

Field choice of staging Greylag Geese *Anser anser* in relation to changes in agriculture in South Sweden

LEIF NILSSON & HAKON PERSSON

Abstract

The Greylag Goose *Anser anser* has increased markedly in South Sweden in recent years. During 1985–1996 the field choice and local distribution of post-breeding foraging Greylag Geese was studied in an inland breeding area (with marked changes in land-use), and in a coastal area (with small changes in land-use) used by the same population. During late summer the geese gathered into one or two major flocks in the lake area and one or a few flocks in the coastal area. In the first years, geese in the inland area only made short feeding flights to crop fields close to the roosts, but with the introduction of large set-asides close to the roosts feeding flights were extended; the average distance increased threefold at two roosts and fivefold at a third. In the last year of the study, the fields close to the roost were again grown with cereals and the geese returned to their old pattern. The preferred feeding areas in the lake area were stubble fields and the geese started to leave the

area when fields were ploughed. When available, peas were a preferred food before the harvest of cereals. In the first years of the set-aside programme, some set-asides were highly preferred early in the season. During the first years, relatively few geese used the coastal area, mainly in late autumn, but increased markedly in importance during the study period, whereas only a slight increase was found in the lake area. During the study period the Greylags in the coastal area established the new habit of feeding on sugar beet spill.

Leif Nilsson, Department of Animal Ecology, University of Lund, Ecology Building, S-223 62 Lund, Sweden. E-mail Leif.Nilsson@zoekol.lu.se.

Hakon Persson, Department of Animal Ecology, University of Lund, Ecology Building, S-223 62 Lund, Sweden.

Received 25 August 1997, Accepted 18 March 1998, Editor: T. Pärt

Introduction

The Greylag Goose *Anser anser* started to breed in south-western Scania, southernmost Sweden in the late 1960s, after being absent since the nineteenth century. A rapid increase started in this population in late 1970s and early 1980s, as in other parts of Europe (Nilsson 1982, 1995, Fog et al. 1984). This led to the appearance of large post-breeding flocks at different sites in South Sweden leading to increased crop damage.

In 1984, a Nordic Greylag Goose project was started by the Nordic Council for Wildlife Research (NKV) to study the migration patterns of Greylag Geese from the Nordic countries by means of neck-banding (Andersson et al. in prep.). Other aspects of their ecology, such as field choice, survival, breeding performance etc. were also studied on the neck-banded population in Scania (Nilsson & Persson 1992, 1994, 1996). As the Greylag Goose, like other staging goose species, depends on agricultural land

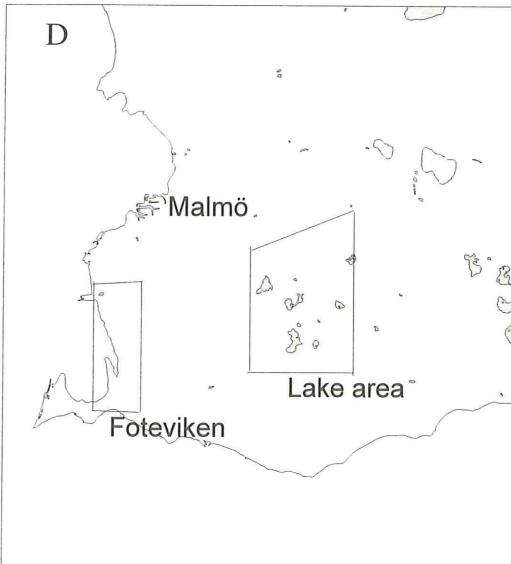
during the non-breeding season, a detailed study was undertaken in SW Scania during 1985–1987 to elucidate their utilisation of agricultural areas during the post-breeding period (Nilsson & Persson 1991, 1992, Persson 1989).

During the last years of the eighties and the first years of the nineties large areas of agricultural land in southern Sweden were set aside or experienced a marked change in land use as a part of the Swedish agricultural policy. In our 1985–87 study area, the proportion of land offering the geese high quality food during late summer and autumn (i.e. peas and cereals) decreased with about 75% between 1985 and 1995, whereas areas outside the study area but within flying distance from the roost were not included in the change programme to the same extent. A new study was therefore undertaken during 1994 and 1995 in order to evaluate how the changes in agriculture since the 1985–1987 study influenced the local distribution and habitat utilisation of the Greylag Goose population.

In this paper, we analyse field choice of post-breeding foraging Greylag Geese in south-western Scania, especially in relation to changes in agriculture. The 1994–96 study of field choice was extended to cover an alternative feeding area at the coast at Foteviken. Moreover, changes in numbers of staging Greylag Geese in SW Scania during 1985 to 1995 were studied. Eventually, the study was extended to include 1996 as several large set-asides close to the roosts in the 1985–87 study area were once more used for growing of wheat.

Figure 1. Feeding areas used by Greylag Geese in the lake area (hatched) in 1985–1990 (A) and in 1991–1995 (B) and in the Foteviken area 1987–1996 (C). The heavy line in A and B denotes the border of the intensive study area (central area) 1985–1987 and 1994–1996. Woodland areas are especially marked out on the maps, whereas agricultural areas are left open. In map C, A–E denote different night-time roosts. The geographical position of the study areas is shown in map D.

Grågässens födosöksområden i sjöområdet (snedstreckat) 1985–90 (A) och 1991–95 (B) samt i Foteviksområdet 1987–1996 (C). Den grova linjen i A och B anger gränsen för det centrala specialstuderade området 1985–87 och 1994–96. Skogsområdena har markerats på kartorna, medan jordbruksområdena lämnats omarkerade. I karta C anger bokstäverna A–E olika nattplatser. Områdenas geografiska läge ses på kartan D.



B



Study area

The study was undertaken in two areas in south-western Scania: the inland Börringe area around the Lakes Börringesjön, Klosterviken, Havgårdssjön, Fjällfotasjön, Yddingesjön and Björkesåkrasjön, i.e. the central area for this Greylag Goose project (for a general description see Nilsson & Persson 1992, 1994) and the Foteviken area, a shallow bay at the west coast of Scania, about 30–40 kms from the lake area (Figure 1). The eutrophic lakes are situated in an agricultural area and are all important breeding and roost sites for the species (Nilsson & Persson 1994). The number of breeding pairs in this area increased from 40 in 1979 to 530 in 1994 and 1995 (Nilsson 1995), with a slight decrease in 1996 (495 pairs). Foteviken is an important roost in late summer and autumn. The bay is surrounded by grazed meadows and there are also some grazed islands in the area. Inland from Foteviken, there are vast agricultural areas.

