived during October, only few being seen earlier (Figure 10). In most years, the arrival patterns in the Netherlands of Greylags from the two main Swedish marking areas were very similar. Greylag Geese from Denmark and Gotland (moulting birds) showed a similar seasonal appearence in the Netherlands.

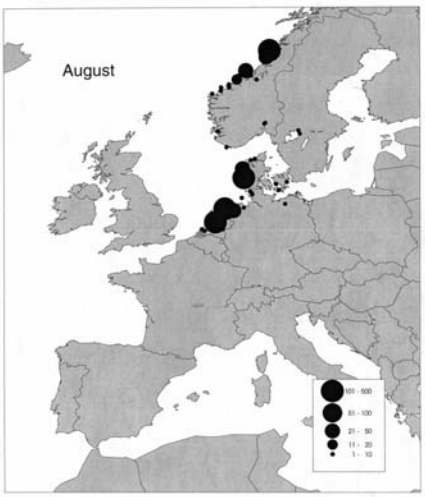
By early November, more than 85% of all Greylags to be seen in the Netherlands during autumn and early winter had been recorded. The number of birds from Scania decreased through November as did the number of Norwegian birds, in contrast to the birds from Södermanland. Norwegian and Scanian Greylag Geese staging in the Netherlands and migrating to Spain mainly left during November (Figure 6). The numbers of all three groups decreased until the end of December, moderate numbers remaining in the Netherlands throughout the winter. During the winter about 10% of the maximum number of Norwegian-marked Greylags remained in the Netherlands compared to 20% of the geese from Scania and 35% of the birds from Södermanland. As stated above the proportion of Scanian geese wintering in the Netherlands showed an increasing trend during the study period (Figure 7).

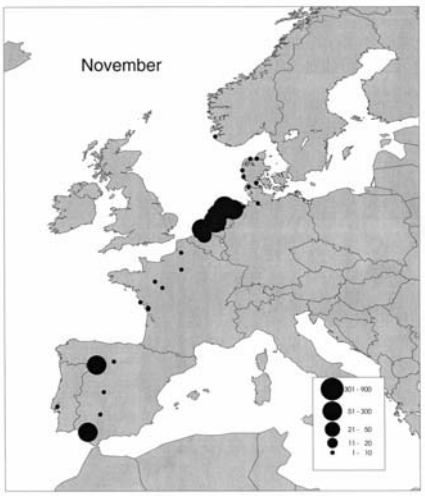
In spring, a large number of Norwegian birds used the Netherlands for staging, whereas others passed the Netherlands quickly. The first Greylag Geese that had wintered in Spain returned to the Netherlands during February, the main arrival month being March (Figure 16), when a peak in the number of marked Norwegian Greylag Geese was noted (Figure 19). Greylag Geese from Scania were back in the Netherlands much earlier than Norwegian ones. The main departure for Swedish birds was during March, whereas Norwegian Greylags left the country mainly during April (Figure 12). The springs of 1989–1995 were extremely early and many Swedish Greylag Geese left the Netherlands already during February, some already in January. The earliest marked individual known to have been in the wintering areas in the Netherlands (the Delta) in 1994/95 was back in SW Scania in mid-November 1994 (all the time accompanied with its family). In the 1990s, Dutch-wintering birds regularly were arriving back in Scania from the middle of January.

The length of stay on staging areas in the northern Netherlands was markedly different for Greylag Geese from Scania and Norway, both during autumn and spring (Figure 5). In the autumns of 1988 –1990, 65–84% of Greylag Geese from Scania seen at Lauwersmeer, Dollard and/or Flevoland stayed for less than 10 days, an appreciable proportion being seen only for one day. Few geese remained in the same area more than a month. For Norwegian Greylag Geese the situation was different. Even if 32%–39% of the geese at Lauwersmeer were only seen once a much higher proportion remained in the same area for a longer period. In spring, the situation was the same as in autumn, but staging periods were shorter, both for Scanian and Norwegian Greylags.

Geographical pattern

Different areas in the Netherlands are of different importance for Greylag Geese from the Nordic countries (Voslamber et.al. 1993). Differences in seasonal and geographical patterns are illustrated in a series of maps and graphs (Figure 20, 21). As seen by the maps five areas are of major importance for the Nordic Greylag Geese: Dollard, Lauwersmeer, south-west Friesland, Flevoland, and the Delta area. During the four seasons 1987/88 – 1990/91, good coverage was obtained from Dollard, Lauwersmeer,


August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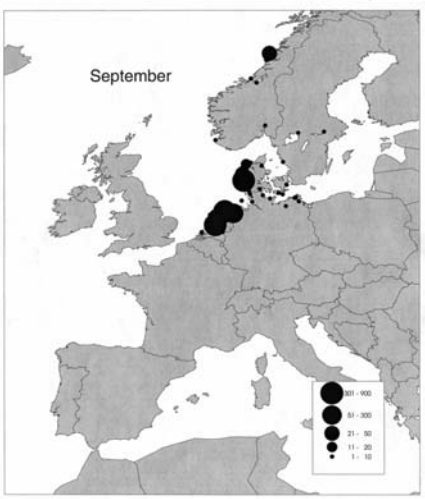
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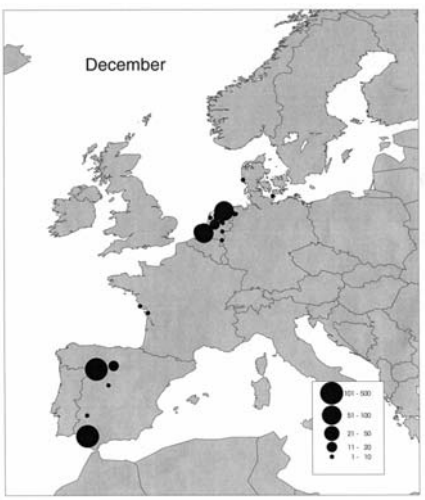
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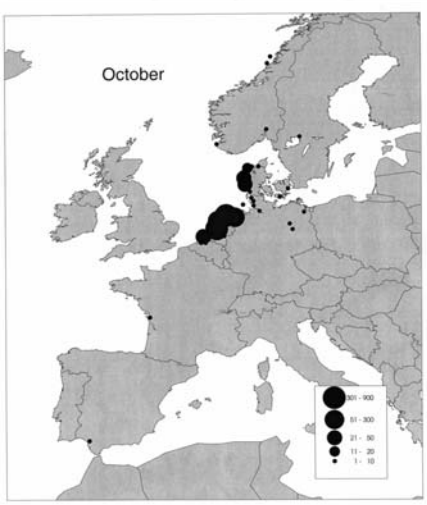
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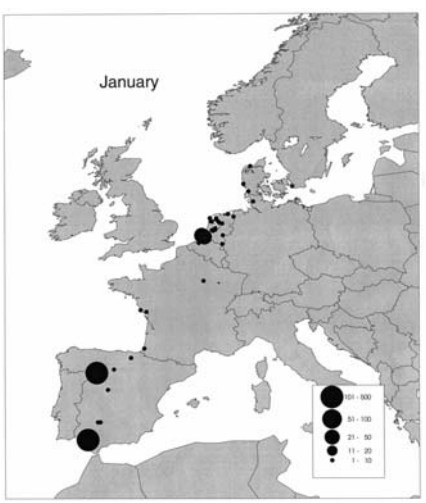
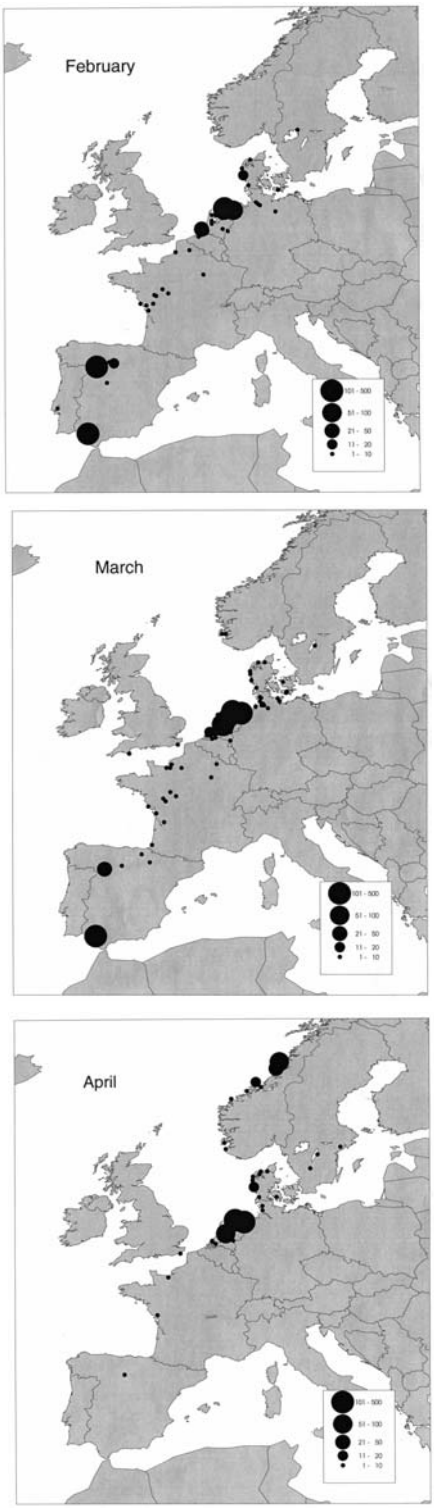

January



Flevoland and the Delta area, wich are given a more detailed treatment below (Figure 21). When comparing the three cohorts the different numbers marked must be taken into consideration.

Dollard (incl. the German parts) was used to some extent by Greylag Geese from all three main study areas both during autumn and spring migration, even if only relatively small numbers of Scanian birds were found here in spring as in other Dutch staging areas. Compared to the other Dutch areas Dollard was of minor importance for Norwegian Greylag Geese during the years considered here. Together with the Delta area Dollard was the most important area in the Netherlands for Greylag Geese from Södermanland, forming a staging area for the geese wintering in the Delta both during autumn and spring migration. Thus in 1989/90 monthly peak number of individuals seen in the area from this population was 41 in the autumn and 43 in February (accumulated total marked before this winter was 310).

