

# Bean Goose

*Anser fabalis*  
in Britain and Ireland  
1960/61 – 1999/2000

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with contributions from  
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## SUMMARY

This report examines changes in the distribution and abundance of Bean Geese *Anser fabalis* in Britain and Ireland between 1960/61 and 1999/2000. It also evaluates the historical status of this species and reviews current monitoring, population dynamics, ecological knowledge and conservation issues for this species in the Western Palearctic.

Two races of Bean Goose are found in the Western Palearctic: the Taiga Bean Goose *A. f. fabalis* and the Tundra Bean Goose *A. f. rossicus*. These populations are currently estimated at 90,000-110,000 and 300,000-600,000 individuals, respectively.

Both races breed at high latitudes eastwards from Fenno-Scandia, Taiga birds generally breeding further south and west than those of the Tundra race. During the non-breeding season, Taiga Bean Geese are concentrated in southern Sweden and Denmark, with smaller numbers in other neighbouring countries. Tundra Bean Geese are distributed widely across Europe, with three population centres: the North Sea, the southern Baltic and central Europe.

In Britain, Bean Geese are scarce winter visitors, with just two regularly used sites supporting more than 50 birds: the Yare Marshes, Norfolk, and the Slamannan Plateau, Falkirk District. Both flocks comprise birds of the Taiga race. Bean Geese are, however, believed to have been abundant in historical times, particularly in Scotland, although some uncertainty exists over their former status.

Numbers at the two key sites are monitored primarily by local study groups and individuals. They

are currently decreasing at the Yare Marshes and increasing at the Slamannan Plateau. Small numbers of birds at other sites, primarily involving those of the Tundra race, are recorded through the Wetland Bird Survey (WeBS), and by county bird clubs. Information on numbers, trends and site use at these key resorts is provided within this review.

Reproductive success, measured as the proportion of juveniles in winter flocks, tends to be significantly lower in the UK than elsewhere in the range, although questions over data quality exist and sample sizes are, inevitably, small.

The species is fully protected in Britain and is placed on the 'Amber' list of The Population Status of Birds in the UK.

In Britain, the principal threat at the Slamannan Plateau is the lack of site protection and unfavourable changes in land use. The Yare Marshes are well protected. Elsewhere within the flyway range, uncontrolled hunting and habitat loss are the main concerns.

Future research and monitoring in Britain should address the need for a better understanding of habitat requirements for, and demography of, Bean Geese. At a flyway scale, greater ability to delimit the range of each sub-species during the non-breeding season should be a priority, leading as it would to more precise population estimates. There is also a need for greater cross-border co-ordination and effective monitoring of hunting bags.



# 1 THE BEAN GOOSE

## 1.1 Introduction

In Britain, the Bean Goose *Anser fabalis* is a scarce winter visitor from breeding grounds in Scandinavia and Russia. It occurs primarily at just two locations, although evidence suggests that it was formally much more numerous. Little has been written about them in Britain, largely due to their scarcity, although monitoring of their status and some more detailed research has been undertaken for many years at both of the key sites.

This report is split into two sections and is the first attempt to summarise the status of this species in Britain. The first section provides a summary of our present knowledge of the ecology of Bean Geese. This has largely been gathered from the texts by Leif Nilsson *et al.* and Leo van den Bergh, written for *Goose Populations of the Western Palearctic* (Madsen *et al.* 1999), since these also summarise basic information about the ecology of this species, albeit in greater detail than space allows for here.

The second section explores the results of monitoring of Bean Geese in Britain. This comprises a detailed summary of status and trends at the two sites qualifying as nationally important, plus a summary for other regularly used sites. All sites with Bean Goose records from five or more winters are presented. The data used to identify regularly used sites comprised primarily of counts made as part of the Wetland Bird Survey (WeBS, Pollitt *et al.* 2003). Many records of Bean Goose in Britain are collected outwith WeBS, however, and these are typically published in County Bird Reports. These records were included where possible, but as they are not centrally co-ordinated their availability varied considerably. Consequently, the inclusion of data from county archives in this review was not even between counties.

## 1.2 Background

The Bean Goose is a widespread and abundant species across the Palearctic, breeding from Scandinavia to eastern Siberia (Madge & Burn 1988, Fig. 1). Five races are currently recognised by most authorities (e.g. Cramp & Simmons 1977) and these fall into two groups: those breeding in tundra regions and those breeding in forested taiga areas to the south. Overlap between these races does exist, however, and the taxonomy of Bean Geese is still uncertain. In particular, there is doubt over the

validity of *A. f. jobanseni* (Burgers *et al.* 1991). In-depth discussion of these issues can be found in Burgers *et al.* (1991) and Sangster & Oreel (1996).

In Northwest Europe, it is common and widespread during the non-breeding season. Two races occur, the Taiga Bean Goose *A. f. fabalis* and the Tundra Bean Goose *A. f. rossicus*. The former race originates from the taiga zone of Scandinavia and western Russia, at least as far as the Ural Mountains, although the majority of *fabalis*-type Bean Geese ringed in the Netherlands were recovered east of the Urals (Burgers *et al.* 1991). It winters predominantly in southern Sweden, Denmark and, to a lesser extent, in northern Germany and Poland. Some birds from more eastern breeding areas are thought to migrate through the Baltic States to reach Poland and Germany, instead of passing through the stopover sites in southern Sweden. Small numbers of birds also visit western Denmark, the Netherlands and Britain.

Tundra Bean Geese breed in low arctic northern Russia and western Siberia, from the Kola Peninsula to the Taimyr Peninsula. During the non-breeding season they are one of the most widespread of all Western Palearctic geese, occurring in almost all European countries except Iceland and Ireland. They migrate through Russia and the Baltic states to stopover sites in western Poland, eastern Germany, the Czech Republic, Slovakia, Austria, Hungary and Croatia, arriving as early as the first half of September. By late October, they start to reach western Germany, the Netherlands, Belgium, Luxembourg, France, Spain, Switzerland, Italy, Yugoslavia, Macedonia, Bosni-Herzegovina, Albania, Bulgaria and Greece. In Britain they occur sporadically, mostly in groups of fewer than 10 and with other, more numerous, geese. Influxes of Bean Geese related to cold weather in continental wintering areas occasionally occur and these are typically Tundra Bean Geese, e.g. 1995/96 (Cranswick *et al.* 1997).

Due to their widespread distribution, overlapping winter range and the difficulties of separating different races in the field, deriving population estimates of these two sub-species is problematic. In addition, there has been a lack of co-ordinated counts across the flyway during the period when these populations are most concentrated (October/November) and therefore best censused. Recent estimates suggest 90,000-110,000 Taiga Bean Geese (Nilsson *et al.* 1999) and 300,000-600,000 Tundra Bean Geese (van den Bergh 1999). Wetlands

International currently estimates 100,000 Taiga Bean Geese and 600,000 Tundra Bean Geese (Wetlands International 2002).

## 1.3 Monitoring and population assessment

### 1.3.1 Counts

At the flyway scale, co-ordinated counts of Bean Geese are carried out as part of the International Waterbird Census, organised by Wetlands International (see Gilissen *et al.* 2002). One count is conducted in mid January of each year, although, as noted above this is not the best time to census this species and in most cases no attempt is made to separate the two races during these counts. As a consequence of this and other difficulties associated with censusing this species, population estimates are rather broad, particularly for Tundra Bean Geese. More frequent counts of Bean Geese are also carried out in many European countries, and these are often at more appropriate times of the year. In most cases, however, they are not co-ordinated between countries. In Sweden, regular counts of Taiga Bean Geese have been conducted each October since 1977/78, and in some years these have been co-ordinated with counts in northern Germany and Poland. Co-ordinated autumn counts of Tundra Bean Geese are, however, not carried out.

In Britain, co-ordinated counts of Bean Geese principally come from the Wetland Bird Survey (WeBS) and its predecessor, the National Wildfowl Census. This provides the most comprehensive dataset for this species, although counts are not assigned to a sub-specific level.

Further counts at the two principal locations: the Yare Valley, Norfolk, and the Slamannan Plateau, Falkirk District, are undertaken regularly (almost daily), and provide a detailed understanding of abundance and phenology. Away from these sites, Bean Geese are local rarities and the majority of records are of Tundra Bean Geese. Consequently, most observations are recorded, but since many are of single birds, or small groups, in larger feeding flocks of more numerous geese and are found away from wetland sites, most are not recorded by WeBS. These records are typically published in annual County Bird Reports, although many are not stored electronically and they are not centrally co-ordinated.

### 1.3.2 Productivity

Breeding success has not been monitored rigorously in the UK, although some counts of the number of first-winter birds present in these flocks have been made. At the Yare Marshes, counts have been made infrequently and do not allow trends in breeding success to be determined. At the Slamannan Plateau, counts of first-winter birds only started in earnest in 1997/98, and these data do not allow the calculation of a ratio, since the number of birds aged was not recorded. It is likely that most of this flock was checked, however, since they remain together and counts of first-winter birds were made only when conditions allowed them to be thorough.