In 1985 and 1986, fields close to the roosting lakes in the Börringe area (Figure 1) were mainly used for cereal crops (markedly dominated by wheat and barley), with only small areas of other crop types such as peas (Figure 2). Some changes in land-use were apparent already in 1989, when the total area of cereal was below 60% and the first set-asides were noted in the main study area.

In 1994 and 1995, the Börringe area was markedly dominated by set-asides, in all covering 52 and 35% of the agricultural area (890 and 1170 km², respectively) close to the lakes. Only small areas with wheat and barley could be found in the former study

area. Large parts (>50%) of the set-aside areas close to Lake Börringesjön were used for extensive cattle grazing. These areas were used for cereals until 1991. During late summer and autumn 1992, these fields were covered by wheat regrowth from the crop of the year before. The wheat was ripening in thin stands, forming suitable goose feeding areas. Similarly, some set-asides with other crops temporarily formed good feeding opportunities for the geese, as when oats was grown on the set-aside at Börringe to provide green fodder for the cattle in 1995. The proportion of the tilled area offering high-quality food for the geese (peas and cereals) was reduced by 75% between 1985 and 1995 (Figure 2). Areas within flying distance (i.e. up to 10–12 kms) from the roosts but outside the old study area were not in the same way affected by the set-aside programme, still offering extensive areas with cereal stubbles during late summer and autumn.

In 1996, some large set-asides next to Lakes Börringesjön, Klosterviken and Havgårdssjön (226 ha = 20% of the study area) was once more used for cereal crops (wheat). By that, we got a situation similar to that we had during our first study period, 1985–1987.

At Foteviken (Figure 1), the geese roost in the bay proper or on a number of small islets, from which they perform feeding flights to the agricultural areas to the east. Close to the coast and on the peninsula, there are extensive areas of shore meadows used for grazing by cattle and horses. The remaining area is a flat coastal plain used for agricultural purposes, the main crops being cereals, covering about 60 to 70% of the tilled area (Figure 3). Another important crop

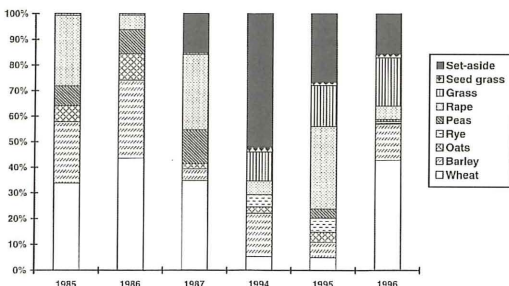


Figure 2. Available field types (per cent of total area) for the geese in the central area at Börringe in 1985–1987 and 1994–96.

Tillgängliga fälttyper (i procent av totalarealen) för gässen i den specialstuderade delen av Börringeområdet 1985–87 och 1994–96. Fälttyperna är uppifrån och ner: träda, frögräs, gräs, raps, ärtor, råg, havre, korn och vete.

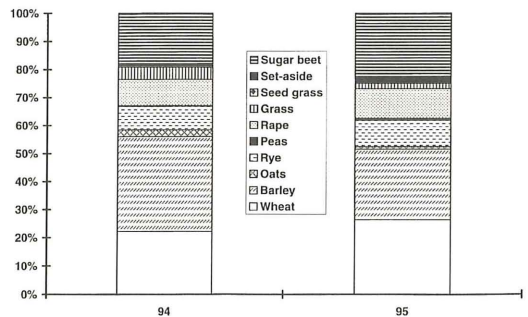


Figure 3. Available field types (per cent of total area) for the geese in the Foteviken area in 1994–1995.

Tillgängliga fälttyper (i procent av totalarealen) för gässen i Foteviksområdet 1994–95. Fälttyperna är uppifrån och ner: träda, frögräs, gräs, raps, ärtor, råg, havre, korn och vete.

in this area is sugar beet, covering about 20% of the acreage. Smaller areas of other crops are also to be found, such as peas. No specific studies of field choice and distribution of different field types were undertaken during the years 1985–87, but there were no drastical changes in land use over the years.

Methods

In 1994 and 1995, field-work in the lake area and at Foteviken was undertaken in the same way as in the lake area in 1985–1987 (Nilsson & Persson 1992), i.e. the areas were visited about two times a week from the first days of July until the geese left in October (the lake area) or November/December (Foteviken). In 1996, the areas were covered weekly. Counts were undertaken at the roosts and the feeding flights were followed to locate the feeding grounds used. The areas were closely searched to locate all feeding flocks.

Field types were mapped before harvest and any changes in the state of the fields (such as harvest, ploughing etc.) were recorded in connection with the search for feeding geese. The mapped area covered 1200 ha in the lake area and 3900 ha at Foteviken.

During 1988–1993, i.e. in the years between the intensive studies in the lake area, regular counts of staging geese in the lake area and at Foteviken were undertaken from late July until the geese left in autumn. Counts were also undertaken at Foteviken in 1985–1987. In connection with counts and checks for neck-banded Greylags in the study areas, field choice was regularly noted. This data set give a general idea of the choice of feeding areas during those years, even if all feeding geese were not localised.

The utilisation of different field types is given as number of goose-days (GD). GD are estimated as follows : $GD = \cdot \sum$ (mean of the counts on two days)* (the number of counts between the two days).