The Lauwersmeer area was almost exclusively used as a staging area for Norwegian Greylag Geese, both during autumn and spring, whereas only very few marked Greylags were found in this area in winter during the years considered here. The highest monthly total of reported marked Norwegian Greylags for these years was 180 in September 1990 (accumulated total marked before this winter was 914). As a comparison the highest total for Greylag Geese marked in Scania was 17 (October 1989). Single birds from Södermanland were seen in the area on a number of occassions. For the entire study period 1213 individuals out of 1854 marked Greylag Geese from Norway were seen in the Lauwersmeer area on at least one occasion.

The Flevoland area appears to be a pronounced autumn staging area for Greylag Geese from Norway and to a smaller extent for birds from Scania, while geese from Södermanland used this area to a very small extent. Monthly maximum numbers of re-sighted marked geese during the four seasons were 245 marked in Norway in September 1989 and 76 Scanian in October 1990, respectively. For the entire study period 1024 Norwegian and 422 Scanian-marked Greylag Geese were seen in Flevoland on at least one occasion.

Figure 14. Geographical distribution of observations of neck-banded Greylag Geese from Norway during August–April, 1986/1987–1994/1995. Each individual included once per locality and month.
Geografisk utbredning av observationer av halsmärkta grågäss från Norge augusti–april 1986/1987–1994/1995. Observationer i märkområdet visas ej. Varje individ räknas en gång per lokal och månad

The Delta area was mainly used as a staging area during late autumn and as a winter area. In contrast to the other three areas discussed here, Greylag Geese from all the three main marking areas were represented here in good numbers. The seasonal pattern as illustrated in Figure 21 is influenced by the habitat choice of the geese to a higher extent than in the other areas, as many geese change from feeding in agricultural areas in autumn to feeding in intertidal areas during the winter (Castelijns et al. 1998), where they are difficult to find. Monthly maximum of marked geese seen from the three areas were all found in November with 29 for those marked in Norway (1988), 63 for Scania (1990) and 37 for Södermanland (1989). In all, 380 of the Greylag Geese from Scania were resighted in the Delta area.

The majority of the Greylag Geese from Scania seen in the Delta area was not recorded in any other area during the winter months (Table 4), whereas about half of the individuals from Norway and Södermanland was also seen in another area in winter, often, however, in another year. Oyf Greylags marked in Scania and Norway, 13 and 16% were later seen in Spain in the same season, whereas none of the geese from Södermanland made the same flight. 14.5 % of all geese visiting the Delta were either seen in France or Spain in the same winter. 18% were seen in another winter area (mainly in Spain) in another The percentage of Delta geese seen in Spain in another season for birds from the three main marking areas was 21, 33 and 8 %, respectively.

Seventeen per cent of the Södermanland Greylags were seen in the Dutch Delta earlier the same season before arriving in their main wintering area at Lac du Der in France, whereas the same percentage was found in France in another year. Among the geese followed for a number of seasons, some shifts in winter quarters were apparent, all of them going in the same direction, from a southern to a more northern area, mainly from the Guadalquivir Marismas (and Morocco) to the Dutch Delta. Such shifts were, however, difficult to establish as some individuals left the Netherlands for south-western Spain as late as around New Year.

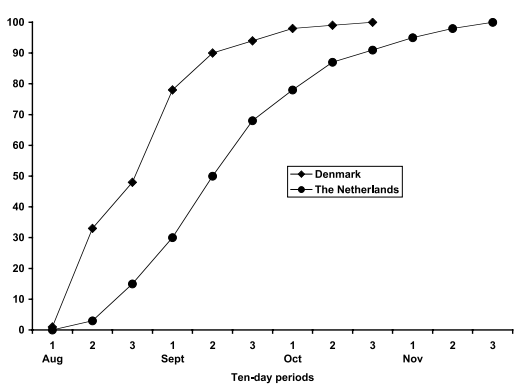


Figure 15. Arrival of Norwegian-marked Greylag Geese in Denmark and the Netherlands, respectively, in the autumns 1992–1994. Arrival is shown as the cumulative number arrived per ten-day period, as per cent of the total number seen in the country during the autumn.
Ankomst av norskmärkta grågäss i Danmark och Nederländerna under höstarna 1992–1994. Ankomsten visas som den ackumulerade summan i resp. land per tiodagarsperiod i procent av det totala antalet märkta individer sedda i landet under hösten.

France

France was mainly a transitory country for Greylag Geese, in autumn as well as in spring. The recently created reservoir Lac du Der (Figure 2) is the most important area for Nordic Greylag Geese (Mouronval et al. 1996). In all, 52% (N=405) of all Greylag Geese marked in fromSödermanland were recorded here, several of them for a number of seasons more than one season. No birds(?) from other marking

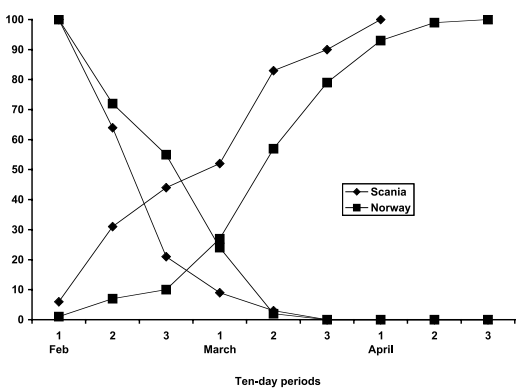


Figure 16. Spring departure from Spain in 1990 and arrival into the Netherlands of neck-banded Greylag Geese from Scania and Norway in the springs of 1989–1991. Departure is shown as the percentage of the total sample remaining per ten-day period, whereas arrival is shown as the cumulative number arrived per ten-day period as per cent of the total number of arriving geese seen in the country during the spring.
Bortflyttning från Spanien våren 1990 och ankomst i Nederländerna för halsmärkta grågäss från Skåne och Norge vårarna 1989–1991. Bortflyttningen visas som procentandelen kvarvarande gäss av totalantalet sedda i resp. land beräknat per tiodagarsperiod medan ankomsten visas som den ackumulerade summan av alla ankomna gäss per tiodagarsperiod i procent av det totala antalet sedda gäss under våren.

areas in the Nordic countries have ever been reported from Lac du Der.

There are only a few other staging areas in France. Along the Atlantic coast sites in Vendeé are visited by Nordic Greylag Geese, especially in spring (Yésou 1991). In total, 70 and 63 individuals from Scania and Norway, respectively, were sighted or reported shot in France from each of these areas respectively. The records obtained from France (both coastal and inland) fell on the direct migration route between then Netherlands and northern Spain (Figure 3, 14).

Spain

The Guadalquivir Marismas in south-western Spain have since long been known as the most important wintering area for Greylag Geese in the Atlantic flyway (Lund 1971, Calderón et al. 1991, Madsen 1991, Nilsson et al. 1999a). Accordingly, a large number of observations was obtained from here, even if as has been mentioned above, the figures do not represent the true picture due to observational difficulties. Two partly restored wetlands in the Duero Basin in the north-central part of the country have quickly become winter areas of international importance for Greylags: Villafáfila in the 1980s (Palacios & Rodríguez 1989), and Laguna de la Nava in the 1990s (Jubete 1991). A detailed analysis of the occurrene of neck-banded Greylags in Spain will be presented elsewhere (Persson in prep), but we include a general presentation for comparison with the other areas.

In all, 353 Greylag Geese from Scania were recorded in the Guadalquivir Marismas during December–February compared to 51 individuals at Villafáfila. For Norwegian Greylag Geese, the corresponding figures are 632 and 385, respectively. At every single visit to Villafáfila between mid-November and mid-February during which more than 50 neck-banded Greylags were recorded, the proportion of Norwegians fell within the range 75–90%. That range of percentages applied also to every single season during the period 1987/88–1994/95. A similar dominance of Norwegians birds among the neck-banded ones was recorded at Laguna de la Nava, but the total number of sightings was still low at this site.

Available sightings showed that Villafáfila was used for both staging and wintering (Table 5). A detailed analysis of the entire data set revealed a very complex pattern of use (Persson unpubl.). The movements between the two main areas in Spain were spread over the entire winter, southwards from

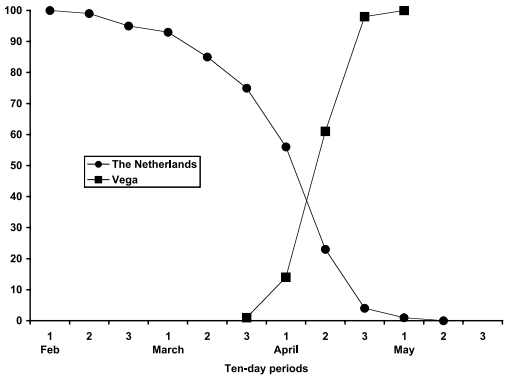


Figure 17. Spring departure of Greylag Geese neck-banded on Vega in Norway from the staging and winter area in the Netherlands and arrival in the breeding area in Vega on the Norwegian coast. Departure is shown as the percentage of the total sample remaining after each ten-day period, whereas arrival is shown as the cumulative number arrived per ten-day period as per cent of the total number seen in the country during the season. *Bortflyttning under våren av grågäss halsmärkta på Vega i Norge från rast och vinterområdena i Nederländerna och ankomst till häckningsområdet i Vega på den norska kusten. Bortflyttningen visas som procentandelen kvarvarande gäss per tiodagarsperiod, medan ankomsten visas som den ackumulerade summan anlända per tiodagarsperiod i procent av samtliga sedda under säsongen.*

the end of October to the end of February and northwards from the middle of November to the middle of March. Villafáfila was used by birds from both Norway and Sweden for stop-overs during autumn and spring migration as well as a refuge when met by bad wintering conditions in the Guadalquivir Marismas. The main pattern among Greylag Geese marked in Norway was, however, to arrive at Villafáfila in late November, to stay for a long period (up to three months) and then continue to Doñana National Park.