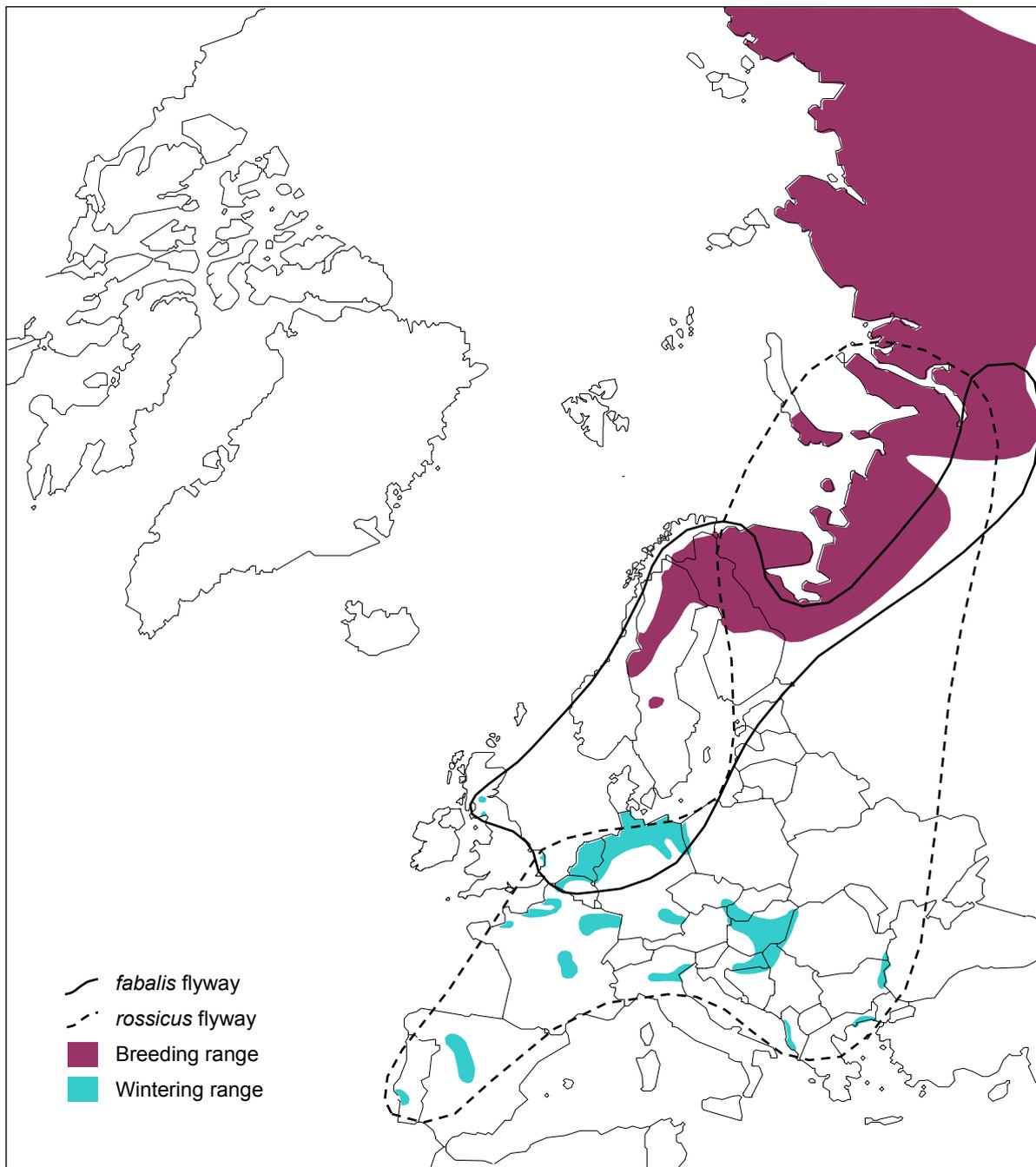
Elsewhere, the breeding success of Taiga Bean Geese has been monitored annually in the Netherlands since winter 1973/74. More recently, data have been collected from other parts of their range, such as areas to the south of the Baltic Sea and in Sweden, although this is mostly as part of specific studies, rather than a long-term monitoring programme. Similar assessments have been carried out for Tundra Bean Geese, primarily in the Netherlands and western Germany where they have been annual since 1981. Other counts have been carried out infrequently in eastern Germany, Poland and Hungary.

### 1.3.3 Ringing

No regular ringing of Bean Geese has occurred in Britain, although colour-marked birds caught elsewhere have been observed or recovered here.

In other parts of the wintering range, large-scale ringing of Bean Geese has only been carried out in four countries. In the Netherlands, over 14,000 were ringed between 1954 and 1989, of which about 3,000 were identified as Taiga Bean Geese. Several hundred of those that were caught in the 1980s were also colour-marked with engraved leg rings. This effort has since been reduced, however, and few are now ringed there. In Sweden, Taiga Bean Geese were caught and marked with neck collars at wintering sites between 1977 and 1980. This study continues, but since 1981 the capture and marking of birds has been carried out at breeding and moulting areas in northern Sweden and Finland, with work in Swedish wintering locations focussing on resighting marked birds. In Germany, ringing has been carried out at Lake Guelpe since 1971.

**Figure 1.** Breeding and wintering ranges of Bean Goose *Anser fabalis* and flyway ranges of *A. f. fabalis* and *A. f. rossicus* (adapted from Lack 1986, Madge & Burn 1988, Scott & Rose 1996, Snow & Perrins 1998, Nilsson *et al.* 1999, van den Bergh 1999 and WWT data).



### 1.3.4 Population assessment

Basic delineation of Bean Goose flyways has been established through ringing, although confusion still exists over the taxonomic status of some forms (see Burgers *et al.* 1991 and Sangster & Orel 1996).

In the UK, there is much confusion over the historical status of Bean Geese and it is difficult to draw any firm conclusions about their former abundance and distribution. Confusion exists not only over their sub-specific identity, but also over whether they were Bean Geese or Pink-footed Geese *A. brachyrhynchus*. This confusion persisted long after their taxonomic separation in 1833 and Bannerman (1957) stated "owing to confusion with Pink-footed Geese, it is almost impossible to assess [Bean Goose] numbers correctly in the past".

Berry (1939) provides one of the earliest reviews of their status, in Scotland at least. He quotes references that Bean Geese were the common grey goose in a number of regions in Scotland during the latter half of the 19th century (and earlier in some cases), including the Solway, the Clyde Basin, the Moray Basin, East Lothian and the Tweed. A rapid decline appears to have occurred in the late 19th century and early 20th century, however, so that by the time of his book, he found that Bean Geese were scarce visitors to all parts of Scotland. Most of these are thought to have been the 'segetum' type (now *A. f. rossicus*), but it was not always possible to determine which race had been present and in some cases it is likely that the 'arvensis' type (now *A. f. fabalis*) also occurred.

Berry (1939) also reports that in many inland areas, small increases in the number of 'arvensis' had recently been noted, but these only involved small numbers of birds in most cases and never more than a few hundred. It was considered at the time, however, to still be the commonest goose on the uplands of Ayrshire. He accepted that some confusion between Bean Geese and Pink-footed Geese must have occurred, but still considered that the Bean Goose was the common grey goose in much of Scotland during the 19th century.

At the same time, Witherby *et al.* (1939) considered the chief haunts to be Northumberland, Norfolk, Suffolk, Ayr and one locality in south-west Scotland. Smaller numbers were also present around The Wash, Sussex, North Uist and Aberdeenshire.

More recently, Bourne & Ralph (2000) concluded that most historical reports of Bean Geese in Scotland referred to Pink-footed Geese and, possibly, Greylag Geese *A. anser*, even if Bean Geese

were more numerous than now. Berry (1939), however, provided evidence that as Bean Goose numbers declined, numbers of Pink-footed Geese began to increase in these areas, suggesting that observers, or more likely wildfowlers, were able to differentiate between the two species.

Resightings of colour-marked birds in the UK have identified links with other parts of the flyway. At the Yare Marshes, neck-collared birds were first observed in 1987/88, when up to 22 individuals were present. These birds were from a catch of 36 individuals marked at a moulting site in Västerbotten, Sweden, during July 1987, where approximately 300 individuals were known to be moulting (Parslow-Otsu 1991a). Subsequently, 21 of these returned the following winter and 14 in 1989/90. Some of these individuals have also been observed during the spring in parts of northwest Jutland, Denmark. Other birds from the catch at Västerbotten have wintered in southern Sweden (Parslow-Otsu 1991a).

At Slamannan, up to six colour-ringed birds were seen between 1989/90 and 1992/93. These originated from a captive-breeding/release scheme in south-central Sweden, which began in 1974 (C. Mitchell *in litt.*, cited in Parslow-Otsu 1991a). All other re-encounters of colour-marked birds in Britain also indicate links with the Scandinavian breeding population (Parslow-Otsu 1991a).

#### *Abundance*

The persistent difficulty of assessing population status at the flyway scale has already been highlighted (see 1.2 and 1.3.1). Confusion between Taiga and Tundra Bean Geese, and the lack of co-ordinated counts at appropriate times of the year mean that derived population estimates are imprecise.

Whatever their former status, a clear picture of their status exists from the late 1940s, by which time there were just three localities in Britain where Bean Geese occurred annually (Boyd 1963). They remain scarce winter visitors, with flocks of Taiga Bean Goose now regularly found at just two locations: the Yare Valley, Norfolk and the Slamannan Plateau, Falkirk District. The peak five-year mean counts for the period 1995/96-1999/2000 were 241 and 152, respectively.

Many recent records away from the Yare Marshes and Slamannan Plateau are unidentified to the sub-specific level, e.g. in Sussex, 75% of 369 records to the end of 1999 remained indeterminate (Fairbank 2000). But it is likely that most are Tundra Bean Geese, e.g. of 110 records of Bean Goose in Hampshire between 1960-92, 49 were identified as

Tundra Bean Geese and three as Taiga Bean Geese (Clark & Eyre 1993).

#### *Productivity*

Both of the sub-populations found in Britain appear to show low reproductive success, although data quality is relatively poor and sample sizes are small. In the Yare Valley flock, productivity decreased suddenly in 1987 and has remained low since then (M Parslow-Otsu pers. comm.). The reason for this remains unclear, but Bean Geese in northwest Jutland, which are from similar breeding areas to the Yare birds, continued to hold between 8-10% young during the period 1990-1995 (M Parslow-Otsu pers. comm.).