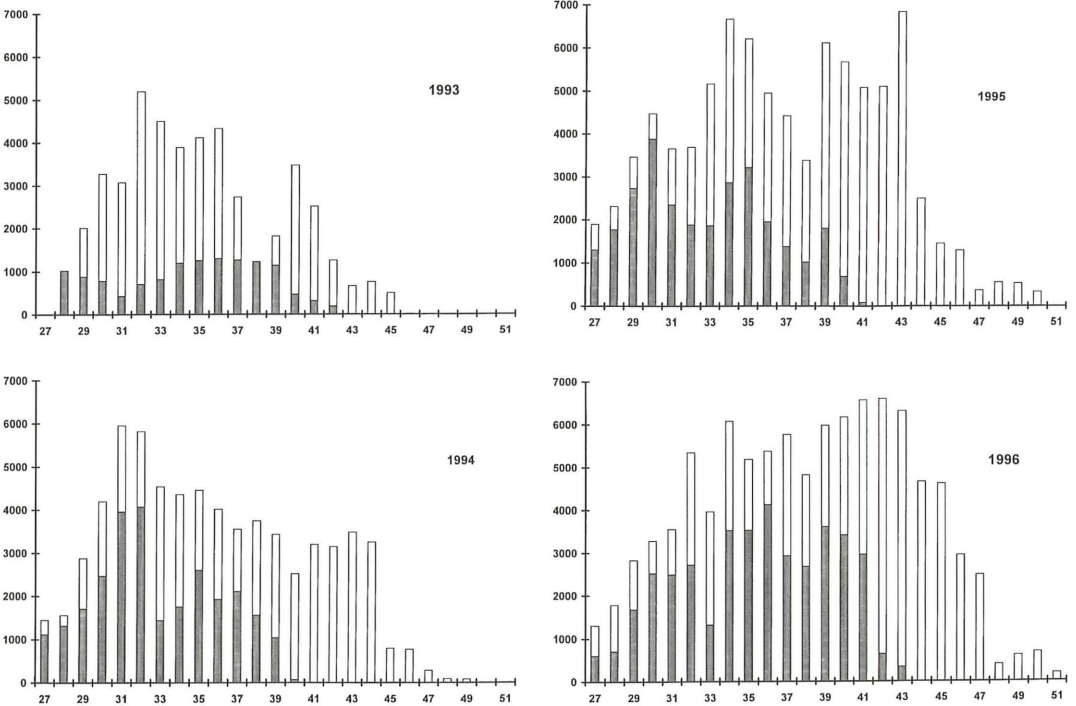


Figure 4. Weekly totals of Greylag Geese in the lake area (filled bars) and at Foteviken (open bars) in July – December, 1993–1996.

Antalet grågäss i sjöområdet (fyllda staplar) och Foteviksområdet (ofyllda staplar) Juli – December 1993–96 redovisat per veckobasis.

Results

Occurrence of Greylag in late summer and autumn.

When counts started in early July, the total number of Greylag Geese in the lake area amounted to about 1000 individuals in the years 1993–1996 (Figure 4), whereas numbers at Foteviken in 1994 and 1995 were a few hundred and somewhat higher in 1996 (counts started later here in 1993).

In 1993, numbers in the lake area showed quite small fluctuations around a level of about 1000 individuals before the geese started to leave, whereas in the other years, numbers peaked at about 4000 in late July or early August, then showing lower numbers until the geese left the lakes in late September or early October in 1994–1995. At Foteviken, there was a gradual built-up in numbers during late summer and early autumn, the highest counts in 1994–1996 being found when the geese had left the lake area. In 1993, the picture was totally different with high numbers of Greylag Geese at Foteviken already in August. Due to mild weather in November and early December 1996, the Greylag Geese re-

mained in the area in high numbers for a longer period than in previous years.

In general, the lake area was more utilised by Greylag Geese than Foteviken until 1991, but from that year we noted a very marked increase in the utilisation of Foteviken (Figure 5). The utilisation level in the lake area was remarkably similar between 1990 and 1995, only varying between 120,000 and 133,000 GD with the exception of 1991 and 1993, when much lower figures were obtained.

The monthly utilisation of the two study areas differed among years (Figure 5). In the lake area, the variation was moderate during the first six years, but marked variations occurred among the last six, especially in August (July data are missing except for the last years). At Foteviken, the monthly pattern in general showed slight variation between years. It may, however, be noted that October showed a marked expansion during the last three seasons and that the utilisation rate for August the same three years was lower than in the preceding years, being coincident with a higher rate of utilisation of the lake area during the same time.

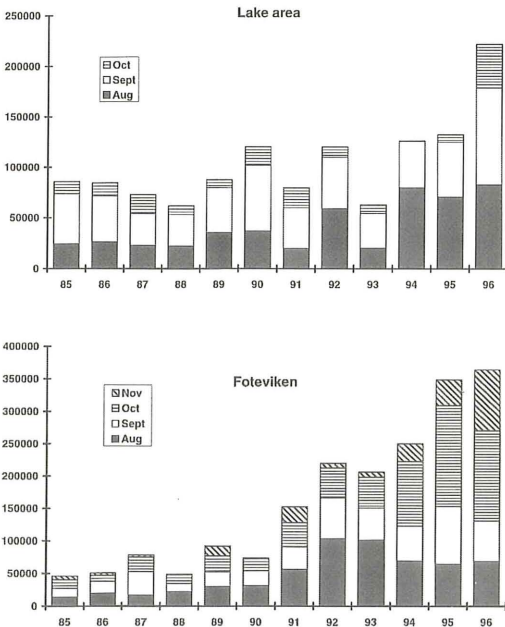


Figure 5. Number of goose-days on a monthly basis for Greylag Geese in the lake area and the Foteviken area in August–November 1985–1996.

Antalet gås dagar per månad för grågässen i sjöområdet och Fotevikensområdet i augusti – november 1985–1996.

Utilisation of different roosts

In the lake area, flocks of Greylag Geese appeared at all breeding lakes during July, when families gather into flocks and are joined by non-breeding birds returning from moult elsewhere. In August, the smaller flocks usually merged into larger flocks and daytime roosting was generally restricted to Lakes Klosterviken, Börringesjön and Björkesåkrasjön. The same lakes were used at night when also Fjällfotasjön is utilised. Generally, the flocks at Lakes Klosterviken and Börringesjön can be considered as one unit, since there was a lot of exchange between Lakes Börringesjön, Klosterviken and Björkesåkrasjön.

Some changes in use of the lakes as daytime roosts occurred between the two intensive study periods (Figure 6). Lake Klosterviken was much less used as a roost compared to Lake Börringesjön during the latter period than during the first period.

Feeding areas

During 1985–1987, Greylag Geese in the lake area were more or less fully restricted in their feeding to fields within the main study area (Figure 1a). They were only occasionally found outside this area, feeding west or southwest of Lake Börringesjön. The field southwest of Lake Börringesjön was a pea

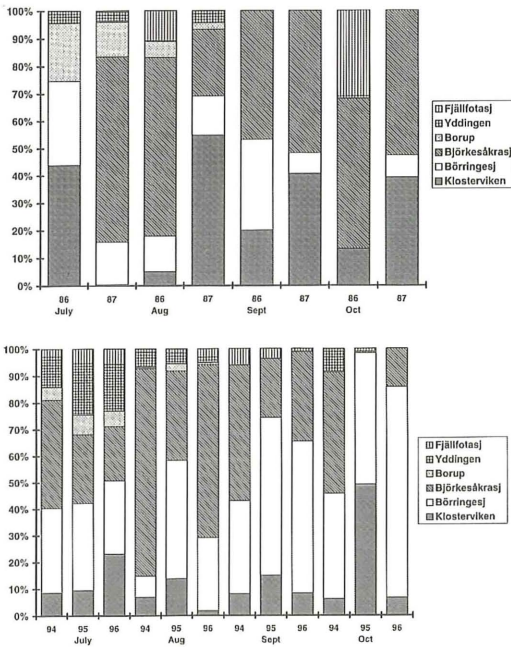


Figure 6. Percentage utilization of the different lakes in the lake area by roosting Greylag Geese in 1986–1987 (A) and 1994–1996(B), respectively.