The main arrival for Greylag Geese in Spain occurred in the last days of October and during November. By mid-November, 87% of Scanian Greylag Geese to be seen in south-western Spain were already present here, whereas a large proportion of Norwegian Greylag Geese arrived appreciably later. For Scanian Greylag Geese the arrival pattern in Spain fits well with the departure from the Netherlands (Figure 6). Norwegian Greylag Geese showed the same departure pattern (measured as last-sightings) from the Netherlands as Scanian geese, but they arrived significantly later in Spain (Figure 6; see also Figure 22).

This difference between Scanian and Norwegian Greylags could be related to a difference in migration

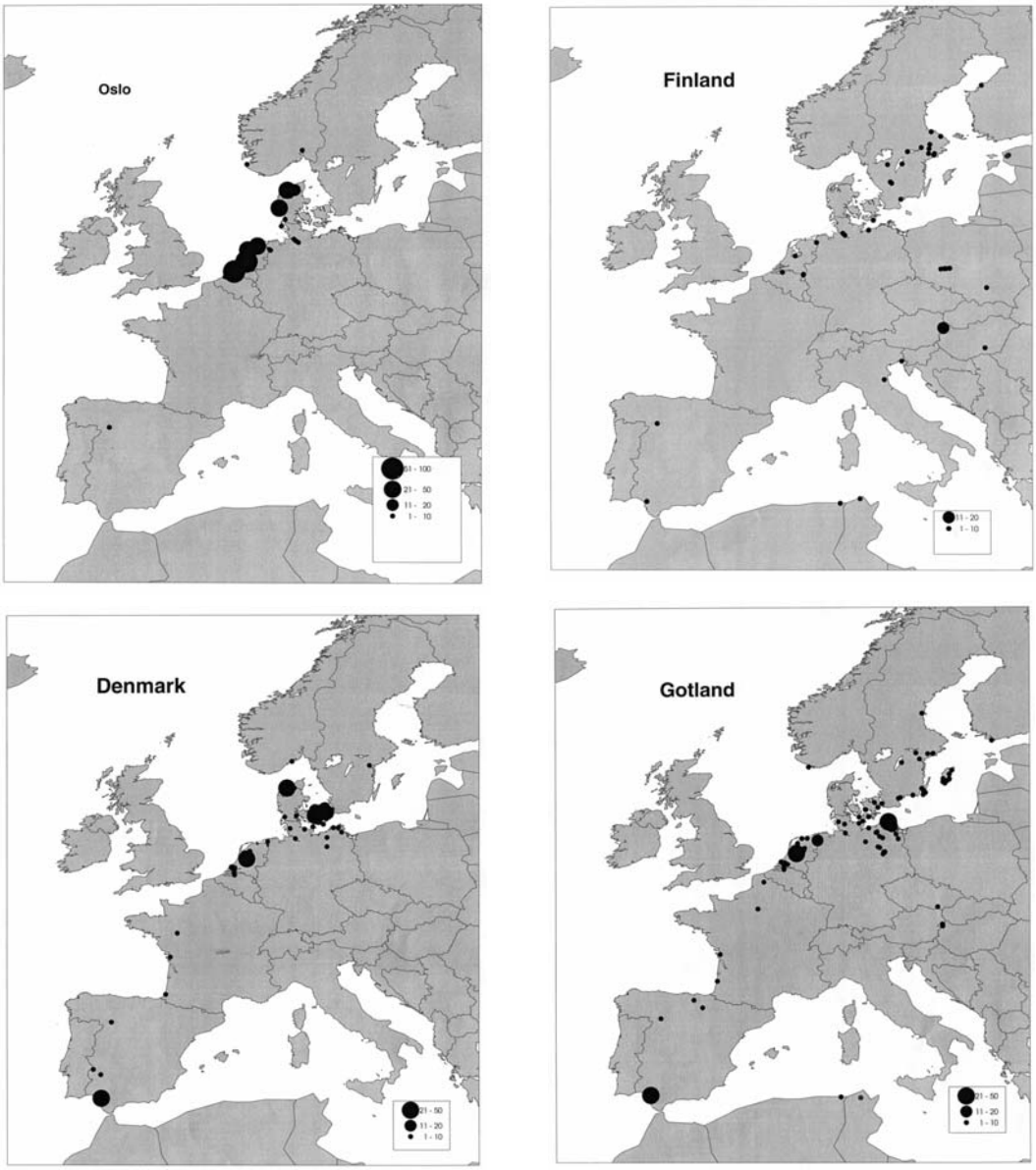


Figure 18. Geographical distribution of observations of neck-banded Greylag Geese from supplementary marking areas in Gotland, in Denmark, Finland and Oslo. One observation per individual and locality included.
Geografisk fördelning av observationer av halsmärkta gäss från märkområdena på Gotland, i Danmark, Finland och Oslo. En observation per individ och lokal har medtagits.

pattern combined with an uneven observation frequency among Spanish sites. Most West Baltic Greylags fly non-stop between the Netherlands and south-western Spain (Persson 1994b) and arrive in the Guadalquivir Marismas when the observation activity is highest. Most Norwegian Greylags, on the other hand, made a stop-over of varying length (up to three months) in north or central Spain with lower observation intensity before continuing to the Guadalquivir Marismas. For that reason, many Norwegians were not spotted until they arrived in the Guadalquivir Marismas, which for about one third

of the individuals occurred after mid-January (Persson 1993).

Spring migration from Spain was appreciably earlier for the Scanian than for the Norwegian birds, which fits with the observations in the Netherlands in spring (Figure 16). In the Guadalquivir Marismas, the timing of the spring migration varied considerably among years. For Norwegian Greylags, the median departure date was 15 days later after the extremely wet winter of 1989/90 than after the 1991/92 winter with "optimal" flooding conditions, while an intermediate date was recorded after the extremely dry winter of 1992/93 (Persson in prep.). The median dates were 10 March, 23 February and 1 March, respectively.

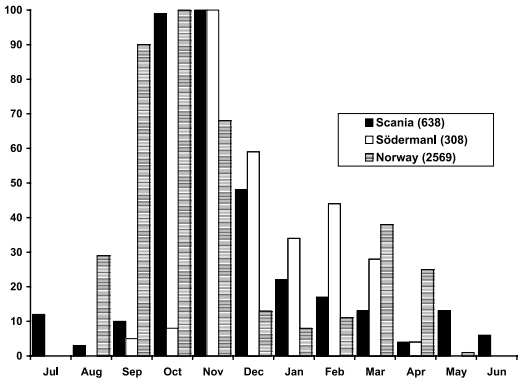


Figure 19. Monthly occurrence in the Netherlands of neck-banded Greylag Geese from Scania, Södermanland and Norway, as per cent of the maximum accumulated monthly total (given in the diagram for each area) for the seasons 1985/86–1994/95. Each individual included once per month in each season.

Månadsfördelning i Nederländerna av halsmärkta grågäss från Skåne, Södermanland och Norge som procent av den högsta ackumulerade månadssumman (visad i diagrammet) för säsongerna 1985/86–1994/95. Varje individ medräknad högst en gång per månad varje säsong.

Discussion

General migration pattern

The main study populations of this project belong to the North-west European Greylag Goose population (sensu Nilsson et al. 1999a) migrating along the Atlantic flyway. This flyway, stretching from northern Norway to south-western Spain, is very narrow, the Netherlands being the crossroad, where geese from all parts of the breeding range stage during the migration further south if they are not staying for the winter (Litzbarski 1982, this study). The present study revealed marked differences in migration pattern between natural populations in Norway and Sweden, as well as between natural and introduced populations.

After breeding, Scanian Greylag Geese gathered in small groups at their breeding sites (Nilsson & Persson 1992) together with geese returning from their moulting areas (Nilsson et al. 2001). These groups congregated into larger flocks eventually merging into one or two or three large flocks in the lakes and one coastal flock. During the early part of the autumn there was a lot of exchange between the lakes and the coast, whereas all geese were concentrated to the coast during the latter part of the season, before departing to the staging areas in the Netherlands. In contrast, the Norwegian Greylag Geese did not merge into summer flocks, but left the breeding areas rapidly for staging areas in Denmark and/or the Netherlands during the period from mid-August to early September. However, the most northerly breeding populations in Norway migrated south much later and not so rapidly.

Whereas the Norwegian Greylags arrived early in the Netherlands and used staging areas in this country (and Denmark) for building up their reserves after breeding, the Greylag Geese from Scania did not arrive until October–November after refuelling in Scania (Nilsson & Persson 1992, 1998). The Scanian Greylags stayed only for a short period on the staging areas before leaving for the winter quarters, which for an increasing proportion were situated in the Dutch Delta area. Even if the Norwegian and Scanian geese left the Netherlands for Spain at about the same time, the Norwegian geese arrived significantly later in the Marismas than the Scanian (Persson 1993), apparently having staged in northern or central Spain, where an increasing number of mainly Norwegian Greylags have started to use areas such as Villafáfila and Laguna de la Nava for staging but also for wintering..