Elsewhere, the breeding success of Taiga Bean Geese, as measured in the Netherlands, averaged 28.7% in the period 1981/82 - 1989/90. In Tundra Bean Geese, assessments in the Netherlands and western Germany suggest a high degree of variation between years, from 41% (1981) to 9.1% (1992), with an average over the period 1981/82-1997/98 of 21.7%.

#### *Survival*

No specific studies of survival in either Taiga or Tundra Bean Geese have been carried out. Nilsson *et al.* (1999) estimated survival in adult Taiga Bean Geese from northern Finland to be at least 75-80% for birds marked during the period 1980-1993. Using basic hunting bag estimates, van den Bergh (1999) suggests an annual rate of mortality of 25-30% for Tundra Bean Geese.

Jonsson *et al.* (1985) found that 62% of adult and 28% of yearling Taiga Bean Geese were carrying lead shot in their tissue.

## 1.4 Annual cycle

### 1.4.1 Breeding season

#### *Range*

Taiga Bean Geese breed from Scandinavia into Russia, although it is not clear how far east this range extends (Nilsson *et al.* 1999). According to Alpheraky (1905), Taiga Bean Geese breed as far east as the lower Ob Region, to the east of the Ural Mountains, an area that is part of the believed distribution of *A. f. jobanseni*. Indeed, Burgers *et al.* (1991) found that the majority of *fabalis*-type birds ringed in the Netherlands were recovered in this region, further east than *rossicus*-type birds also ringed there.

In Scandinavia, Taiga Bean Geese are found predominantly in Finnmark, from Jämtland northwards, Dalarna and Hälsingland and the aapa mire zone of eastern Lapland. Data on the size of breeding populations are scarce, but recent estimates in Sweden and Norway are of 500-1,000 pairs and in Finland of 1,500-2,000 pairs (Nilsson *et al.* 1999).

Tundra Bean Geese breed in low arctic northern Russia and western Siberia, from the Kola Peninsula to the Taimyr Peninsula, extending between the 5°C and 10°C July isotherms (van den Bergh 1999). It is not thought that the breeding range extends south of the Arctic Circle; there have, however, been few studies of the southernmost extent of Tundra Bean Geese and the northernmost extent of Taiga Bean Geese. The majority of the population is found on the Malozemelskaya and Bol'shezemelskaya tundras, between the Kanin and Yugorskiy Peninsulas, although some also breed on islands to the north, such as Novaya Zemlya. This is supported by recoveries of birds ringed in the Netherlands (Burgers *et al.* 1991).

#### *Phenology*

In most areas, the majority of Tundra Bean Geese arrive on their breeding grounds between early May and early June, with the passage of non-breeding birds lasting until late June in some areas (e.g. Kanin Peninsula). They typically arrive in pairs or small flocks of fewer than 20 birds, settling to breed after a short period of territorial display (van den Bergh 1999).

In favourable years, the first broods hatch in late June; under less favourable conditions this may be delayed until early July. Young fledge as early as mid July and, in general, little variation in fledging time has been found between regions (Filchagov *et al.* 1985).

Departure from the breeding grounds occurs as early as late June for failed and non-breeders, when they move to nearby moulting sites. After moulting, the geese leave their tundra breeding and moulting areas in late August and early September.

Pairs of Taiga Bean Geese begin to arrive in Lapland during early May (Lampio 1984). Little other information is currently published on the timing of the breeding cycle, however, although it is thought to be generally similar to that of Tundra Bean Geese.

#### *Dispersal*

Failed and non-breeders may disperse quite rapidly to moulting areas. Immediately after moulting, many birds (both failed and successful breeders) move to

coastal tundra areas prior to initiating migration to the wintering areas.

#### *Habitat*

Taiga Bean Geese inhabit the forest zones south of the tundra, which include mires, mire forest, ponds, lakes and streams. Spruce mires and more complex mire types seem to be preferred. High breeding densities in the aapa mire zone are thought to be related to the availability of plentiful food resources (Pirkola & Kalinainen 1984a, b). The wider distribution in Sweden is thought to have resulted from the creation of suitable feeding habitat on mires by the activities of hay-makers (Mellquist & von Bothmer 1984). During brood-rearing, Taiga Bean Geese prefer more open marshland.

In contrast, Tundra Bean Geese breed in open tundra habitats, especially in areas dominated by sedge and grasses alongside lakes and rivers.

#### *Ecology*

At this time they forage for different *Carex* species, *Scheuchzeria palustris* and *Menyanthes trifoliata* (Pirkola & Kalinainen 1984a, b). Later in the summer, berries of *Empetrum nigrum* and *Vaccinium myrtillus* are frequently taken.

They forage predominantly on cotton grasses (*Eriophorum scheuchzeri* and *E. angustifolium*), *Arctophila fulva*, *Carex stans*, *Equisetum arvense* and, to a lesser extent *E. variegatum*, *Oxytropus middendorffii* and leaves of *Salix reptans* and *S. polaris* (see van den Bergh 1999). At certain times, particularly the arrival and post-moult periods, when the geese are concentrated at certain sites, their foraging activities can greatly affect their feeding habitats, particularly the cotton grass-moss habitats and meadow grass areas (e.g. Zharkova & Borzhonov 1972).

#### *Moult migration and moulting areas*

Concentrations of moulting Taiga Bean Geese are known to have existed in Finnmark, northernmost Norway, for many decades, with up to 3,500 present there in 1968 (Nilsson *et al.* 1999). Other moulting areas have been found on the Kola Peninsula and in northernmost Sweden, although searches in the latter area during the 1970s failed to find any large number of birds. More recently, flocks of up to 300 have been located in southern Lapland (Nilsson *et al.* 1999).

Key moulting areas for Tundra Bean Geese exist on the Kola Peninsula, where they mix with Taiga Bean Geese during this period, and the Bol'shezemelskaya tundra. Up to 36,000 birds have been estimated to moult on the Kola and as many as 175,000 on the Bol'shezemelskaya tundra (Bianki 1981, Mineyev

1981). A further 15,000 have been reported from the Lumbovka-Ponoy-Reka District and 50,000 at the Vashutkiny, Padimeyskiye and Khargeyskiye lakes (68°N, 62°E) (Scott & Rose 1996).

## 1.4.2 Autumn migration

#### *Range*

Taiga Bean Geese follow two main routes during autumn migration: the principal one takes birds through Finland and Sweden, the other through the Baltic States and Poland.

Staging areas exist in many parts of Finland, but are found primarily in coastal areas, where birds congregate before crossing the Baltic Sea or Gulf of Bothnia. They also use a number of staging sites in southern Sweden, from the province of Uppland southwards (Nilsson & Persson 1984). Use of these sites during the autumn is a relatively new phenomenon, having developed since the late 1970s, although some were frequented before this period during the spring migration. Before this change in autumn site use, most birds staged at sites in Sweden's southernmost province, Scania, which is also the principal wintering area.

Tundra Bean Geese use two main flyways from their breeding areas: one through the far north, from the White Sea and the Baltic States; the other further inland across European Russia (van den Bergh 1999).

Beyond Lake Ladoga, northwest Russia, they mix with the more southerly migrating population of Taiga Bean Geese. This limits the current understanding of the exact routes taken by each population, but it is believed that Tundra Bean Geese migrate mainly through the Novgorod/Vitebsk region, reaching the Polish border between 21°N and 24°N and only use the more coastal route through Estonia, Latvia and Lithuania, favoured by Taiga Bean Geese, in small numbers. A detailed account of the migration routes of Tundra Bean Geese is given in van den Bergh (1999).

#### *Phenology*

Migration of Taiga Bean Geese through Finland occurs during September, with birds arriving in Uppland, Sweden, later that month. Peak numbers occur at the Swedish staging sites during mid October. Departure varies according to the extent of frost periods, but by December, few birds remain at these sites (Nilsson *et al.* 1999).

Tundra Bean Geese leave their breeding areas during late August and early September, passing through the

republics of the former USSR during September and October.

#### *Dispersal*

From their staging areas, Taiga Bean Geese move into Scania, Sweden, the principal wintering area. In colder winters, a greater proportion of the population moves further south into Denmark, primarily southern Sjælland, Lolland, Falster and Møn.

Upon arrival in Eastern Europe, Tundra Bean Geese disperse to three principal wintering areas: the southern Baltic (western Poland and eastern Germany); the North Sea area (western Germany, the Netherlands and Belgium); and central Europe (Czech Republic, Slovakia, Austria, Hungary, Slovenia and Croatia).

#### *Habitat*

At autumn staging areas, Bean Geese use a variety of agricultural and wetland habitats.

#### *Ecology*

The feeding ecology of staging and wintering Taiga Bean Geese was studied extensively in Scania between the 1950s and 1980s (Nilsson *et al.* 1999). Typically, stubbles were favoured during the early autumn. Selection of autumn sown cereals and root crops, such as sugar beet, carrots and potatoes was mainly confined to later during the winter.

Tundra Bean Geese also switch from natural food to agricultural crops during the autumn, feeding on various arable crops (van den Bergh 1999).

### 1.4.3 Winter

#### *Range*

The wintering range of the two populations has been described above on a flyway scale. In Britain, Bean Geese have a very restricted distribution. Two groups of Taiga Bean Goose are found at the Yare Marshes, Norfolk, and the Slamannan Plateau, Central and a scattering of Tundra Bean Geese occurs during most winters, typically in eastern counties, with the majority of sites failing to reach double figures.