Grågässens procentuella utnyttjande av deolika sjöarna i sjöområdet som dagrastlokal 1986–87 (A) respektive 1994–96 (B).

field, which was utilised by geese roosting in both Lake Klosterviken, Lake Börringesjön and Lake Björkesåkrasjön. Most of the time, also geese roosting at Lake Björkesåkrasjön were feeding in the area around Börringe.

The picture was totally different during 1994–96 (Figure 1b). Fields in the Börringe area were still used, but to a much lower extent and not in all years. A constant decrease in the utilisation rate was noticed for the set-aside areas east of Lake Börringesjön. Instead, the geese flew to feeding areas more distant from the roosts, and the central area accounted for only about 6 % of the goose-days after the families had fledged in 1994 and 30% in 1995. In 1994, the feeding within the central area only occurred during the early part of the season, whereas it was concentrated to certain periods in 1995, related to the availability of newly harvested fields close to the roosts (Figure 7).

To compensate for reduced feeding opportunities in the central area geese from Lake Börringesjön extended their feeding flights to the south, south-

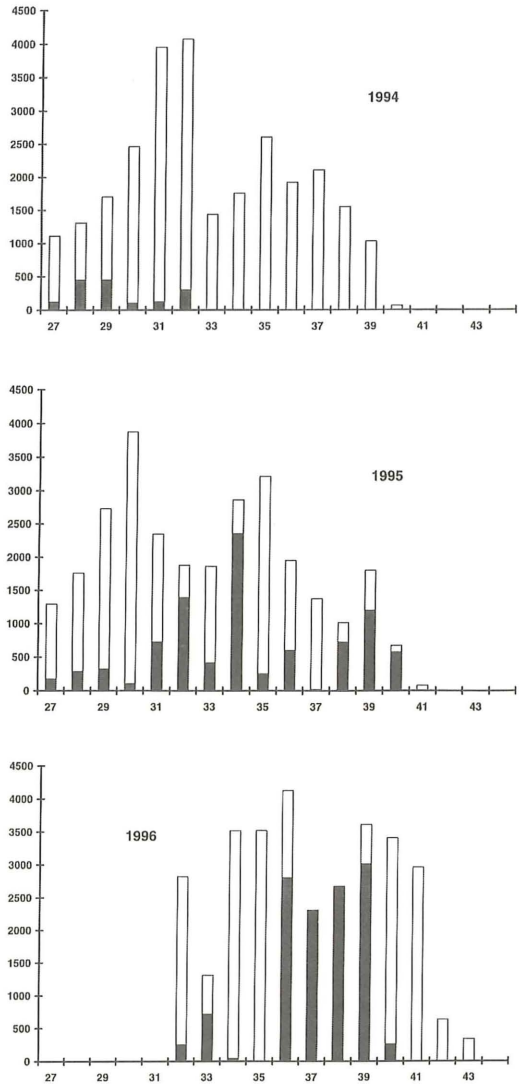


Figure 7. Weekly totals of Greylag Geese feeding inside (filled bars) and outside (open bars) the special study area at Börringe during the autumns 1994–1996.

Antalet grågäss som födosökte inom (fyllda staplar) respektive utom (ofyllt) specialundersökningsområdet vid Börringe under höstarna 1994–96.

west and west of the lake, where large fields with cereals were still to be found and which accounted for nearly 50% of the goose-days in 1995, when all areas outside the central area was checked for feeding geese.

The most marked shift in the lake area was noted for geese using Lake Björkesåkrasjön as a roost. In the first period, they fed in the Börringe area south-west of the lake, whereas in 1994 and 1995, they were almost all feeding north and north-west of the lake. In all, in 1995, 21% of all goose-days in the lake area were recorded on these fields to the north.

As a consequence of the change in feeding areas, the feeding flights in 1994–1995 were much longer than in 1986–87 (Figure 8). During the first study period, geese from Lakes Klosterviken and Börringesjön only had to fly about one km from the roost to feed on stubble fields, whereas in 1995, only 35% did such short flights, most geese flying three kms. Geese from Lake Björkesåkrasjön always had longer flying distances to their feeding areas, but they were extended from less than four km in the first

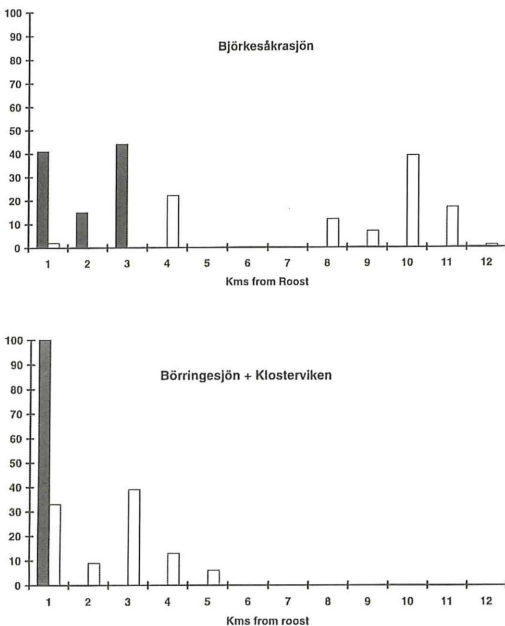


Figure 8. Distances to feeding areas (stubble fields) for Grey-lag Geese roosting at Lake Björkesåkrasjön and Lakes Börringesjön+Klosterviken, respectively, during 1986–1987 (filled bars) and 1995 (open bars) as per cent of all geese counted in the feeding areas on complete surveys of the respective areas.