In spring Swedish Greylag Geese left Spain before the Norwegian birds, passing north fast with only a short stay in the Netherlands, whereas Norwegian birds staged in the Netherlands for about a month. The Greylag Geese from Scania arrived in their breeding area early, several weeks before the start of breeding (Nilsson & Persson 1994), whereas the geese from Central Norway arrived in the breeding areas shortly before laying (A. Follestad unpubl.). The populations from northern Norway left the spring staging areas in the Netherlands at the same time as the geese from Central Norway but reach

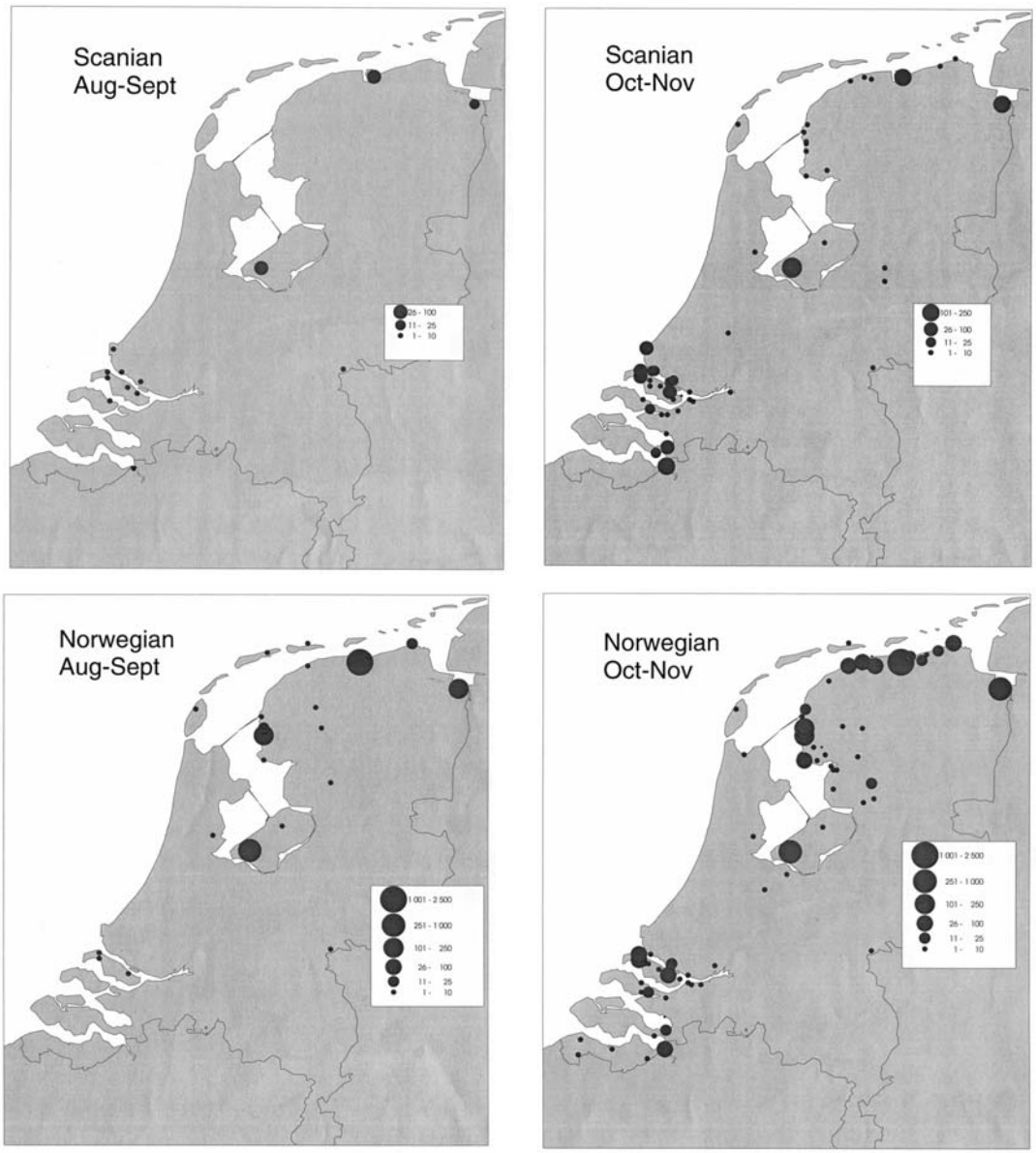
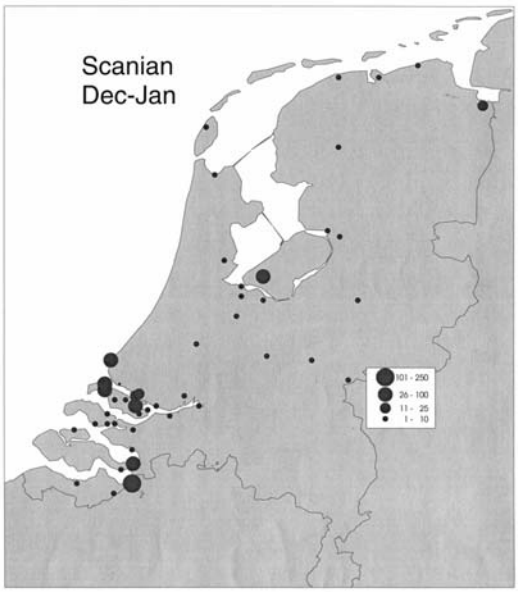
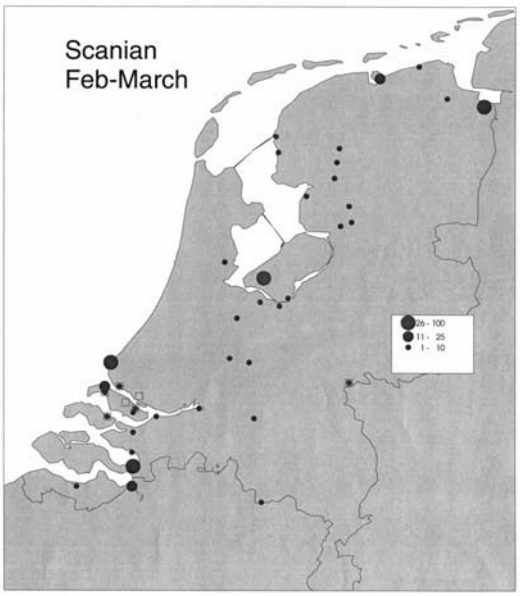


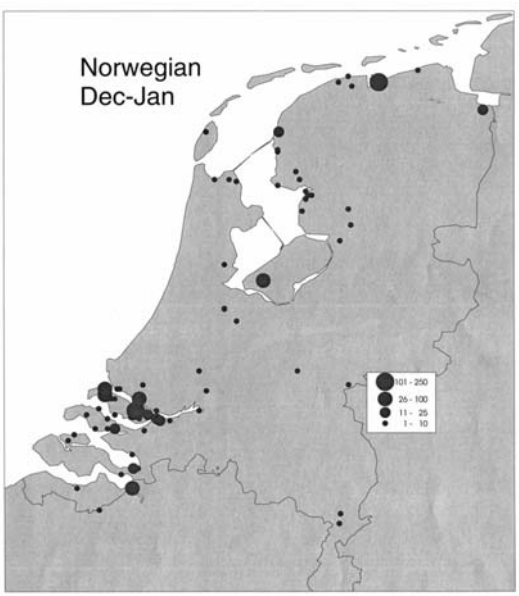
Figure 20. Local distribution of observations of neck-banded Greylag Geese from Norway and Scania in the Netherlands during different parts of the season, 1985–1995. One observation per individual and period included. Note that observations in the Dollard, Lauwersmeer and Flevoland are only represented by one symbol for the entire area.
Lokal fördelning av observationer av halsmärkta grågäss från Skåne och Norge i Nederländerna under olika delar av säsongen 1985–1995. En observation per individ och period medtagen. Notera att observationer från Dollard, Lauwersmeer och Flevoland sammanfattas i en symbol för resp. område.

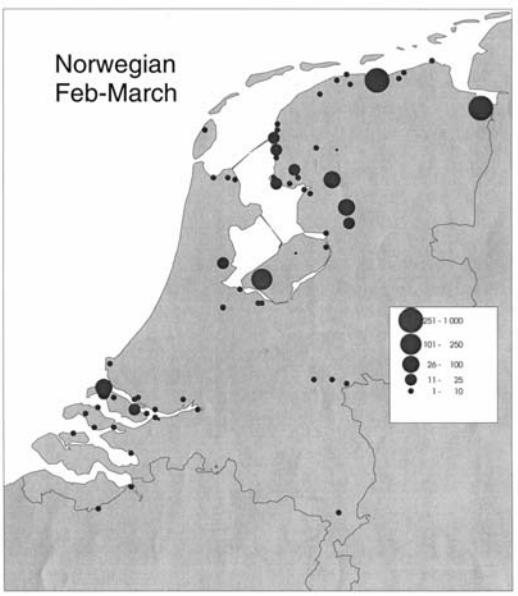
their breeding grounds much later, apparently using staging areas along the Norwegian coast.

The two naturalised populations studied showed different migration patterns from the natural ones. The Oslo population emanates from introductions started in the 1960s. They left late in autumn, migrating through Denmark to winter quarters in the Netherlands. The Greylag Geese in the study area in









Södermanland were introduced 1970 – 1975. They were found to have their main winter quarters at Lac du Der in inland northern France, a reservoir created in 1974 when the introduced Greylag Geese successively developed their migration pattern. This population thus has developed an unique migration pattern ending in a winter quarter between the large concentrations in the Netherlands and Spain. We believe that the choice of winter quarter more is a result of circumstances prevailing when the population was established rather than an influence from the Canada Geese. A small number of Greylag Geese from Södermanland staged during the first years of our study at the coast of south-western Sweden on localities used by the Canada Geese, but this habit has now ceased. Apparently, this stop-over was a heritage from their former foster-parents.