#### *Phenology*

Taiga Bean Geese leave their Scandinavian breeding grounds during September (Eriksson & Henricsson 1990). The first arrivals in the Yare Valley appear around mid November, with peak numbers present by mid December. In contrast, the Slamannan birds typically begin to arrive during mid October, with the whole flock present by early November.

Departure from the Yare Marshes is increasingly early, with most birds leaving during January (some as early as the first week) and all gone by mid February in most years. In the 1980s, most departures took place during February, but during the 1990s, the average departure date for the majority of the population was 25 January (M. Parslow-Otsu *in litt.*) and in the latter half of this decade it was typical for most to leave by mid January. At Slamannan, departure takes place during the second half of February, with birds staying into early March in some years.

In some years, greater numbers of Bean Geese are found in the UK. These influxes are typically associated with cold weather in wintering areas further to the east and are primarily composed of Tundra Bean Geese. They usually occur during mid to late winter, when cold temperatures are more likely and when a greater proportion of resources have been utilised in other wintering areas.

#### *Dispersal*

Dispersal of Taiga Bean Geese from the Yare Marshes and Slamannan Plateau is unknown and considered unlikely. Once the peak winter count has been reached, there is little, if any, fluctuation in the counts until birds start their spring migration. The dispersal of Tundra Bean Geese between sites in Britain is unknown.

Elsewhere, Taiga Bean Geese have been found to show marked site fidelity: 69% of birds wintering in southern Sweden were seen at only one site within a season and most seen in a second consecutive winter had not changed wintering site (Nilsson & Persson 1991b).

#### *Habitat*

The habitat preferences of Bean Geese were studied in detail at the Yare Marshes between 1982/83 and 1987/88 (Allport 1991). It was discovered that these Bean Geese selected old, rough meadows with a relatively high biomass that were dominated by *Poa trivialis/pratensis/annua*. This habit is in marked contrast to that of other geese, which typically show preferences for newly reseeded meadows. Such areas are usually associated with cattle- and horse-grazing.

Habitat use at the Slamannan Plateau was studied during winter 1993/94 (Smith *et al.* 1994). The birds fed almost exclusively in improved or semi-improved grassland fields, and used moorland areas only for resting. Analyses suggested that they selected areas more distant from buildings and roads, and that within these areas they preferred improved grasslands with a greater than average proportion of flooding. There was also evidence suggesting that

they avoided fields stocked with cattle. Sward height in selected fields averaged 3.3 cm, in strong contrast to the findings of Allport (1991). However, no significant differences were found at Slamannan in sward height and species composition between fields that were grazed by Bean Geese and those that were not.

#### Ecology

The feeding ecology of Taiga Bean Geese has been studied by a number of researchers, principally in the main wintering region of Scania, southern Sweden (e.g. Markgren 1963, Nilsson & Persson 1991a). These studies found typical habitat use for an *Anser* goose: stubbles were highly favoured during the autumn, with cereals and grasses preferred later in the winter. Use was also made of waste root crops, primarily sugar beet, when they were available. Similar habitat selection has been found for Tundra Bean Geese across the European wintering range, with maize identified as an important food source by several researchers (e.g. Mooij 1992, Sterbetz 1979).

In the UK, a detailed study was carried out at the Yare Marshes between 1982/83 and 1987/88 (Allport 1991) and suggested that their preference for meadows dominated by *Poa trivialis/pratensis/annua* arose because they capitalised upon the energetic benefits of their large body size to exploit food resources of such poor quality that they were unavailable to smaller-bodied competitors. Their disproportionately large guts allowed them to retain their food for a lengthy period of digestion, giving high digestive efficiency.

This habitat selection makes the Yare Valley Bean Goose flock sensitive to changes in grazing management practices that result in an alteration in sward composition or a reduction in biomass. A change from cattle- to sheep-grazing at the Yare Marshes in the 1980s resulted in a shorter sward and increased numbers of Wigeon *Anas penelope*. This caused a change in the distribution of the Bean Geese and may have affected the carrying capacity of the site for them (Allport 1991).

An analysis of droppings collected from Bean Goose feeding areas at Slamannan in 1993/94 and 1994/95 revealed that *Lolium perenne* was the dominant food plant in most samples. It was also the dominant species within the sward (as determined in September 1995 by Robertson & Fraser 1995), but a statistically significant selection for this species was still found in all samples where it was the predominant food plant (Percival & Votier 1996). This is in contrast to the Yare Valley flock, which was found to avoid reseeded fields with a dominant *Lolium* sward (Allport 1991). *Holcus lanatus* was also a

common food plant, although it tended to be taken in proportion to its availability in the sward. The other dominant species within the swards were *Agrostis* sp., and these were generally avoided. In fields where *Agrostis* spp. were common, and *L. perenne* less common, selection for *H. lanatus* and *Trifolium repens* occurred (Percival & Votier 1996). Bean Geese at Slamannan also took a number of other species in small amounts, such as *Rumex acetosa*, *Deschampsia caespitosa*, *Cerastium fontanum*, *Festuca* spp. and *Glyceria fluitans*.

#### 1.4.4 Spring migration

##### Range

The spring migration of Taiga Bean Geese follows a very similar route to that used in the autumn. In Sweden, they are concentrated in Uppland and Västermanland. Part of the population, however, follows a different route from that in the autumn, flying north through Sweden along the western coast of the Gulf of Bothnia (Nilsson & Persson 1984).

In Finland, the most important site is at Liminka, Oulu District, where up to 10,000 birds regularly gather (Nilsson *et al.* 1999). Two other locations to the south, Lapua-Ilmajoki and Kristinestad, also regularly support more than 1,000 Taiga Bean Geese during the spring. Information on spring passage through the Baltic States is not available.

Sightings of colour-marked birds have shown that the Yare Valley flock uses stop-over sites in Jutland, Denmark.

Tundra Bean Geese also follow very similar routes during the spring to those used in the autumn, although they tend to remain for longer at individual stop-over sites.

##### Phenology

Taiga Bean Geese depart from their wintering grounds during March, with some remaining until April. Peak counts at staging areas to the north typically occur during late March and April, depending mainly on climatic conditions (Nilsson *et al.* 1999). Onward migration takes place during late April, with peak counts at staging sites along the Gulf of Bothnia in early May.

In Finland, the first arrivals reach southwestern regions in early April, with the peak passage during late April and early May. They start to arrive in Lapland during early May (Lampio 1984, Nilsson *et al.* 1999).

The only available information concerning the direction and timing of onward movements from Britain comes from the neck-collared birds observed at the Yare Marshes. Re-encounters of these individuals indicate that many use a suite of stop-over sites in north-west Jutland, before moving onto breeding areas in central Scandinavia in late April (M. Parslow-Otsu *in litt.*).

Tundra Bean Geese initiate their spring migration before the end of March, with peak passage during April and early May, but lasting as late as early June in some years (van den Bergh 1999).

#### *Dispersal*

The dispersal of Bean Geese at the end of spring migration is presently unknown.

#### *Habitat*

Bean Geese, like other *Anser* species, strongly select improved grasslands and cereals during the spring, as well as switching to areas of natural or semi-natural floodplain (van den Bergh 1999).

#### *Ecology*

Spring staging Bean Geese mainly feed on hay fields or barley stubble (Lampio 1984), but also select other crops such as sprouting barley to a lesser extent (Nilsson *et al.* 1999).

## **1.5 Conservation and management**

### **1.5.1 Legislation and other conservation measures**

#### **1.5.1.1 International**

##### *Conservation status*

Under BirdLife International's Species of European Concern (SPEC) classification (Tucker & Heath 1994), Bean Goose is listed as non-SPEC, and its European Threat Status is classified as Secure. This classification system does not recognise biogeographic populations, however, and so does not reflect the status of discrete populations found within the overall range.

Bean Geese and their habitats are protected by a number of international conventions and directives (Table 1).

##### *Habitat protection*

Under the EC Wild Birds Directive, one Special Protection Area has been classified in the UK for the Taiga Bean Goose, namely Broadland, in Norfolk, which encompasses the Yare Marshes and is also a Ramsar site. This site protects 51.8% of the national population and 0.3% of the biogeographic population (Stroud *et al.* 2001).

Further international protection of key wetland habitats for Bean Geese is provided through the 'Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat' and the 'Bern Convention on the Conservation of wildlife and natural habitats 1979'.

##### *Species protection*

The Bean Goose is listed in Annex II/1 of the EC Birds Directive, which makes provision for hunting of the species anywhere in EC territory under national legislation. They are also listed on Annex III of the Bern Convention, requiring each Contracting Party to take appropriate and necessary legislative and administrative measures to ensure the protection of the species.

#### **1.5.1.2 National**

##### *Conservation status*

Bean Goose is placed on the 'Amber' list of The Population Status of Birds in the UK because 50% or more of the UK non-breeding population occurs at 10 or fewer sites (Gregory *et al.* 2002).

##### *Habitat protection*

The principal site protection designation in Britain is the Site of Special Scientific Interest (SSSI), derived from the Wildlife & Countryside Act (1981). National Nature Reserves (NNR) are areas of national and sometimes international importance which are owned or leased by the appropriate statutory conservation body, or bodies leased by them, or are managed in accordance with Nature Reserve Agreements with landowners and occupiers. NNRs are also notified as SSSIs and attract similar protection. Legislative protection for these sites derives from the Wildlife & Countryside Act 1981. Under these provisions, operations likely to damage the nature conservation interest of SSSIs are subject to control.

Broadland is designated as a NNR, and various SSSI designations also cover the area used by Bean Geese in the Yare Valley. The habitats used at the Slamannan Plateau, both for foraging and roosting, do not have statutory protection, although the principal roost site is within an RSPB reserve.