Avstånd mellan dagrastlokal och födosöksområde (spannmålstubbar) för grågäss från Björkesåkrasjön respektive Klosterviken-Börringesjön under 1986–87(fyllda staplar) och 1995 (ofyllda staplar) i procent av totala antalet gäss i respektive födosöksområde.

period to between 8 and 12 km in the latter period. Geese feeding on other preferred crops such as peas during early season made longer feeding flights, e.g. in the latter period 11 km to a pea-field south-west of Lake Börringesjön. The very same field was also used by a flock from Foteviken, a distance of about 20 km.

In 1996, 40% of the goose-days for feeding Grey-lag Geese in August were recorded within the central area (Figure 7). No detailed observations of feeding flights were undertaken during the early part of the season, but the pattern seemed to be similar to 1995. The wheat crops on the large former set-asides close to Lake Börringesjön were harvested in early September and for the following month, until ploughing made the fields unavailable, most feeding in the lake area was undertaken here.

For the Foteviken area, we have no data to elucidate the detailed choice of feeding areas during the first years of the study. Generally the geese have been found on a vast number of fields, normally with maximum distances of 5 – 8 kms from the daytime roost, but sometimes up to 20 km (see above).

Field choice

In July, the field-choice by the Grey-lag Geese varied markedly among years (Figure 9), much dependent on availability. Grassland was used in most years, but in one year set-aside dominated, whereas unharvested cereals were much used in another year when a suitable field was available close to one of the roosts. Peas were preferred in two years, 1989 and 1995, when long feeding flights were undertaken to reach such fields. Seed-grass was used in July 1995.

In August, peas dominated the field choice in the study area during 1985–1987. Later, the growing of peas decreased markedly in the area and few fields were available. From 1988 and onwards stubble fields dominated the field choice in the lake area with the exception of August 1991, when most feeding took place on a set-aside field with wheat regrowth. When comparing with the first three years, it must be remembered that the seasons from 1988 were much earlier than the seasons before and the harvest of cereals often started in late July or at least in early August. In September, stubble fields dominated more or less completely but in some years newly-sown cereals were also used by the geese. Taking into account that 1996 was a late season the choice of field types was similar to previous years.

At Foteviken, detailed data were available for the last three seasons. In July, the picture varied between

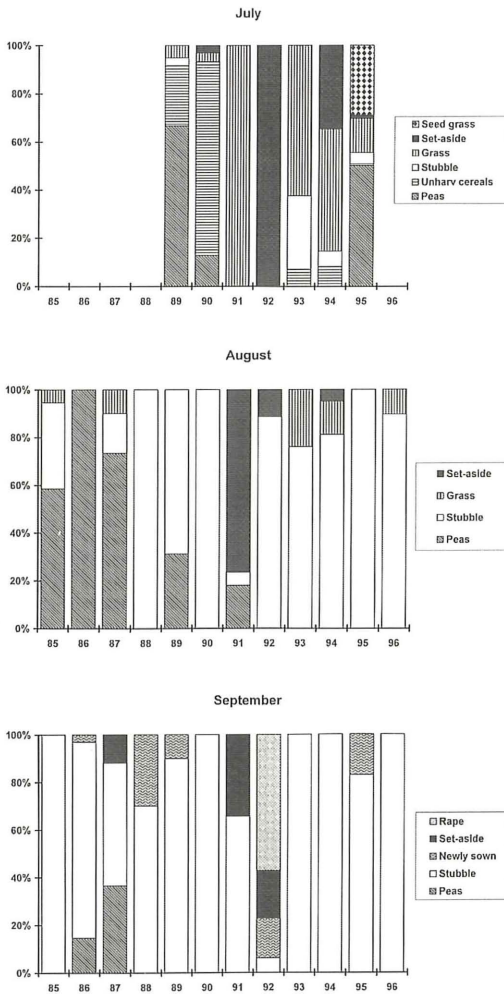


Figure 9. Field choice (as per cent of goose-days) for Greylag Geese in the lake area in July–September 1985–1996. No data available for July in the years 1985–1988 and 1996.

Fältval (i procent av antalet gåsdagar) för grågäss i sjöområdet månaderna juli – september 1985–1996. Fullständiga uppgifter saknas för juli åren 1985–88 och 1996. Fälttyperna är uppifrån och ner i juli: frögräs, träda, gräs, spannmålsstubb, oskördad spannmål och ärtor; i augusti: träda, gräs, spannmålsstubb och ärtor; i september: raps, träda, nysådd, spannmål, spannmålsstubb och ärtor.

years. In 1994, the flocks were seen feeding on unharvested sugar beet and on rape, but from harvest they were found on stubbles, mostly barley (Figure 10), whereas they used stubbles and unharvested cereals in 1995. In July 1996, peas were preferred

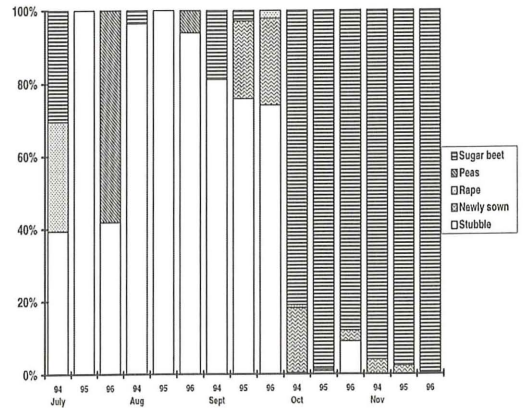


Figure 10. Field choice (as per cent of goose-days) for Greylag Geese in the Foteviken area in July – November 1994–1996.

Fältval (i procent av antalet gåsdagar) för grågäss i Foteviksområdet månaderna juli – november 1994 – 1996. Fälttyperna är uppifrån och ner: sockerbetor, ärtor, raps, nysådd spannmål och spannmålsstubb.

and some flocks were found flying long distances (up to 20 km) to feed on this crop. Occasionally, the geese were feeding on unharvested barley.

Stubbles completely dominated in August and September in all three years, whereas the absolutely dominating field type in October and November was sugar beet. Small scale feeding on leaves and the upper part of the root of unharvested sugar beet was seen on different localities all through 1994. Even if important parts of the sugar beet fields were harvested, no less than 65% of the geese were feeding on unharvested beet in October 1994, whereas the rest used spill from the harvest. This feeding habit was also rarely seen in 1995, but not in 1996.

Although no systematic detailed data on field choice were collected at Foteviken during the late eighties, we know that sugar beet was not used before 1987. After 1987 the use of sugar beet spread rapidly among the geese, and from 1990 the majority was feeding on sugar beet fields in late autumn.