The migration patterns of Greylag Geese at Gülper

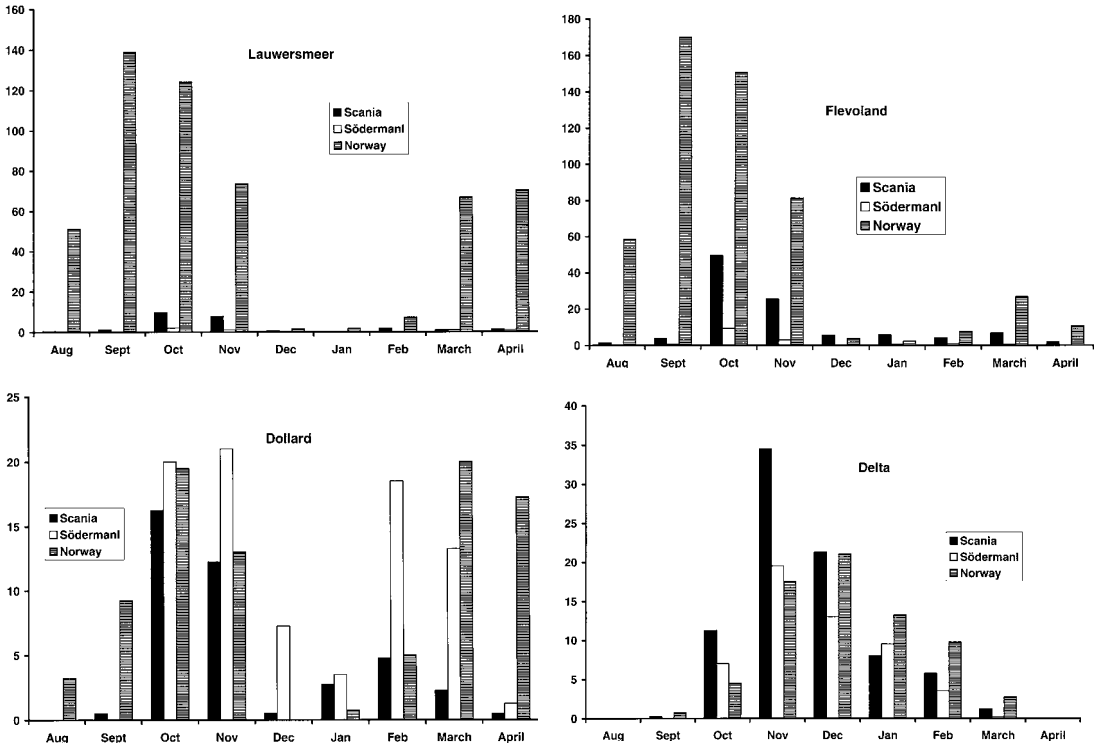


Figure 21. Monthly occurrence on four staging and wintering areas in the Netherlands of marked Greylag Geese from Scania, Södermanland and Norway, 1987/88–1990/91. Mean numbers of marked individuals seen calculated for the four season.
Månatligt uppträdande i fyra rast/vinterområden I Nederländerna av halsmärkta grågäss från Skåne, Södermanland och Norge, 1987/88–1990/91. Medeltal märkta individer har beräknats för de fyra åren.

See in Germany (Litzbarski 1982, Rutschke 1982, Rutschke et al. 1982) and Scania were generally similar. Formerly, the two populations used the same moulting place (Oostvaardersplassen in Flevoland, Zijlstra et. al. 1991), from which the majority of moulters migrated back to gathering places in Germany and Sweden, respectively; nowadays the Scanian Greylags moult on Saltholm close to the breeding area (Fox et al 1995, Nilsson et al. 2001). Some exchange occured between the two populations, young geese from Sweden appeared in autumn staging areas in eastern Germany, whereas families from Germany appeared in South Sweden. In East Germany, summer and autumn gathering places were generally more separated than in Scania (Rutschke 1982) and there was a migration from inland summer gathering places to autumn gathering places at the coast prior to autumn migration (Rutschke et al. 1982). In Scania, these movements were more of a local character (Nilsson & Persson 1992).

The Atlantic flyway was also used by Greylag Geese from parts of Poland (Gromadzki & Majewski 1984, Witkowski 1991), but the movement pattern of this population is less well-known. Some geese from the Czech Republic also migrated to wintering areas in south-western Spain (Hudec 1984b).

Traditionally, the border line between the Atlantic and Continental flyways runs northwards through the Baltic Sea and cross the Swedish east coast (cf. Madsen 1987). Finnish Greylag Geese did not yield as many observations as the neck-banded geese from the other Nordic countries. Even if a few observations were obtained from western Europe, most observations recorded indicate that Finnish Greylag Geese mainly follow the Central European flyway (Hudec 1984a, Dick et al. 1999), passing via Austria and ending in Tunisia and Algeria. Geese from the northern part of the Bothnian Bay apparently belong to the Atlantic flyway. However, we were not able to identify the border line in the north.

The Continental flyway is also used by Greylags from more easterly areas in Europe, such as part of

the Polish population (Gromadzki & Majewski 1984), Czechoslovakia (Hudec & Formanek 1970, Hudec 1984a, 1984b) and Austria (Dick et al. 1999). The movement pattern of this Central European population is less well-known, but summer movements after moulting from the Neusiedlersee area in Austria to southern Moravia are well documented (Dick et al. 1984, Hudec et al. 1986). Some geese from this population have earlier been recorded on Gotland, in Denmark and even Norway moulting in the same areas as birds from the other populations (Paludan 1965, 1973, Hudec 1984a, 1984b, Essen & Beinert 1982, this study), but these moulting areas now seem to have decreased in importance especially for geese with origin in east Europe. The exchange between the two main study populations in Sweden and the Continental flyway is minimal, one bird from Södermanland was found in Algeria and one from Scania was found in Hungary.

Migration strategies

After breeding and wing-moult the geese have an urgent need to build up their energy reserves. In Scania, the vast agricultural areas with a variety of crops which, especially after the harvest, provide the geese with high-quality food sources (Nilsson & Persson 1992, 1998). The increased cultivation of autumn-sown crops (mainly wheat and rape) in recent decades has markedly increased the food resources for different goose species late in the season after the ploughing up of harvested fields. In Norway, on the other hand, the geese fed on grassland or heather moors after breeding. The heather moors, usually very close to the breeding grounds, offered the geese a variety of roots, seeds and berries (Follestad 1999). Hence, in both study areas the geese could stay and build up their reserves close to the breeding areas. The geese from Södermanland followed the same pattern as the geese from Scania.

In the study period, Norwegian Greylags left the breeding grounds as soon as they had attained full flying ability during August (except for the most northerly populations). When arriving in Denmark or the Netherlands they could feed mainly on stubble fields (Nilsson et al. 1999a). The rich food resources in Denmark and the Netherlands give the Norwegian Greylag Geese good opportunities to go through the body moult and to build up their energy reserves before they continue their autumn migration. The Norwegian Greylags thus differ from the West Baltic Greylags, which go through the body moult close to the breeding grounds, before they start the autumn migration. The present situation in Norway differs from that in the 1960s and 1970s, when the geese migrated during September and early October. Recent information from local people indicate that *Zostera* beds were an important food resource before 1980 (Follestad unpubl.).

During the autumn, the vast agricultural areas in the Netherlands offered the Greylag Geese a variety of rich feeding areas, from left-overs of root crops after the harvest, to stubble fields, grassland and autumn-sown cereals and rape (see refs in Nilsson et al. 1999a). In addition, there were still wetland areas offering nutritious tubers of *Scirpus maritimus* and several other species. These tubers are especially important during the winter.

The West Baltic Greylag Goose is a *grubber* in winter, preferably feeding on underground storage organs of marsh plants, e.g. *Scirpus* tubers, while the Norwegian is a *grazer* (Persson unpubl.). This may explain the dominance for Norwegian birds on the stubble fields in Lauwersmeer and Flevoland, whereas the Dollard and the Delta area offered good feeding areas for the geese from Scania and Södermanland in late autumn and winter, feeding on the tubers. The marked increase in the number of Scanian Greylag Geese wintering in the Dutch Delta and especially in the Verdronken Land van Saeftinghe can be seen in relation to their preference to feed on *Scirpus* tubers in winter. The tidal marshes in Land van Saeftinghe offer large food resources for wintering geese in form of *Scirpus* tubers (Castelijns et al. 1998). Before the hunting ban in the winter 1989/90, these areas could not be fully used due to disturbance, but when the area was fully protected a marked increase in Greylag Goose numbers started (Castelijns et al. 1998).

Arctic-breeding geese like the Barnacle Goose *Branta leucopsis* and the Brent Goose *Branta bernicla* have very pronounced stop-over sites, where large numbers of geese stay for refuelling for some time (Madsen et al. 1999). For instance, the Brent Goose move from staging areas in the White Sea to the Danish/NW German North Sea coast, which means about 1840 km non-stop flight. Geese breeding in temperate latitudes are less well studied in this respect. The Taiga Bean Goose *Anser fabalis* in northwest Europe use several stop-over sites between breeding and winter quarters (Nilsson et al. 1999b). In our study we found that the Greylag Goose usually use several staging areas. Some groups stop for shorter periods of one or a few days on their migration, while most use the staging areas for a week or more. From the breeding sites in central

Table 4. Observations of neck-banded Greylag Geese from the Nordic countries in the Dutch Delta area separated into those apparently wintering there (only seen in the Delta and areas further north) and those which have also been seen in areas further south. Each individual is only represented once in the table. Observations up to 1994/95 included.
Observationer av halsmärkta grågäss från de nordiska länderna i det holländska deltaområdet separerade på dem som sannolikt övervintrar där (endast sedda i deltaområdet och områden längre norrut) och de, som också setts i områden längre söderut. Varje individ är representerad högst en gång i tabellen. Observationer till och med 1994/95 medtagna.

Observation areas	Number of individuals from		
	Scania	Norway	Södermanland
Delta only	247	156	57
Delta – France same year	3	0	22
Delta – France different years	0	1	22
Delta – France – Spain same year	2	0	6
Delta – Spain same year	48	53	0
Delta – Spain different years	40	33	9
Spain – Delta same year	0	7	0
Spain – Delta different years	39	72	1
Morocco – Delta different years	1	0	0
France – Delta different years	0	0	12
Total	380	322	129

Norway to western Jutland in Denmark the distance is about 1100 km. Greylag Geese leaving Scania for the Netherlands have a non-stop migration of about 550 km, while geese from Södermanland to the same destination cover about 960 km and to Lac du Der in France about 1400 km. Geese starting in the Netherlands to southern Spain are facing a 2000 km flight. The longest non-stop flight indicated in our study seems to be from Scania to southern Spain which is about 2500 km. Even if the Greylag Goose thus usually have moderate distances of non-stop flights, they are apparently capable of covering flights comparable to those of Arctic-breeding geese. Theoretically, a Greylag Goose can cover a distance of 3800 km between breeding and wintering areas (Hedenström & Alerstam 1998).