**Table 1.** The status of the Bean Goose under international legislation

	Taiga Bean Goose	Tundra Bean Goose
Convention on Migratory Species (Bonn Convention)	Appendix II	Appendix II
The African-Eurasian Migratory Waterbird Agreement (AEWA)	B1	(C1) <sup>1</sup>
EC Wild Birds Directive (79/409/EEC)	Annex II/1	Annex II/1
Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention)	Appendix III	Appendix III

<sup>1</sup> Parentheses indicate population status unknown and conservation status estimated.

Key threats for Bean Geese at the Slamannan Plateau have been identified by Fraser (in prep.) as: (1) loss of improved grassland and other open habitats through tree planting and other activities; (2) increased disturbance through visitor pressure, recreational activity and primary industry operations; (3) loss of lochs and other wetlands for roosting; (4) poor quality restoration of open cast mining sites.

At the Slamannan Plateau, a Bean Goose Working Group (recently renamed the Bean Goose Action Group, BGAG) was established in 1994 in recognition of the importance of the area for Bean Geese in Britain. A broad cross-section of stakeholders are represented on the group, including Scottish Natural Heritage, Royal Society for Protection of Birds, Central Scotland Forest Trust, Forestry Commission, Forest Enterprise, Farming and Wildlife Advisory Group, Scottish Agricultural College and Falkirk and North Lanarkshire Councils.

The broad aims of the BGAG are to help conserve the flock of Bean Goose wintering at Slamannan by protecting and managing the habitats used by the geese, to minimise potential land use conflicts in the Slamannan Plateau area by the development of land management guidelines to assist industries such as farming, forestry and mineral extraction, and to influence the practice of planning policies for conserving Bean Geese without discouraging employment prospects or the enhancement of the landscape. Woodland planting guidelines that aim to maintain the areas of open landscape favoured by the geese have been in place since 1994/95.

In addition, a Local Biodiversity Action Plan for Bean Geese at the Slamannan Plateau is currently under preparation (Fraser in prep.).

#### *Species protection*

In Britain, the Bean Goose is fully protected under the Wildlife & Countryside Act 1981.

## 1.5.2 Hunting

Bean Geese cannot be shot legally in Britain, although one or two are probably taken in most years due to confusion with other *Anser* geese that are legal quarry (C. Mitchell pers. comm., Smith & Forshaw 1988). Furthermore, a complete ban on hunting wintering geese has been in place in Belgium since 1981/82 and in the Netherlands since 2000/01. In recent years prior to the ban on goose hunting, the Dutch bag of Bean Geese had been around 7,000 birds per year (van den Bergh 1999). No data exist on the proportion of Taiga versus Tundra Bean Geese within this bag (van Oostenbrugge *et al.* 1992). Elsewhere, Bean Geese are shot extensively, although few countries collect accurate bag estimates and in those that do, most do not specifically identify the geese. The estimates that are available suggest that approximately 3,000 Taiga Bean Geese were taken in Sweden in 1990/91 and in Denmark the bag decreased from 1,200 to 500 between the mid 1960s and early 1990s.

The most recent estimates for Tundra Bean Geese indicate around 40,000 are shot annually in the European wintering range (van Roomen & Madsen 1992). A considerable number of Bean Geese are also believed to be shot each year in Russia, with some estimates as high as 200,000 birds (Majewski in Kalchreuter 1991).

Some countries have reported considerable increases in the annual hunting bag of geese. For example, in Germany, the annual goose bag has increased from c. 6,000 in the 1960s, 7,500 in the 1970s, 10,000 in the 1980s to 30,000-40,000 in the 1990s. This is primarily due to an increase in hunting pressure, rather than goose numbers (Mooij 1991) and, although individual species are not recorded in this system, an increase in the number of Bean Geese shot is likely.

The major threat to Tundra Bean Geese is uncontrolled hunting. Open seasons exist for this species in nearly all regions where important numbers occur. In some areas there is evidence that excessive hunting pressure may have caused birds to abandon former wintering strongholds, for example, this was probably a major factor in the dramatic decrease in the number of birds on the Great Hungarian Plain (van den Bergh 1999). Similar problems have also been reported recently from strongholds in Germany and the Czech Republic.

Yet in most of these countries there are no accurate records of the number of birds shot. In addition, the problems of sub-specific separation highlighted earlier mean that the understanding of population trends is also incomplete. Given the dramatic changes in the widespread distribution of this species that have occurred in recent decades, and the fact that several strongholds are located along the borders of different countries, greater international co-ordination of monitoring and conservation effort will be required to ensure effective management and protection of Bean Geese in the future.

Whilst Taiga Bean Geese appear less threatened by hunting, this population is much smaller and increases in the general hunting pressure on geese in countries such as Germany may impact on it in the future. Therefore, it is vital that solid monitoring programmes are maintained, and in future, this should include enhanced surveillance of hunting bags. The development of adaptive harvest management for all hunted goose populations in Europe is considered essential.

### 1.5.3 Agricultural conflict

Nilsson *et al.* (1999) reports that there is little conflict between Taiga Bean Geese and agriculture, although some problems have been reported in Sweden. In contrast, Tundra Bean Geese come into conflict with farmers more frequently. During the autumn and for much of the winter they feed primarily on waste root crops, but from February onwards they increasingly select winter cereals and pasture. Two countries, Germany and the Netherlands, report considerable crop damage caused by Bean Geese, while some others report little or no damage. In Germany, an average of US\$ 550,000-810,000 is paid each year in compensation for loss of yield due to geese, of which 75% is thought to have been caused by White-fronted Geese and Bean Geese. In the Netherlands, an average of US\$ 240 and US\$ 13,500 is paid for damage to pasture and arable crops respectively caused by Bean Geese.

In Britain, there is no reported conflict between Bean Geese and agriculture, although some did arise between Bean Goose conservation objectives and grazing regimes in the Yare Valley prior to the implementation of a management agreement in 1987/88 (Allport 1989).

## 2 SURVEY OF WINTERING AREAS

The following section provides a detailed site-by-site review of the status of Bean Geese wintering in Britain. For most sites in this review, the principal source of data was the WeBS. These data have been supplemented by additional counts submitted for this review by volunteer counters and site managers throughout the wintering range. In some cases, exhaustive datasets were available for some counties (via the County Bird Recorder), whilst in other counties no information in addition to the WeBS dataset was available. Regions containing sites of importance for wintering Bean Geese are considered and, where relevant information exists, are split into the following sections:

### *Background*

A brief overview of the region's landscape and the availability of suitable habitat for Bean Geese found there. For those regions with no nationally important sites, brief accounts of sites that were previously of national importance, but no longer support such numbers, or have supported large numbers for short periods of time are presented

### *Historical status*

An overview of the status of Bean Geese up to 1960, when the current review period begins. Additional information for the period 1960/61-1999/2000 that is not provided elsewhere is also given here.

### *Nationally important sites*

Detailed accounts of nationally important sites are presented. Sites are selected using the threshold for national importance at the time of the last year under consideration in this report (currently 4, Kirby 1995). The minimum 1% threshold for site designation, however, is normally 50 birds (e.g. Kershaw & Cranswick 2003). In line with accepted practice, therefore, full accounts are only provided for sites with a peak five-year mean count of 50 birds or more. Each site account contains information on status, site safeguards, habitat, trends, and site usage. For definitions of international site safeguards and selection criteria/guidelines used, see Ramsar (1999) for Ramsar sites, Stroud *et al.* (2001) for Special Protection Areas (SPAs) and Heath & Evans (2000) for Important Bird Areas (IBAs).

For each site, a figure is presented showing the peak counts recorded in each season since winter 1960/61. Years in which no counts were made at a site are highlighted by a dot. Note, however, that such cases should be interpreted with caution. Only in very few cases (e.g. systematic surveys) are zeros

recorded for a count – more often, no data are submitted, but the means of recording or presenting data does not distinguish between a zero count and an absence of data, for example, in annual county bird reports. It is, however, likely that important sites have in fact been visited regularly and an absence of data represents nil counts. We have been conservative in our interpretation of such cases, and presented these using dots to indicate the absence of data in relevant months or years. In reality, it is likely that dots in graphs for sites that normally hold very small numbers of birds represent zero counts; only in cases of sites that regularly hold several hundreds or more birds for many years, followed by an absence of data, is it likely that there was a genuine absence of data (e.g. because the counter for a remote site moved from the area). Where known, such cases are highlighted in the text.

A list of nationally important sites with summary information is provided in Table 2 and their location is shown in Fig. 2.

### *Other sites*

Brief accounts of sites that were previously of national importance, but no longer support such numbers, or have supported large numbers for short periods of time are presented.

### *Key references*

This section provides a comprehensive list of relevant literature and published monitoring data on Bean Geese in each region.

**Table 2.** Sites of national importance for Bean Geese in Britain (arranged in descending order of importance)

Site name	5-year mean (1995/96-1999/2000)
1. Yare Marshes	293
2. Slammanan Plateau	152

**Figure 2.** Nationally important sites for Bean Geese in Britain (see Table 2 for key to sites)



## 2.1 England

### 2.1.1 East Anglia

#### 2.1.1.1 Background

This region contains the most important site for Taiga Bean Geese in Britain: the Yare Marshes. Away from this site, the species is scarce and records consist primarily of sporadic sightings of Tundra Bean Geese, or of occasional wandering parties of Taiga Bean Geese from the Yare Marshes. A few sites support small numbers on a more regular basis.

#### 2.1.1.2 Historical status

Bean Geese have frequented the Yare Marshes since at least the early 1920s, and regular counts have been made since 1939/40. At this time, around 200-300 birds were present in most winters, although reports exist of up to 5,000 in 1927 and 1,000 in 1936 (Parslow-Otsu 1991b). The number of birds increased to approximately 250 during the mid 1940s, before declining to fewer than 100 (except for occasional late-season cold weather influxes) for more than 20 years from the early 1950s to the mid 1970s.