Discussion

The increased utilisation of the two study areas during the post-breeding period over the years 1985–1996 reflects to a great extent the increase of the number of breeding pairs in the lake area (cf. Nilsson 1995). Temporary setbacks, three in each study area, coincided with the four winters exposing the birds using the (formerly) main wintering area of Scanian

Greylag Geese in south-western Spain for the highest hunting pressure during the period 1984/85–1993/94 (Persson 1996a). High hunting pressure in the Guadalquivir Marismas has a pronounced negative effect on both survival and productivity (Nilsson & Persson 1996, Persson 1996a). In view of this, it is surprising that no setback was recorded in 1995, as 50% of the population wintering in southern Spain died due to shooting during the 1994/95 winter (Persson 1996b). One reason for the missing setback might be that the proportion of the breeding population wintering in the Netherlands now is so large that their higher survival and productivity (Nilsson & Persson 1996) fully compensate for a bad winter for those wintering in Spain.

The longer distances flown between roost and feeding areas in the mid-1990s compared to the mid-1980s may be partly an effect of a population increase and partly due to the fact that many of the fields next to the roosts that earlier were used for cultivation of cereals and peas now were set-asides. Such an increase in flight distances in relation to a population increase has earlier been recorded in Scotland (Bell 1988) and was expected in Scania (Nilsson & Persson 1992). A direct result of the longer flight distances is an enhanced daily energy expenditure as bird flight is energy consuming. However, as the geese use only a minor part of the day for feeding in autumn (Nilsson & Persson 1992), it ought to be possible for them to compensate for the increased energy expenditure by using more time for feeding.

Roosting conditions are important to take into account when studying field choice, as geese are prepared to fly longer distances to reach high-rated roosts than low-rated ones (Nilsson & Persson 1992). Better roosting conditions are very likely a satisfactory explanation to why the average flight distance was much longer at Lake Björkesåkrasjön than at Lakes Böringesjön and Klosterviken.

The main consequence for the geese of set-asides was that they had to fly much longer after the cereal harvest to reach their feeding grounds; the average distance increased threefold at Lakes Böringesjön and Klosterviken and fivefold at Lake Björkesåkrasjön between the mid-1980s and the mid-1990s. The longer distances were apparently not an effect of a local population increase, because in September, the main month for stubble feeding, the total number of goose-days in the lake area was surprisingly stable from year to year, over the whole study period (until 1996). In another respect, however, it can be regarded as an effect of increased population size. In the

first years of this study, the geese could get shorter flight distances by a change from the lake area to the Foteviken area (Nilsson & Persson 1992), but after the large increase in numbers in the latter area, they can no longer achieve such an advantage by a change of gathering area.

The importance of good feeding areas close to the roost was clearly demonstrated in 1996, when the large set-asides close to Lake Böringesjön were once more used for growing wheat. This led to a high usage of the geese after the harvest and a marked increase in the total number of goose-days for the lake area in this year, with a corresponding decrease in the usage of Foteviken during the same part of the season.

Greylag Geese staging in western Europe have been reported to select stubble fields both in Denmark and the Netherlands (Dubeldam 1978, Madsen 1985, Voslamber 1989), where the Scania geese stage on migration, but also in Scotland (Newton & Campbell 1973, Bell 1988). They have also been reported to feed on a number of other food items, including clover, seed-grass, rice, winter wheat seedlings, rape, potatoes, carrots and sugar beet (Hudec 1973, Newton & Campbell 1973, Dubeldam 1978, Fog 1982, Havlin 1986, Dick 1988, van der Reest 1988, Voslamber 1989). Naturally, various underground storage organs of marsh plants, such as *Scirpus* tubers (Ouweneel 1981, Amat 1986, 1995), are important food items for the species. Also in Scania, Greylag Geese were found to feed on a variety of food items during the post-breeding season.

Remnants of sugar beet has become an important late-autumn food in the Foteviken area, where it is grown on large areas. It seems likely that the geese learned to utilise this food item in the Netherlands, as sugar beet has been used since long in that country (Ouweneel 1981, Dubeldam & Poorter 1982, Voslamber 1989). The disproportionate increase in number of goose-days for the Greylag Goose at Foteviken in October might be seen in relation to the utilisation of this new food source in later years, a trend predicted by Nilsson & Persson (1992).

Changes in farming practice in southern Sweden during the last decade have, on the whole, changed the feeding conditions for the Greylag Goose. In 1980s, the geese could feed on ripening peas close to the roosts during three or four weeks before the cereal harvest started (Nilsson & Persson 1992). Effects on the geese of the taking away of this food source are difficult to elucidate, but Greylags that fed on peas arrived, on average, earlier to their

winter quarters in south-western Spain than those that had no access to this food resource (Persson unpubl.). Peas are still grown to some extent in south-western Sweden, but in most cases far from any roost. Moreover, they are no longer accessible to the geese until after harvest due to a change of variety recently. The long distances flown by Greylags to reach such fields today, up to 20 km in this study, demonstrate how highly preferred this protein-rich food is by the geese. Seed-grass and unharvested cereal can locally offer the geese an acceptable alternative for the peas. Otherwise, they have to continue with grazing and seed-stripping until the first cereal stubbles are available. However, during the rest of the post-breeding season, from the start of the cereal harvest until the geese leave Sweden on autumn migration, the geese have been much less affected. In late autumn, the feeding situation is actually much better today than earlier, owing to the fact that also the Greylag Goose has learned to utilise sugar beet.

By way of conclusion, it must be stressed that we restricted our study to those changes in farming practice that were easily observable in the field. As noted above for the peas, the change from one variety to another may affect the feeding conditions of the geese much more than a shift from one crop to another. Effects of plant breeding, improved harvesting methods and practices were outside the scope of the present study. These factors must, however, be investigated as they very likely will be of crucial importance for farmland feeding geese in the future.

Acknowledgements

The study of field choice of Greylag Geese during 1985–1987 was financed by grants from the Swedish Environmental Protection Board, whereas grants for the study in 1994 and 1995 were obtained from Carl Tryggers Stiftelse för Vetenskaplig Forskning. Counts in the intervening years and in 1996 were obtained in connection with the Nordic Greylag Goose Project (grants from Nordic Collegium for Wildlife Research). Grants for the Greylag Goose work in Scania were also obtained from Swedish Hunters' Association.