Bernis (1964) reported that north-central Spain was used by two different groups of Greylag Geese (one staging en route to the Guadalquivir Marismas, the other wintering in the Duero Basin), which probably originated from different parts of the breeding range. Chapman & Buck (1910) stated half a century earlier that the main food for Greylags in mid-winter was Scirpus tubers in the Guadalquivir Marismas, while geese in other regions of Andalucia in general fed on open grassy plains.

The first time grazing Greylags were found in the Guadalquivir Marismas also during wet winters was in the early 1980s (Plácido Rodríguez pers. comm). In the winters 1989/90 and 1990/91, nearly all Norwegian Greylags wintering in the Iberian Peninsula used the Guadalquivir Marismas during at least one part of the winter (Persson 1997). Since then, the Norwegian Greylags have used the Duero Basin more and more, and very likely, about 20,000 wintered at Villafáfila in the late nineties (Persson unpubl.). Apparently, two shifts in wintering-area selection have taken place during the last decades: first to the Guadalquivir Marismas some time before the early 1980s and then, a return to use north-central Spain.

The first shift could have been caused by the large-scale modernization of Spanish agriculture of the time. The most important consequence of these changes was probably the loss of safe night roosts, when seasonally flooded wetlands were reclaimed. Hunting, however, was of little significance (Bernis et al. 1964), until the loss of most roosting sites caused excessive hunting disturbance in the few remaining sites. The return of the Norwegian Greylags to the Duero Basin can therefore be seen as a reaction to the creation of safe roosts, first at Villafáfila and later at Laguna de la Nava.

A strong evidence that the presence of Norwegian Greylags in Doñana National Park was normally related to a lack of suitable roosts in areas further north was obtained in the winter of 1997/98. In the autumn of 1997, precipitation was high in north-

Table 5. Neck-banded Greylag Geese from Scania and Norway seen in Spain during the winters of 1989/90 and 1990/91. Each individual included once per winter in the table.
Halsmärkta grågäss från Skåne och Norge sedda i Spanien under vintrarma 1989/90 och 1990/91. Varje individ noteras högst en gång per vinter i tabellen.

	Number of individuals from			
	Scania		Norway	
Observation areas	89/90	90/91	89/90	90/91
Villafáfila only	18	15	84	101
Villafáfila–Guadalquivir Marismas	1	0	16	6
Villafáfila–Guadalquivir Marismas–Villafáfila	0	0	2	2
Guadalquivir Marismas–Villafáfila	3	2	6	1
Guadalquivir Marismas only	164	146	190	158
Total	186	163	298	268

central Spain and several areas that do not hold water in a normal winter were flooded, offering the geese a large selection of potential roosts. In mid-winter, more geese than ever were recorded in the Villafáfila area, several thousands of these using temporarily flooded sites for roosting (HP pers. obs). The same behaviour was recorded in the surroundings of Laguna de la Nava (Fernando Jubete pers. comm.). Simultaneously, a sharp decline in the number of wintering Norwegian Greylags occurred in the Guadalquivir Marismas (José Ramón Magro pers. comm.).

The observed difference in arrival pattern in Spain, West Baltic Greylags coming ahead of the Norwegians (Persson 1993, this study), can be related to the above-mentioned difference in food choice. As all natural goose habitats in Spain dry out during the summer, they do not offer the geese food until after the first autumn rain. The mainly grazing Norwegian Greylags must await the regrowth grass after the start of the rains. As the start of the rainy period varies considerably among years, Norwegian Greylags must delay their arrival until there are enough feeding opportunities. The West Baltic Greylags, on the other hand, have escaped this dependence, as the large-scale rice-growing in reclaimed parts of the Guadalquivir Marismas offers them an alternative food source in years when the first autumn rain comes late (Persson 1996).

Most Greylags wintering in Spain reached the country by a non-stop flight from the Netherlands (Persson 1994b). To which degree these non-stop flights are due to the extremely high hunting pressure in France (Persson 1999) is not known. The fact that many neck-banded individuals have made autumnal stop-overs in France indicates, however, that the behaviour of crossing France might be strongly human-influenced.

During spring migration it would be optimal to use stop-over sites between the wintering and breeding grounds. Large numbers of Greylag Geese use Villafáfila and Laguna de la Nava after having spent the winter in the Guadalquivir Marismas (Jubete 1997, Jubete & Gómez-Crespo 1997, HP pers. obs.). Scanian Greylags using this strategy were found to significantly increase their reproductive success (Nilsson & Persson 1996). Moreover, many Scanian

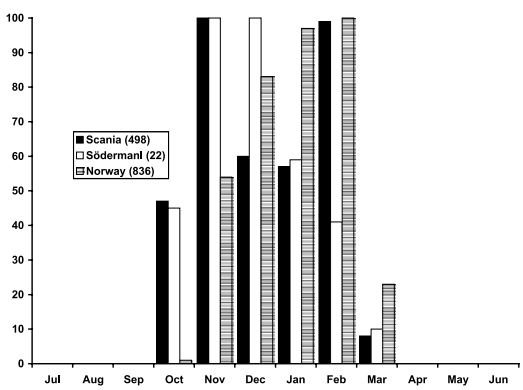


Figure 22. Monthly occurrence in Spain of neck-banded Greylag Geese from Scania, Södermanland and Norway, as per cent of the maximum accumulated monthly total (given in diagram for each area) for the seasons 1985/86–1994/95. Each individual included once per month in each season.
Månatligt uppträdande i Spanien av halsmärkta grågäss från Skåne, Södermanland och Norge som procent av den högsta ackumulerade månadssumman (visad i diagrammet) för säsongerna 1985/86–1994/95. Varje individ medräknad en gång per månad och säsong.

Greylags wintering in the Netherlands were recorded staging during their return flight to the breeding grounds, despite the total distance covered being only 550 km. The heavy use of small hunting-free reserves along the French Atlantic coast by spring-staging Greylags (see e.g. Poiré 1995) may be seen in relation to this strategy.

The main difference in spring migration strategy between the Norwegian and Scanian Greylags is related to the need to build up energy reserves before the start of breeding. In normal years, Scanian Greylags could build up their reserves on the breeding grounds, whereas the Norwegian Greylags staged for a longer period in the Netherlands to build up theirs.

Adult Greylags showed an extremely high fidelity to their wintering grounds. Nilsson & Persson (1996) reported that breeding birds from Scania were found in the very same wintering area as the year before in 99.2% of all cases. The same applies to Norwegian Greylags wintering in Spain (Persson unpubl.). A high site fidelity can also be found in local subpopulations. The majority of all Greylags neck-banded in the Södermanland area, for instance, winters at Lac du Der, a 4,800 ha reservoir, 200 km east of Paris (Mouronval et al. 1996). A substantial part of the wintering population at this site, about 1,400 birds, comes probably from the inner Södermanland area.

Notwithstanding such high site fidelities, marked shifts in winter distribution can occur within short periods of time, such as the return of the Norwegian Greylag Goose to the Duero Basin related above, and the enormous growth of the Dutch wintering population. The latter population, reached 70,000 in January 1994 (Koffijberg et al. 1997), and is probably mostly made up of Baltic Greylags. Neck-banded Norwegian Greylags staying into winter in the Netherlands, at least in the early 1990s, were those being in too bad physical condition to carry through a migration to Spain (Van Eerden et.al. 1991, Berend Voslamber pers. comm.). Heavy birds left the Netherlands earlier in the autumn.

Management implications

Distinct migration routes and staging and wintering sites of goose populations in general give an almost unique basis for population-oriented management. In the context of waterfowl management (Scott & Roose 1996, Madsen et al. 1999) the Greylag Geese in the main part of Europe have been considered as two populations, a North-west Europan population using the Atlantic flyway and a Central European population using the continental flyway. The results in the present contribution clearly show that the North-west European Greylags actually consist of two major populations: one population centered around the western part of the Baltic Sea and a Norwegian population. Consequently, as stated by Persson (1997), the Norwegian Greylag Goose and the West Baltic Greylag Goose should be considered as two populations and managed separately.

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Sammanfattning

Flyttningsmönster hos nordiska grågäss Anser anser

Snabbt växande populationer av grågås i samtliga länder i nordvästra Europa medförde gryende konflikter med jordbruket och andra intressen. För att få bättre kunskap om såväl varifrån gässen i flockarna på rastlokalerna rekryterades som gässens generella flyttningsmönster startade Nordiskt Kollegium för Viltforskning ett nordiskt projekt. I Norge, Sverige, Danmark och Finland halsringmärktes totalt 4.173 grågäss under åren 1984–1994. De märkta fåglarna utgjordes av 738 häckare, 1.999 gässlingar och 1.436 ruggare. Majoriteten av ruggarna kunde senare identifieras som tillhörande någon geografiskt avgränsad häckpopulation, i de flesta fall den lokala.

I Norge märktes på ett flertal lokaler längs med kusten från Olso i söder till Store Tamsöy i norr, med Vega som huvudlokal. I Sverige koncentrerades märkningarna till SV Skåne och Södermanland, med kompletterande fångster på Gotland och några skärgårdslokaler. I Danmark kompletterades fångsten av häckande gäss med fångster med kanonnät under sensommaren. I Finland märktes häckfåglar och ruggare i den sydvästra skärgården, medan i fångenskap uppfödda gäss sattes ut utan fosterföräldrar längs med landets väst- och sydkust. Inom projektet märktes förutom från ursprungliga bestånd även grågäss från två introducerade populationer. Då arten infördes till Oslo-området på 1960-talet togs ägg från såväl västra Norge som Sverige. Vid Öster-Malma i Södermanland återintroducerades arten under åren 1970–75, genom att ägg från sydöstra Sverige placerades i bon av kanadagäss, vilka därefter fungerade som fosterföräldrar.