Fluctuations in the number of Bean Geese wintering at the Yare Marshes have occurred in parallel with those in the Danish stop-over sites. The declines in the 1940s-1960s coincided with a drastic contraction in breeding distribution, believed to be caused by increased human disturbance and persecution and agricultural changes (Melquist & von Bothmar 1984).

Elsewhere in the region there is little information available on their historical status. As in Scotland, the early history is obscured by confusion with Pink-footed Geese (Taylor *et al.* 2000). Several localities around Thetford and Westacre, Norfolk, are reported to have been abandoned, although no date is provided (Taylor *et al.* 2000). Other records include a flock of 109 off Terrington, Norfolk in March 1930 (P. Scott, in Taylor *et al.* 2000).

#### 2.1.1.3 Nationally important sites

##### i) Yare Marshes

Five-year mean 95/96-99/2000: 293

##### *Site conservation status*

SPA (Broadland: selection stage 1.3)

Ramsar (Broadland: non-qualifying species)

SSSI (Yare Broads and Marshes, Cantley Marshes)  
IBA (Broadland: non-qualifying species)

##### *Site description and habitat*

The area of the Yare Valley used by Bean Geese primarily consists of two grazing marshes, Buckenham Marshes (115 ha) and Cantley Marshes (163 ha), separated by a dyke. Much of the marshes have been improved since the 1960s by levelling and reseeding. All of Buckenham and the southeastern section of Cantley have been reseeded with a *Lolium perenne/multiflorum* and *Phleum bertolonii/pratense* mix in this time, although areas of unimproved grassland also remain.

##### *Numbers and trends*

Since the low-point in the 1960s, the number of birds steadily increased up to the late 1980s, reaching a peak of almost 500 birds in 1990/91. Since then, numbers have declined again, so that the mean peak winter count (1995/96-1999/2000) was 293 (Fig. 3).

##### *Site use*

Between 1982/83 and 1987/88, the number of days between the first bird arriving and the last bird leaving ranged from 96-112 days (Allport 1991). During the most recent five-year period, the time between arrival and departure has become increasingly shorter. The first birds do not arrive until November and typically leave during February, or even late January (Fig. 4). Prior to departure in the spring, the birds first move to one of a range of peripheral sites in the Yare valley for up to two weeks (Allport 1991).

The Yare Bean Geese forage almost entirely within a suite of five marshes between Rockland Broad (TG3305) and Hardley (TG3801): namely Rockland/Claxton, Buckenham, Cantley, Langley and Hardley. Within this area, the majority of time is spent at either Buckenham or Cantley, with the geese tending to prefer one of these areas for most of a winter, depending on the local foraging conditions found there at that time. They may disperse further afield to feed when foraging conditions are poor in this preferred area, such as during the winter of 1992/93.

During the 1960s and 1970s, the geese primarily used Buckenham Marshes, but around 1980, they moved to Cantley. This change was associated with a shift from cattle- to sheep-grazing at Buckenham, which resulted in a shorter sward and provided ideal conditions for Wigeon, which increased from fewer than 1,000 in the early 1970s to more than 5,000 by the 1980s. As Buckenham was already designated a SSSI (largely for its Bean Geese), a management plan designed to provide better foraging opportunities for

Bean Geese was implemented there in 1987/88 so that the birds could be better protected and observed by birdwatchers with minimal disturbance. During winter 1987/88, Bean Geese increased their use of Buckenham from 5-7% to 36% of their total daylight foraging time (Allport 1989). However, use subsequently declined in the early 1990s (Parslow-Otsu 1991b).

In addition to much of the 1980s, Cantley was also the key foraging area in 1955-64. In 1940-45, they fed primarily on the marshes around Langley (Parslow-Otsu 1991b).

A third area, Haddiscoe Island (7 km to the east) also occasionally supports feeding Bean Geese, typically in late winter once the main flock becomes more dispersed prior to spring migration (Parslow-Otsu 1991a). Use of this area during 1984-1987 was relatively high (up to 27% of daylight foraging hours), but subsequently declined due to increased farming activity (Parslow-Otsu 1991b). A further dozen or so other local areas have been used by feeding Bean Geese from the Yare Marshes (Parslow-Otsu 1991b).

Birds roost primarily on nearby Buckenham Carrs, Hassingham (TG3605), a pair of small lakes surrounded by woodland. Surlingham Broad (TG3107) is occasionally used when this site is frozen or disturbed by hunters (Parslow-Otsu 1991a) and, exceptionally, roosting Bean Geese have been reported from the River Yare itself, Rockland Broad and Fritton (Parslow-Otsu 1991b). Breydon Water, approximately 13 km from the Yare Marshes, has also been used extensively in the past and counts from this site are provided in the following section.

#### 2.1.1.4 Other sites

Excluding the Yare Marshes, Bean Geese have been recorded by WeBS from 60 sites in East Anglia. Of these, seven have records in five or more winters:

##### i) Ouse Washes

The Ouse Washes (TL5393) regularly supports small flocks of Tundra Bean Geese, particularly in recent years (Fig. 5), with a peak count of 34 in 1996/97. They occur mainly between December and March, with the peak month being January during 1995/96-1999/2000 (Fig. 6).

##### ii) Breydon Water and surrounding marshes

Prior to 1980, Bean Geese occurred almost annually at Breydon Water (TG4907) and it is likely that the majority of these records refer to the Yare Marshes flock of Taiga Bean Geese. Since 1980, use of this site and its associated marshes has been more

sporadic and more of these records are of Tundra Bean Geese (Fig. 7).

##### iii) Upper Thurne broads and marshes

This site, including Horsey Mere, Heigham Holmes, Martham Broad and Hickling Broad, is also used occasionally by wandering Taiga Bean Geese from the Yare Marshes, with large counts of 365 in 1993/94 and 125 in 1995/96. Large flocks of Tundra Bean Goose have also been recorded: the flock of 104 in 1992/93 was composed entirely of this race (Taylor *et al.* 2000), and flocks of 80 and 42 in January 1994 and February 1996, respectively, were also present, although these are not apparent below (Fig. 8) because of the large flocks of Taiga Bean Goose that also occurred in those winters.

Typically, birds frequenting the area use Horsey Mere (TG4422) as a roost and feed on Heigham Holmes (TG4420). This site is part of the Broadland SPA.

##### iv) Minsmere

Use of Minsmere (TM4666) is rather erratic and may be linked to cold weather movements. Bean Geese have been recorded there in 11 years since 1960/61 (Fig. 9).

##### v) North Norfolk coast

Counts of Bean Geese along the North Norfolk coast, and associated inland farmland grazing areas, have shown a steady increase since the early 1980s (Fig. 10). The vast majority of records are from Holkham and Burnham Overy Marshes (TF8744). Other locations where Bean Geese have been recorded more than three times are the marshes at Cley (TG0544), Stiffkey (TF9744) and Titchwell (TF7544).

##### vi) The Wash

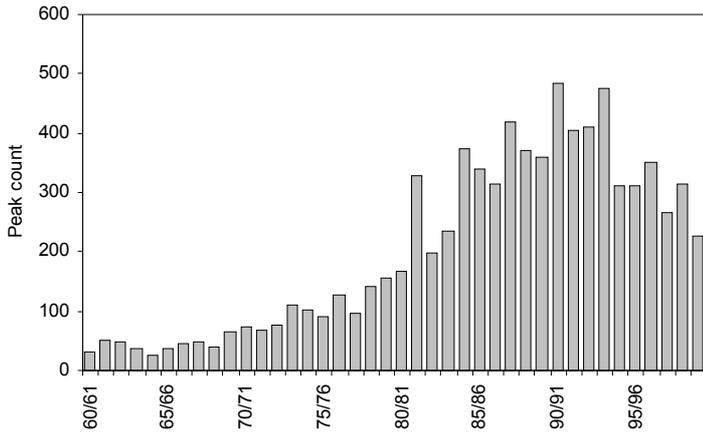
Records of Bean Geese at The Wash have also increased in recent years, although peak winter counts are typically of single-figure flocks, with a peak count of 28 in 1993/94 (Fig. 11). The majority of records are from the Snettisham area (TF6430).

##### vii) North Warren & Thorpeness Mere

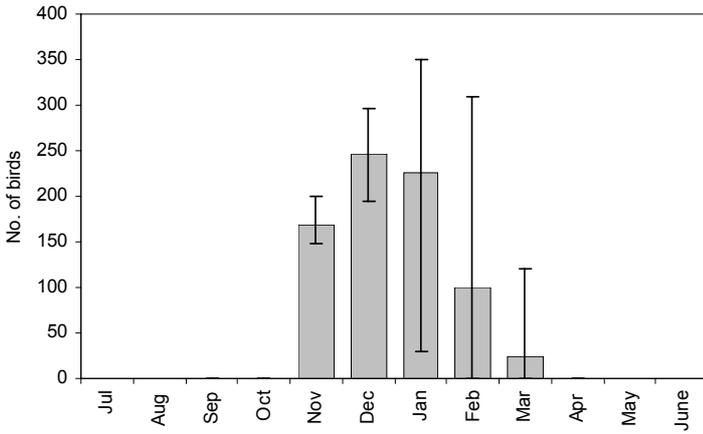
A small flock, peaking at 48 in February 1996, wintered at North Warren & Thorpeness Mere (TM4658) between 1994/95 and 1997/98, but now appears to have abandoned the site. Two other groups of three birds occurred during 1991/92 and 1992/93.