References

- Amat, J. 1986. Some aspects of the foraging ecology of a wintering Greylag Goose Anser anser population. *Bird Study* 33:74–80.
- Amat, J. 1995. Effects of wintering Greylag Geese Anser anser on their Scirpus food plants. *Ecography* 18:155–163.
- Bell, M. V. 1988. Feeding behaviour of wintering Pink-footed and Greylag Geese in north-east Scotland. *Wildfowl* 39:43–53.
- Dick, G. 1988. Feeding behaviour of the Greylag Goose (Anser anser): A field study. *Ökologi der Vögel* 10:59–69.
- Dubbeldam, W. 1978. The Greylag Goose Anser anser in Flevoland in 1972–1975. *Limosa* 51:6–30. (In Dutch with English summary)
- Dubbeldam, W. & Poorter, E. P. R. 1982. Short communication on Anser anser in The Netherlands, 1970–1980, with special reference to Oostvaardersplassen. *Aquila* 89:73–76.
- Fog, J. 1982. Markskader forvold av gaes i Danmark. In *De svenska gässen*. Svensson, S. (ed.). *Vår Fågelv. Suppl.* 9:79–82.
- Fog, M., Lampio, T., Myrberget, S., Nilsson, L., Norderhaug, M. & Röv, N. 1984. Breeding distribution and numbers of Greylag Geese Anser anser in Denmark, Finland, Norway and Sweden. *Swedish Wildlife Res.* 13:187–212.
- Havlin, J. 1986. Damage caused to newly sown maize by Greylag Geese. *Folia Zoologica* 35:347–356.
- Hudec, K. 1973. Die Nahrung der Graugans Anser anser, in Südmähren. *Zoologické Listy* 22:41–58.
- Madsen, J. 1985. Habitat selection of farmland feeding geese in West Jutland, Denmark, an example of a niche shift. *Ornis Scand.* 16:222–228.
- Newton, I. & Campbell, C. R. G. 1973. Feeding of geese on farmland in East-Central Scotland. *J. Appl. Ecol.* 10:781–801.
- Nilsson, L. 1995. The breeding population of Greylag Geese in the Lake area in southwest Scania in 1985–1994. *Anser* 34:21–26. (In Swedish with English summary).
- Nilsson, L. & Persson, H. 1991. Selection and exploitation of feeding areas by staging and wintering geese in southernmost Sweden. *Ornis Svecica* 1:81–92.
- Nilsson, L. & Persson, H. 1992. Feeding areas and local movement patterns of post-breeding Greylag Geese Anser anser in South Sweden. *Ornis Svecica* 2:77–90.
- Nilsson, L. & Persson, H. 1993. Variation in survival in an increasing population of Greylag Goose Anser anser in Scania, southern Sweden. *Ornis Svecica* 3:137–146.
- Nilsson, L. & Persson, H. 1994. Factors affecting the breeding performance of a marked Greylag Goose Anser anser population in south Sweden. *Wildfowl* 45:33–48.
- Nilsson, L. & Persson, H. 1996. The influence of the choice of winter quarters on the survival and breeding performance of greylag geese (Anser anser). In *Proceedings of the Anatidae 2000 Conference*, Strasbourg, France, 5–9 December 1994, M. Birkan, J. van Vesseem, P. Havet, J. Madsen, B. Trolliet & M. Moser, eds. *Gibier Faune Sauvage, Game Wildl.* 13:557–572.
- Ouweneel, G. L. 1981. Aantalsveranderingen bij de Grauwe Gans (Anser anser) langs het Hollands Diep- Haringvliet. *Watervogels* 6:13–18.
- Persson, H. 1996a. Survival rates and breeding success in a marked Greylag Goose Anser anser population, wintering in the Guadalquivir Marismas. *Proc. II Congr. Ibérico de Ciéncias Cinegéticas. Revista Florestal* 9:189–199.
- Persson, H. 1996b. Otoño silencioso: el declive del ánsar común en Doñana. *Quercus* 129:38–41.

Van der Reest, P. J. 1988. Distribution and feeding of geese wintering in a polder area in SW Netherlands. *Limosa* 61:73–77. (In Dutch with English summary).

Voslamber, B. 1989. *Foerageergebieden van de Dollard-ganzen*. (Report) Provinciale Planologische Dienst, Groningen.

Sammanfattning

Grågässens Anser anser fältval i förhållande till förändringar inom jordbrukets markanvändning i södra Sverige

Grågässens fältval under sensommar och höst undersöktes i Börringeområdet åren 1985–87 (Nilsson & Persson 1992). Därefter genomgick det svenska jordbruket en stor omställning, vilken bland annat ledde till att stora arealer odlad mark togs ur produktion och antingen lades i träda eller ställdes om till annan användning. Denna omläggning av jordbruket förändrade radikalt födosöksituationen för grågässen under sensommar och höst, ty under den delen av året sker nästan allt födosök på jordbruksmark. I Börringeområdet omställdes betydande arealer. Detta gjorde det möjligt att genomföra en förnyad undersökning av grågässens fältval i mitten av 1990-talet.

Undersökningsområde

Undersökningen genomfördes i två områden i sydvästra Skåne, Börringeområdet (Nilsson & Persson 1992, 1994) och Foteviksområdet (Figur 1.). I Börringeområdet har antalet häckande grågäss ökat från 40 par 1979 till 530 par 1994 och 1995 (Nilsson 1995), följt av en minskning till 495 par 1996.

Spannmål var den dominerande grödan i närheten av daglokalerna i Börringeområdet åren 1985 och 1986 (Figur 2), men 1994 och 1995 hade spannmålen till stor del ersatts av trädor. Andelen av den odlade marken som erbjöd gässen högkvalitativ föda (ärtor och spannmål) minskade med hela 75% mellan 1985 och 1995. Områden inom flygavstånd från daglokalerna, men utanför det gamla undersökningsområdet (Figur 1), omfattades inte i lika hög grad av trädprogrammet, utan fortsatte att erbjuda god tillgång på spannmålsstubbar under hösten. De stora trädorna mellan Börringesjön och Havgård-sjön (totalt 226 ha) ersattes 1996 med spannmålsodling (vete). Vi fick därmed en situation som i hög grad liknade den under åren 1985–87.

Det allmänna intrycket är att markanvändningen i Foteviksområdet inte har förändrats nämnvärt under den senaste 10 års-perioden. Arealmässigt domine-

rar spannmålsodlingen stort (60–70%, men även sockerbetsodlingen är omfattande (ca 20%) (Figur 3).