Det egna fältarbetet koncentrerades till Vega, Skåne, Södermanland och Guadalquivir Marismas, men samtliga lokaler av betydelse inom den atlantiska flyttningskorridoren besöktes vid åtminstone något tillfälle. I övrigt förlitade vi oss på ett nätverk av frivilliga; totalt finns 950 namn i adressregistret. Artikeln bygger på observationer gjorda fram till och med 30 juni 1995.

Totalt erhölls under denna period ca 62.000 avläsningar av halsmärkta grågäss från områden utanför märkområdena. Dessutom gjordes ett stort antal avläsningar inom märkområdena under samma period, t.ex. 49.000 i SV Skåne. Mellan 80 och 97% av de märkta gässen återsågs efter märkningen; mellan 50 (utsatta finska gäss) och 85% av gässen från de olika områdena kontrollerades i ett annat land efter märkningen

Majoriteten av de norska grågässen lämnade landet i slutet av augusti och början av september, men de nordligast häckande flyttade först i september och oktober. De viktigaste höstrastlokalerna låg vid Jyllands västkust och västra delen av Nederländerna. Huvudparten av de som rastade i Danmark flyttade vidare till Nederländerna före oktober månads utgång. Under november flyttade sedan de flesta norska grågässen vidare till Spanien, varvid Frankrike snabbt passerades. Den viktigaste övervintringslokalen under de här aktuella åren var tveklöst Guadalquivir Marismas i sydvästra Spanien och då framförallt de norra delarna av Doñana National Park. Under studiens gång fick dock lokaler i Duerodalgången, 50 mil längre norrut, ökande betydelse. Dessa lokaler, först Villafáfila och sedan Laguna de la Nava, utnyttjades dels som rastområde och dels som tillflyktsort då gäss mötte dåliga övervintringsförhållanden längre söderut. Det normala var att de norska grågässen anlände i november, stannade en längre tid, upp till tre månader, för att sedan fortsätta till Guadalquivir Marismas. Vanligtvis lämnade gässen Spanien under februari, men senare om vintern varit extremt nederbördsfattig. Ett fåtal rastade i Frankrike under våren. Bortsträcket från Nederländerna inleddes i mars, 50 % fanns kvar i början av april, men samtliga lämnade före månadens slut. Häckfåglarna återvände till Vega i april, men till Troms och Finnmark först i maj.

Efter häckningen stannade de skånska (liksom de danska) grågässen kvar i eller i närheten av häckområdet. Allteftersom ruggarna återvände från sina ruggningslokaler och gäss från mer nordligt belägna häcklokaler anslöt sig, växte flockarna och blev slutligen till mångtusenhövdade skaror. Majoriteten lämnade landet i oktober, för att efter endast ett kort

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Appendix 1.
Observations in different countries of Greylag Geese neck-banded in different regions or countries. One observation per individual for each country and seas on included. "Total" refers to number of individuals recorded in each country at least once.
Observationeri olika länder av grågäss halsmärkta i olika regioner eller länder. En observation per individ för varje land och år medräknade."Total" avser antal individer observerade i varje land minst en gång.

	85/86	86/87	87/88	88/89	89/90	90/91	91/92	92/93	93/94	94/95	Total	%
Skåne												
Norway	1	0	2	0	0	0	0	1	1	1	6	0.4
Sweden	84	109	268	304	395	484	433	538	449	475	1335	90.2
Denmark	3	10	24	29	38	29	31	68	47	39	216	14.6
Germany east	0	5	6	8	18	7	19	8	11	6	68	4.6
Germany west	0	4	7	11	2	16	7	4	13	9	62	4.2
The Netherlands	27	46	111	176	190	223	141	204	148	151	741	50.1
Belgium	0	0	0	0	0	3	9	10	16	11	27	1.8
England	0	0	0	0	0	1	0	0	0	2	2	0.1
Scotland	0	0	0	0	0	0	0	0	1	0	1	0.1
France	1	7	10	2	11	10	4	11	15	6	70	4.7
Spain	30	43	76	57	186	165	42	150	119	133	541	36.6
Morocco	0	0	0	0	3	0	0	1	1	0	3	0.2
Hungary	0	0	0	0	0	0	0	0	1	0	1	0.1
Total seen	*88*	*117*	*278*	*330*	*423*	*523*	*460*	*567*	*502*	*515*	*1341*	*90.6*
Seen abroad	*47*	*90*	*176*	*209*	*314*	*355*	*217*	*359*	*300*	*297*	*995*	*67.2*
Acc. neck-banded	*137*	*250*	*448*	*595*	*760*	*961*	*1023*	*1214*	*1320*	*1480*	*1480*	
Reported dead	*11*	*6*	*14*	*11*	*21*	*17*	*6*	*26*	*10*	*15*	*148*	*10.0*
Södermanland												
Norway	0	0	1	0	0	0	0	0	0	0	1	0.2
Finland	0	0	0	0	0	2	0	0	0	0	2	0.5
Sweden	53	78	112	119	193	226	205	153	98	65	385	95.1
Denmark	1	2	0	4	2	5	5	2	1	3	21	5.2
Germany east	0	0	1	0	0	2	2	2	0	1	8	2.0
Germany west	0	2	2	5	10	9	7	3	2	5	33	8.1
The Netherlands	13	16	45	67	108	82	82	48	34	26	228	56.3
Belgium	0	0	1	1	0	0	1	0	2	0	3	0.7
England	0	1	0	0	0	0	0	0	0	0	1	0.2
France	29	39	65	71	84	80	96	69	70	51	211	52.1
Spain	2	2	1	0	10	10	7	8	10	6	44	10.7
Algeria	0	0	0	0	1	0	0	0	0	0	1	0.2
Total seen	*56*	*80*	*127*	*216*	*211*	*243*	*236*	*178*	*127*	*96*	*394*	*97.3*
Seen abroad	*44*	*59*	*100*	*180*	*180*	*169*	*176*	*116*	*106*	*78*	*343*	*84.7*
Acc. neck-banded	*67*	*114*	*174*	*221*	*311*	*367*	*404*	*405*	*405*	*405*	*405*	
Reported dead	*2*	*2*	*5*	*5*	*13*	*9*	*6*	*5*	*2*	*1*	*50*	*12.3*
Central Norway												
Norway	–	6	21	87	116	146	218	206	108	213	840	43.9
Sweden	–	0	0	3	2	4	7	9	5	3	11	0.6
Denmark	–	2	14	19	13	8	43	112	334	328	433	22.7
Germany east	–	0	0	0	4	4	1	0	1	0	6	0.3
Germany west	–	0	4	15	19	8	14	21	7	15	92	4.8
The Netherlands	–	39	149	434	484	504	540	632	639	664	1494	78.2
Belgium	–	0	0	1	0	0	2	1	2	0	4	0.2
England	–	0	0	0	0	0	1	0	1	0	2	0.1
France	–	0	3	3	4	2	4	10	9	10	34	1.8
Spain	–	26	50	161	298	260	129	318	320	244	917	48.0
Portugal	–	0	0	0	0	1	0	0	0	0	1	0.1
Total seen	–	*52*	*164*	*470*	*551*	*556*	*639*	*766*	*755*	*741*	*1684*	*88.1*
Seen abroad	–	*49*	*159*	*450*	*523*	*534*	*577*	*704*	*748*	*741*	*1598*	*83.6*
Acc. neck-banded	–	*67*	*210*	*566*	*730*	*931*	*1143*	*1430*	*1687*	*1903*	*1911*	
Reported dead	–	*8*	*10*	*23*	*37*	*26*	*41*	*39*	*47*	*54*	*285*	*14.9*

	85/86	86/87	87/88	88/89	89/90	90/91	91/92	92/93	93/94	94/95	Total	%
Denmark												
Norway	–	–	0	1	0	0	0	0	0	0	1	0.8
Denmark	–	–	32	19	15	16	20	19	10	15	75	63.6
Sweden	–	–	1	0	1	1	3	3	0	0	7	5.9
Germany east	–	–	1	1	2	1	0	1	1	3	5	4.2
Germany west	–	–	1	1	1	1	0	1	1	0	6	5.1
The Netherlands	–	–	13	13	14	6	9	9	4	6	44	37.3
Belgium	–	–	0	0	0	0	0	0	0	2	2	1.7
France	–	–	0	0	1	0	0	1	0	0	2	1.7
Spain	–	–	11	3	9	10	3	12	7	12	45	38.1
Total seen	–	–	*35*	*24*	*25*	*24*	*24*	*26*	*12*	*30*	*94*	*79.7*
Seen abroad	–	–	*22*	*14*	*20*	*15*	*14*	*18*	*10*	*21*	*68*	*57.6*
Acc. Neck-banded	–	–	*43*	*49*	*49*	*66*	*66*	*76*	*76*	*118*	*118*	
Reported dead	–	–	*2*	*5*	*1*	*1*	*0*	*0*	*0*	*0*	*9*	*7.6*
Gotland												
Finland	0	0	0	1	0	0	0	0	0	0	1	1.1
Norway	0	0	0	0	0	1	0	0	0	0	1	1.1
Sweden	8	15	9	18	14	9	6	3	2	3	49	56.3
Denmark	0	2	4	1	0	2	1	3	1	0	10	11.5
Germany east	2	12	11	9	16	11	11	9	4	1	44	50.6
Germany west	0	3	2	2	1	1	0	0	0	3	7	8.0
The Netherlands	1	14	13	16	21	9	6	5	5	1	48	55.2
Belgium	0	0	0	0	0	0	0	0	0	1	1	1.1
France	0	1	0	0	0	0	0	1	1	0	3	3.4
Spain	0	8	3	1	16	5	4	6	4	7	34	39.1
The Czech Republic	0	0	0	0	1	0	0	0	0	0	1	1.1
Austria	0	0	0	1	1	0	1	0	0	0	2	2.3
Hungary	0	0	0	0	0	0	2	1	1	0	2	2.3
Tunisia	0	0	0	0	1	0	0	0	0	0	1	1.1
Algeria	1	0	0	0	0	0	0	0	0	0	1	1.1
Total seen	*11*	*35*	*24*	*33*	*39*	*23*	*25*	*20*	*14*	*13*	*83*	*95.4*
Seen abroad	*4*	*27*	*20*	*26*	*33*	*20*	*20*	*19*	*12*	*12*	*70*	*80.5*
Acc. neck-banded	*20*	*48*	*53*	*73*	*87*	*87*	*87*	*87*	*87*	*87*	*87*	
Reported dead	*1*	*2*	*2*	*4*	*2*	*1*	*1*	*1*	*0*	*1*	*15*	*17.2*
Finland												
Finland	4	23	10	1	15	+	+	+	+	+	>53	>39.8
Sweden	0	0	1	2	2	1	2	2	0	1	4	3.0
Denmark	1	0	0	0	0	0	0	0	0	0	1	0.8
Germany east	0	0	0	0	1	0	0	0	0	0	1	0.8
Germany west	0	0	1	0	1	1	0	0	0	0	2	1.5
The Netherlands	0	2	0	1	2	0	1	0	0	0	6	4.5
Spain	0	0	1	0	4	3	0	0	0	0	6	4.5
Estonia	0	0	0	0	2	0	0	0	0	0	2	1.5
Poland	0	1	0	0	1	1	1	1	1	1	2	1.5
Austria	0	3	0	0	10	1	1	0	0	0	14	10.5
Hungary	0	0	0	0	1	0	2	1	0	0	5	3.8
Italy	0	0	0	0	1	0	0	1	0	0	1	0.8
Tunisia	0	0	1	0	0	0	0	0	0	0	1	0.8
Algeria	0	0	0	0	1	0	0	0	0	0	1	0.8
Total seen	*5*	*24*	*13*	*2*	*23*	*7*	*6*	*4*	*1*	*2*	*>67*	*>50.4*
Seen abroad	*1*	*6*	*4*	*2*	*17*	*7*	*6*	*4*	*1*	*2*	*34*	*25.6*
Acc. neck-banded	*29*	*75*	*97*	*97*	*133*	*133*	*133*	*133*	*133*	*133*	*133*	
Reported dead	*3*	*6*	*0*	*0*	*1*	*0*	*1*	*0*	*0*	*0*	*11*	*8.3*