#### 2.1.1.5 Key references

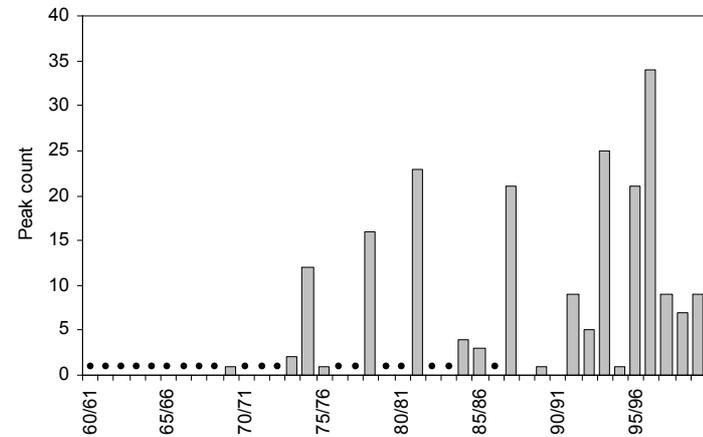
Allport (1991), Parslow-Otsu (1991a, 1991b), Taylor *et al.* (2000), Piotrowski (2003)



**Figure 3.** Bean Geese at Yare Marshes, 1960/61-1999/2000: peak counts (bars) (circles denote years with no known data)

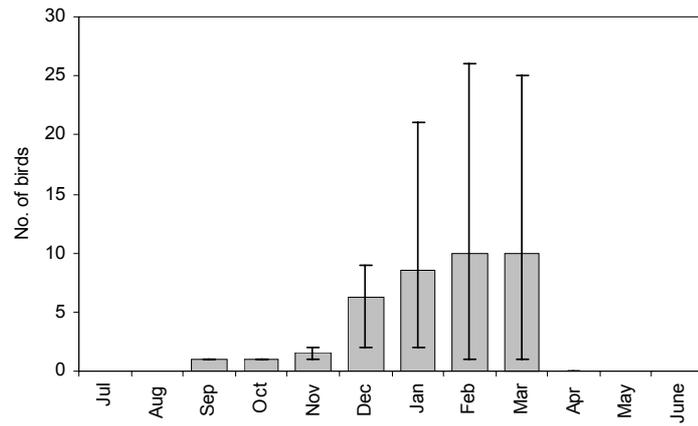


**Figure 4.** Bean Geese at Yare Marshes, 1995/96-1999/2000: mean peak counts per month (error bars denote minimum and maximum peak counts during the period)

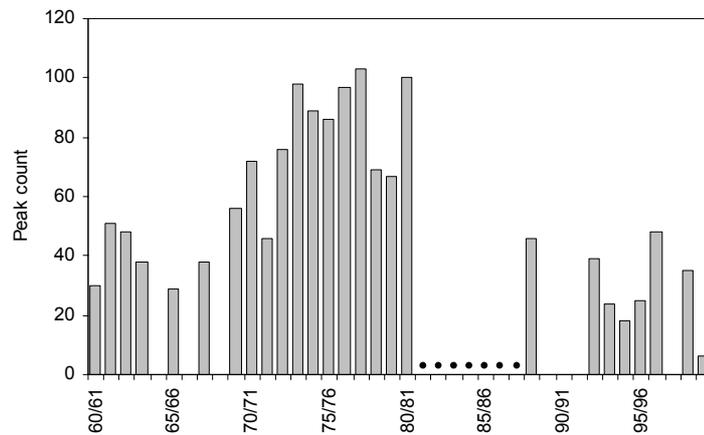


**Figure 5.** Bean Geese at the Ouse Washes, 1960/61-1999/2000: peak counts (bars) (circles denote years with no known data)

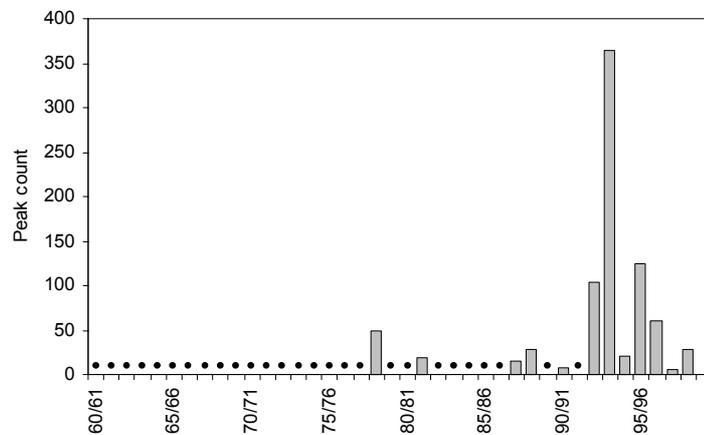
**Figure 6.** Bean Geese at the Ouse Washes, 1995/96-1999/2000: mean peak counts per month (error bars denote minimum and maximum peak counts during the period)

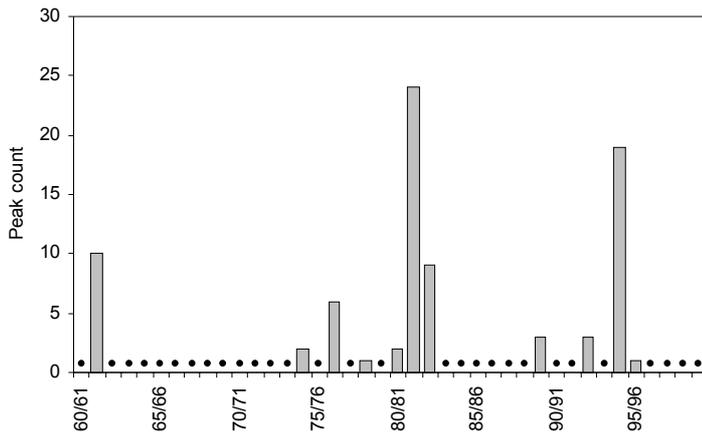


**Figure 7.** Bean Geese at Breydon Water, 1960/61-1999/2000: peak counts (bars) (circles denote years with no known data)

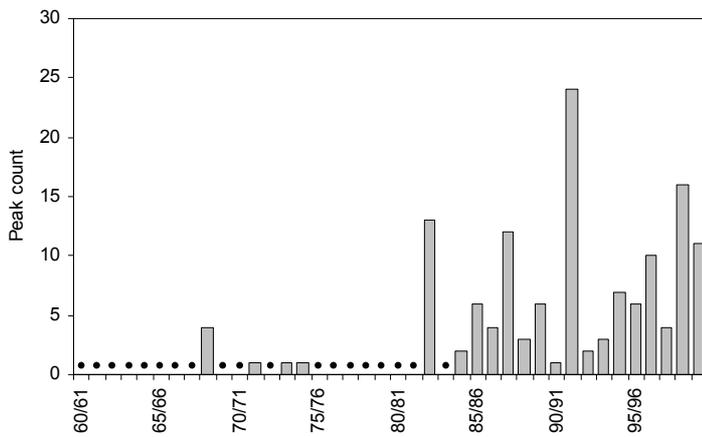


**Figure 8.** Bean Geese at Upper Thurne broads and marshes, 1960/61-1999/2000: peak counts (bars) (circles denote years with no known data)

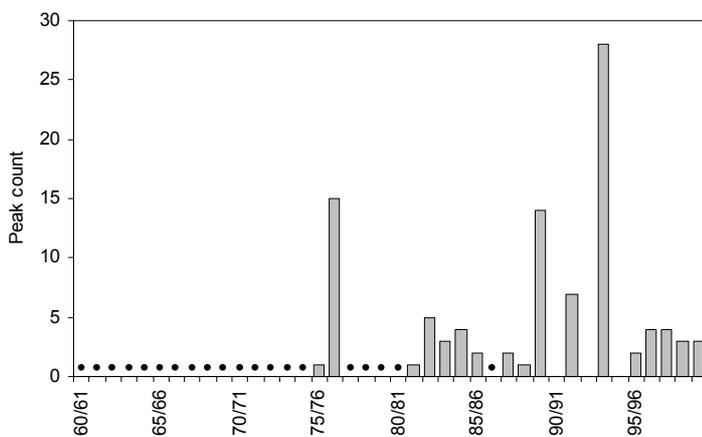




**Figure 9.** Bean Geese at Minsmere, 1960/61-1999/2000: peak counts (bars) (circles denote years with no known data)



**Figure 10.** Bean Geese at the North Norfolk Coast, 1960/61-1999/2000: peak counts (bars) (circles denote years with no known data)



**Figure 11.** Bean Geese at The Wash, 1960/61-1999/2000: peak counts (bars) (circles denote years with no known data)

## 2.1.2 Southeast England

### 2.1.2.1 Background

The Bean Goose is a scarce or very scarce winter visitor to this region, except during occasional cold weather influxes from the Continent. There are two sites worthy of note:

#### i) Isle of Sheppey

Since available data began, in 1976/77, Bean Geese have been recorded in every winter except one (1987/88) on the Isle of Sheppey (TQ9967). The peak count is of 41 in 1981/82, with 40 present in 1997/98 (Fig. 12). Most records occur on the marshes at Elmley (TQ9467) and Harty (TR0567).

#### ii) Dungeness/Dengemarsh and Walland Marsh

This site includes Denge Marsh (TR0520), Walland Marsh (TQ9824) and the gravel pits at Dungeness (TR0619) and Scotney (TR0119). Counts suggest that Bean Geese at this site regularly move between these different areas, thus they are presented here together.

Since 1978/79, when the peak count of 30 birds occurred, Bean Geese have been present in all except three winters. In most winters the peak count is of fewer than ten birds (Fig. 13).