Metoder

Undersökningsområdet besöktes två gånger i veckan under åren 1994 och 1995, samt en gång i veckan 1996, från början av juli tills de sista gässen lämnade i oktober (Börringe) eller november/december (Foteviken). Totala antalet gäss räknades på daglokalerna. Fältvalet fastställdes genom att födosöksområdena noga genomsöktes för att lokalisera samtliga flockar.

Utbudet av olika fälttyper karterades före skörd, varefter alla förändringar (såsom tröskning och plöjning) noterades i samband med kontrollerna efter födosökande gäss. Det karterade området omfattade 1200 ha i Börringeområdet och 3900 ha i Foteviksområdet.

Under 1988–93, dvs åren mellan de båda fältvalsstudierna i Börringeområdet, företogs regelbundna räkningar av rastande gäss i båda undersökningsområdena, från slutet av juli tills gässen lämnade områdena. Räkningar företogs likaså i Foteviksområdet 1985–87. Noteringar om gässens fältval i samband med dessa räkningar ger en tämligen god bild av fältvalet under dessa år, även om inte alla födosökande gäss lokaliserades.

Utnyttjandet av olika fälttyper anges som antalet gåsdagar (GD). GD beräknas på följande sätt: $GD = \cdot \sum$ (medelvärde av två räkningar) * (antalet dagar mellan räkningarna).

Resultat och diskussion

Det största antalet grågäss i Börringeområdet sågs normalt i slutet av juli eller början av augusti, medan de högsta antalen vid Foteviken noterades efter det att gässen lämnat sjöarna (Figur 4). Båda områdena är för grågässen av ansevärd internationell betydelse. Den svenska höstpopulationen uppgick 1995–96 till ca 60.000 grågäss (Andersson & Nilsson opubl.), medan den baltiska populationen ligger i storleksordningen 200.000 (Persson 1997). En tiondel av den svenska populationen förekommer sålunda regelmässigt inom undersökningsområdena.

Grågässens utnyttjande av Börringeområdet ökade från omkring 85.000 GD 1985 till 133.000 GD 1995 och till inte mindre än 225.000 GD 1996 (Figur 5). Ökningen mellan 1995 och 1996 föll helt och hållet på månaderna september och oktober. Denna ökning kan tillskrivas det faktum att trädorna mellan

Börringesjön och Havgårdsjön ersattes med veteodling.

Antalet gåsdagar i Foteviksområdet ökade under perioden 1985–96 från 45.000 till 350.000 (Figur 5). Den kraftiga ökningen i oktober under de senaste 3 åren kan kopplas till ett ändrat födoval (se nedan).

Grågässens ökade utnyttjande av de båda områdena under 1985–96 avspeglar till stor del ökningen i antalet häckande par i Börringeområdet. Tillfälliga bakslag, tre i varje undersökningsområde, sammanföll med de 4 vintrar som utsatte gässen i det (tidigare) viktigaste övervintringsområdet för skånska grågäss i sydvästra Spanien för det högsta jakttrycket under perioden 1984/85–93/94 (Persson 1996a). Högt jakttryck i Guadalquivir Marismas har en uttalat negativ effekt på både överlevnad och häckningsframgång (Nilsson & Persson 1996, Persson 1996a).

Den viktigaste konsekvensen för grågässen av trädesbruket blev att de efter spannmålsskörden tvingades flyga betydligt längre för att nå sina födosöksområden: mellan mitten av 1980-talet och mitten av 1990-talet ökade den genomsnittliga sträckan med 3 gånger vid Klosterviken och Börringesjön och med 5 gånger vid Björkesåkrasjön (Figur 1, 8). En direkt följd av de längre flygsträckorna är en ökad energiförbrukning eftersom fåglarnas flygning är energikrävande. Men då gässen under hösten endast utnyttjar en mindre del av dygnet för födosök (Nilsson & Persson 1992) borde det vara möjligt för dem att kompensera den förhöjda energiförbrukningen genom att använda mer tid för födosök.

Betydelsen av goda födobetingelser på daglokalen demonstrerades tydligt 1996, när de stora trädena öster om Börringesjön återigen användes för veteodling. Detta ledde till ett högt utnyttjande efter skörden och en markant ökning av det totala antalet gåsdagar i Börringeområdet det året sammanfallande med en motsvarande minskning vid Foteviken.

Liksom i andra delar av Europa utnyttjade grågässen i Skåne ett stort antal olika födoslag (Figur 9). Även om det förekom variationer mellan åren kan ett bestämt grundmönster urskiljas. Under de första

veckorna av juli skedde nästan allt födosök på gräsmarker, såväl naturliga som vallar. På de naturliga gräsmarkerna var det gräsfrö som lockade, medan det på vallarna var spirande gräs. Under perioden från mitten av juli fram till dess spannmålsskörden tog sin början fann vi de största mellanårsvariationerna. Mest eftertraktade var fält med mognande ärtor; gäss var beredda att flyga upp till 20 km för att nå sådana fält. Även gräsfröodlingar var eftersökta. Under denna period inträffade det också att gässen gav sig på mognande säd. Vanligen landade gässen på en intilliggande vall och vandrade in i sädesfältet. Trädor utnyttjades också under denna period.

Då spannmålsskörden började, koncentrerades gässen till stubbarna för att söka spillsäd. Nysådda fält har också utnyttjas kortvarigt vid denna tid. Gässen lämnade sjöområdet när stubbarna började plöjas upp, men i Foteviksområdet skiftade de i senare delen av september eller i oktober till sockerbeter, en gröda som saknades i sjöområdet. Denna föda var den dominerande tills dess grågässen lämnade Skåne i november eller december.

Ärtodlingen i Skåne har under det senaste decenniet förändrats på ett för grågässen negativt sätt. Växtförädlare har länge försökt få fram ärtor som kan stå upprätt fram till skörd. Den sort som började odlas 1995 tycks uppfylla detta krav. Som en konsekvens därav har gässen inte längre tillgång till mognande ärtor under treveckorsperioden före skörd, utan endast till stubbar efter skörden.

Under undersökningsperioden har sockerbeter blivit en viktig födokälla för grågässen i Foteviksområdet. Första gången grågäss sågs på sockerbeter i Skåne var hösten 1987, men sedan 1990 har sockerbeter varit den dominerande födokällan under senhösten. Förmodligen har grågässen lärt sig utnyttja sockerbeter i Nederländerna, där denna födokälla sedan länge utnyttjas på av skånska gäss besökta lokaler (Voslamber 1989). Den kraftiga ökningen av antalet gåsdagar vid Foteviken torde kunna relateras till utnyttjandet av denna nya födoresurs.