Appendix 2.
Monthly pattern of distribution in different countries of observations of neck-banded Greylag Geese from different marking areas (bold). One observation per individual per month and country included in the table. Accumulated totals for 1984/85–1994/95.
Månatlig fördelning av observationer i olika länder av grågäss halsmärkta i olika områden (fetstil). Endast en observa-tion per individ, månad och år medräknas i tabellen. Summerade antal för 1984/85–1994/95.

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Scania												
Sweden	2451	2380	2446	2138	418	20	85	797	1572	1482	1515	1086
Norway	2	0	0	0	0	0	0	0	0	2	1	1
Denmark	29	67	76	67	4	1	0	8	16	11	62	115
Germany east	4	27	50	20	5	0	0	4	1	1	0	0
Germany west	15	9	3	18	3	1	5	2	19	4	2	3
The Netherlands	75	18	64	630	638	304	141	111	86	25	85	40
Belgium	0	0	0	24	30	8	4	4	0	0	0	0
England	0	0	1	2	2	0	0	0	0	1	0	0
Scotland	0	0	0	0	0	0	0	0	0	0	0	1
France	0	0	0	8	18	3	2	30	17	4	0	0
Spain	0	1	2	235	498	302	286	495	42	1	2	0
Morocco	0	0	0	0	0	4	2	0	0	0	0	0
Hungary	0	0	0	1	0	0	0	0	0	0	0	0
Södermanland												
Sweden	238	546	597	157	31	9	1	10	380	470	421	293
Norway	0	0	0	0	0	0	0	0	0	1	0	0
Denmark	0	2	4	8	4	1	1	3	6	0	1	0
Germany east	1	3	2	0	0	0	0	1	2	0	0	0
Germany west	0	0	0	8	1	2	3	14	12	1	0	0
The Netherlands	1	1	15	246	308	181	106	136	88	14	0	1
Belgium	0	0	0	1	0	4	0	0	1	0	0	0
England	0	0	0	0	0	1	0	0	0	0	0	0
France	0	0	24	228	371	401	420	428	329	1	0	1
Spain	0	0	0	10	22	22	13	9	2	0	0	0
Algeria	0	0	0	0	0	1	0	0	0	0	0	0
Central Norway												
Norway	454	647	111	41	4	2	1	2	21	196	139	159
Sweden	1	9	10	6	0	0	1	6	7	4	5	1
Denmark	1	364	514	114	17	1	5	41	56	38	0	0
Germany east	0	1	7	2	0	0	0	0	0	0	0	0
Germany west	0	6	20	16	7	2	3	13	43	8	2	2
The Netherlands	4	830	2569	2872	1965	386	216	321	1081	726	18	9
Belgium	0	0	0	0	4	1	1	2	1	0	0	0
England	0	0	0	0	0	0	0	0	1	1	1	0
France	0	0	0	1	8	2	10	17	13	2	0	0
Spain	0	0	0	8	449	692	811	836	193	1	1	0
Portugal	0	0	0	0	1	0	0	1	0	0	0	0
Denmark												
Denmark	58	85	93	54	5	2	2	3	13	15	23	17
Norway	1	0	0	0	0	0	0	0	0	0	0	0
Sweden	0	3	3	6	3	0	0	0	0	0	1	0
Germany east	1	4	4	0	0	0	0	0	0	0	0	0
Germany west	0	3	1	2	1	0	0	1	1	1	0	1
The Netherlands	3	0	6	37	20	4	2	5	12	2	5	2
Belgium	0	0	0	0	2	1	1	0	0	0	0	0
France	0	0	0	0	0	0	0	1	2	0	0	0
Spain	0	0	0	14	27	17	12	14	1	0	0	0

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Gotland												
Norway	0	1	0	0	0	0	0	0	0	0	0	0
Finland	0	0	0	0	0	0	0	0	0	0	0	1
Sweden	30	43	43	14	2	0	0	2	6	5	4	7
Denmark	2	2	3	6	0	0	0	0	1	0	0	3
Germany east	15	48	49	15	0	0	0	3	3	0	0	0
Germany west	2	4	2	3	1	0	1	0	3	0	2	0
The Netherlands	1	1	4	42	27	11	5	6	4	2	11	2
France	0	0	0	0	0	1	0	1	2	0	0	0
Spain	0	0	0	6	27	19	15	9	0	0	0	0
The Czech Republic	0	1	0	0	0	0	0	0	0	0	0	0
Austria	0	0	0	0	1	0	0	0	0	0	0	0
Hungary	0	0	0	2	2	0	0	1	0	0	0	0
Tunisia	0	0	0	0	0	1	0	0	0	0	0	0
Algeria	0	0	0	0	0	0	0	2	0	0	0	0
Finland												
Finland	1	19	28	11	1	0	0	0	0	2	3	0
Sweden	0	1	8	4	1	0	1	1	1	3	0	0
Denmark	0	0	0	0	1	0	0	0	0	0	0	0
Germany east	0	0	0	1	0	0	0	0	0	0	0	0
Germany west	0	0	0	0	0	0	0	1	2	0	0	0
The Netherlands	0	0	0	3	3	0	1	0	1	1	0	0
France	0	0	0	0	0	0	0	0	1	0	0	0
Spain	0	0	0	0	3	4	5	4	0	0	0	0
Estonia	0	0	2	0	0	0	0	0	0	0	0	0
Poland	1	1	2	2	1	0	0	3	0	0	0	0
Austria	0	0	0	0	15	0	0	0	1	0	0	0
Hungary	0	0	0	1	2	0	0	1	1	0	0	0
Italy	0	0	0	0	0	0	0	1	1	0	0	0
Tunisia	0	0	0	0	0	0	1	0	0	0	0	0
Algeria	0	0	0	0	0	1	0	0	0	0	0	0

uppehåll i Nederländerna fortsätta till sydvästra Spanien. Det viktigaste övervintringsområdet var Guadalquivir Marismas, men till skillnad från de norska grågässen var det framförallt de centrala och östra delarna av Doñana National Park som utnyttjades. Lokalerna i Duero-dalgången utnyttjades framförallt som rastlokaler under höst och vår men också som tillflyktsort då gässen drabbades av ogynnsamma förhållanden i sitt normala övervintringsområde. En ökande andel av de skånska grågässen övervintrade i det Holländska Deltat. Bland häckfåglar med känt övervintringsområde ökade andelen som övervintrade i Nederländerna från 9 % 1986 till 50 % 1995. De skånska grågässen började flytta norrut från Guadalquivir Marismas under de sista 10 dagarna av januari, men de flesta dröjde kvar till mitten av februari. Vårsträcket gick snabbt. De flesta som övervintrat i Nederländerna lämnade landet under februari, medan de som tillbringat vintern i Spanien passerade under februari och början av mars.

Av de vilda märkta finska grågässen sågs tre längs med den atlantiska flyttningskorridoren, ända ner till Guadalquivir Marismas. Majoriteten utnyttjade dock den kontinentala flyttningskorridoren, vilken via Estland, Polen, Tjeckien, Ungern, Österrike och Italien leder ner till vinterkvarteren i Tunisien och Algeriet.

Flyttningsmönstrena hos de introducerade populationerna skiljde sig markant från huvudpopulationernas. Oslo-gässen lämnade häckområdet sent, rastade i västra Jylland och övervintrade i Nederländerna. Några fåglar rapporterades från lokaler i nordvästra Tyskland, men endast en sågs längre söderut än det Holländska Deltat, vid Villafáfila. Det viktigaste övervintringsområdet för grågäss från Södermanland var vattenreservoaren Lac du Der öster om Paris. Andra grågäss från detta häckområde övervintrade i det Holländska Deltat eller i Guadalquivir Marismas, men det finns också en rapport från Algeriet. En del fåglar från Södermanland rastade i norra delen av Nederländerna, där Dollard var ett särskilt viktigt område, medan andra flyttade mer eller mindre direkt mellan häckområdet och Lac du Der.