### 2.1.2.2 Key references

James (1996), Fairbank (2000)

## 2.1.3 Southwest England

### 2.1.3.1 Background

Bean Geese have been recorded at a number of sites within this region, although only one of these supports birds with any regularity.

The New Grounds at Slimbridge (SO7204) is the key site for Bean Geese in this region. They have been recorded in a total of 121 months in 36 different winters since 1960/61, peaking at 28 in 1987/88, although in most years there are fewer than five (Fig. 14).

During the period 1995/96-1999/2000, most birds occurred at the New Grounds during January and February, often remaining into March. In some

winters, however, birds arrive earlier in the year, typically with European White-fronted Geese *Anser a. albifrons* and remain for several months (Fig. 15).

The Bean Geese that have occurred at Slimbridge have almost all been Tundra Bean Geese (D. Paynter pers. comm.).

### 2.1.3.2 Historical status

Records of Bean Geese at the key site, New Grounds, Slimbridge, go back to 1939. During the 1940s and 1950s, small numbers were recorded in most winters, peaking at six in 1946/47.

### 2.1.3.3 Key references

Swaine (1982)

## 2.1.4 Northeast England

### 2.1.4.1 Background

There are three sites in the region worthy of note:

#### i) Lower Derwent Ings

With improved management for waterfowl at the Lower Derwent Ings (SE6938), the frequency of use by Bean Geese, as well as that by other species such as European White-fronted Geese, has recently increased, peaking at 42 in December 1998 (Fig. 16). These birds typically occur during December, with a smaller peak later in the winter. Most are thought to be Tundra Bean Geese.

#### ii) Lindisfarne

Lindisfarne (NU1041) was regularly used by small numbers of Bean Geese during the 1970s, but after a peak of 28 in 1981/82, use of the site ceased (Fig. 17).

#### iii) Holywell Pond

Bean Geese have been recorded at Holywell Pond (NZ3175) in 13 winters since 1960/61, between 1972/73 and 1996/97. The peak is of 16 in February 1985; all other counts are of fewer than ten birds.

## 2.1.5 Northwest England

### 2.1.5.1 Background

In Lancashire and north Merseyside, Smith & Forshaw (1988) recorded 91 Bean Geese during the 11 winters from 1975/76 – 1985/86. Of these, 32 (35%) were identified as Taiga Bean Geese, 56 (61%) as Tundra Bean Geese, and three were considered to be *A. f. serrirostris* or intergrades between *serrirostris* and Tundra Bean Goose. Two sites are worthy of note:

i) Martin Mere

Bean Geese were recorded at Martin Mere (SD4214) between 1973/74 and 1975/76, and annually since 1980/81 (Fig. 18). The two highest counts are of 21 in February 1975 and 13 in January 1976; all other peak winter counts are of fewer than six birds.

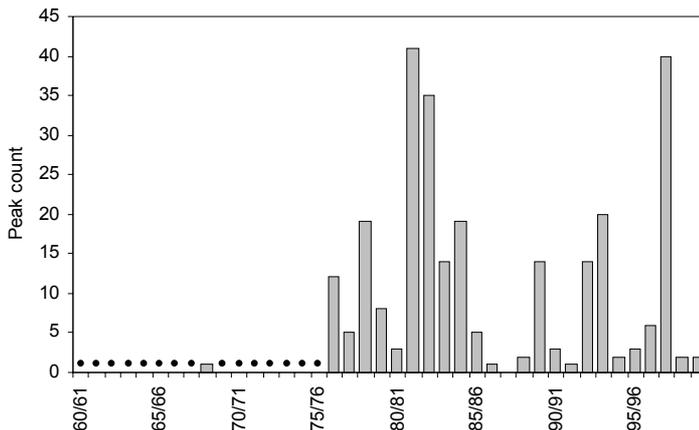
ii) Marshside

Bean Geese have been recorded at Marshside, Southport, in fourteen winters since 1960/61, peaking at 10 in March 1985.

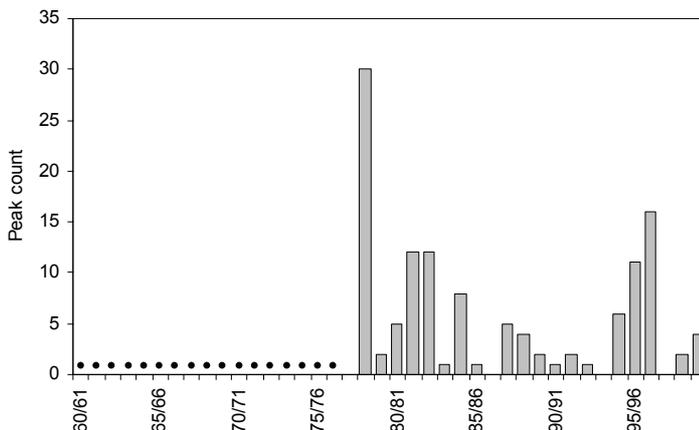
### 2.1.5.2 Key references

Smith & Forshaw (1988)

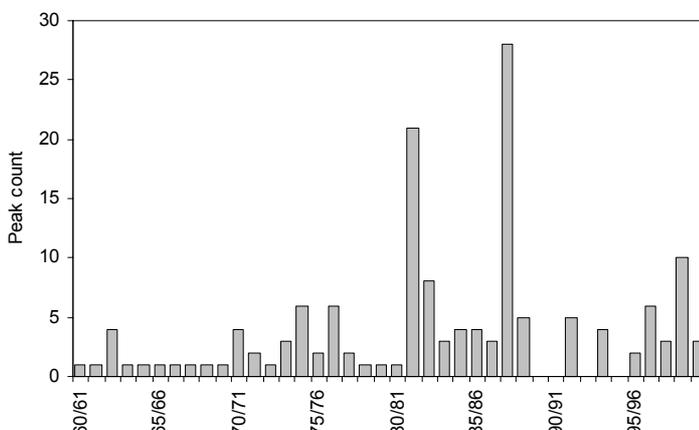
**Figure 12.** Bean Geese at the Isle of Sheppey, 1960/61-1999/2000: peak counts (bars) (circles denote years with no known data)



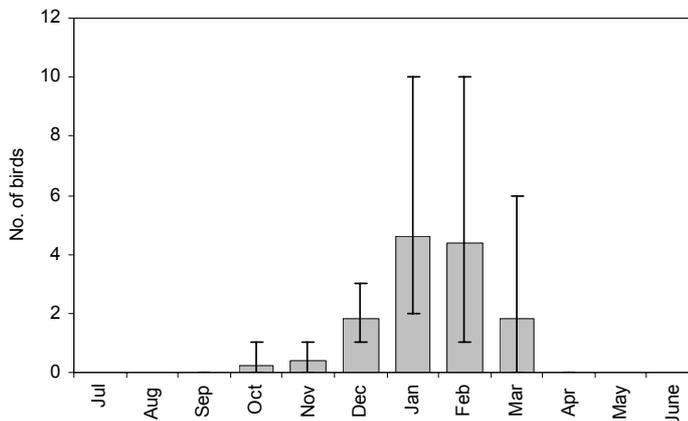
**Figure 13.** Bean Geese at Dungeness/Dengemarsh and Walland Marsh, 1960/61-1999/2000: peak counts (bars) (circles denote years with no known data)

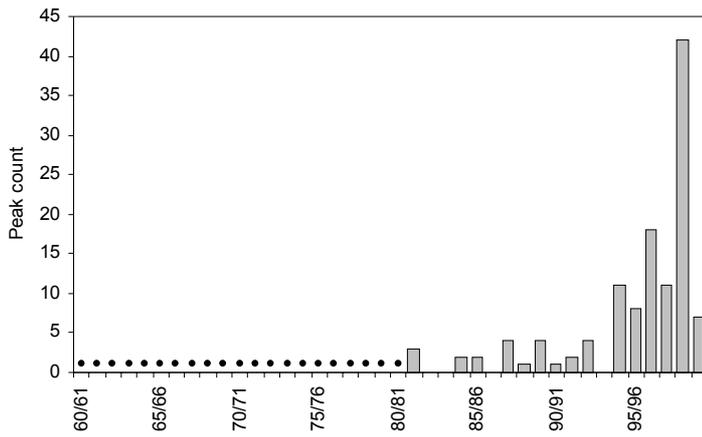


**Figure 14.** Bean Geese at the New Grounds, Slimbridge, 1960/61-1999/2000: peak counts (bars) (circles denote years with no known data)

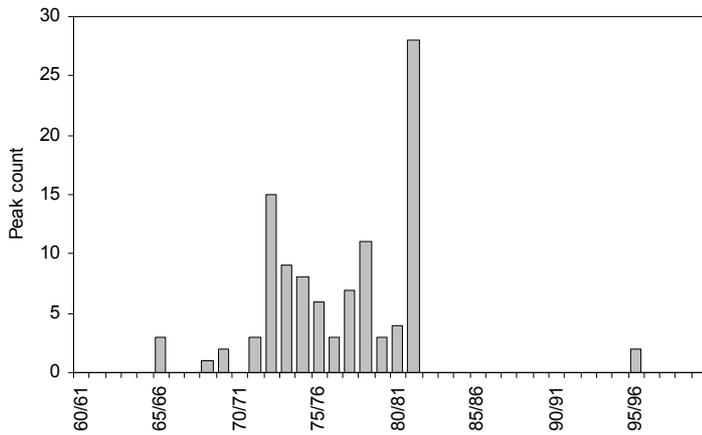


**Figure 15.** Bean Geese at the New Grounds, Slimbridge, 1995/96-1999/2000: mean peak counts per month (error bars denote minimum and maximum peak counts during the period)

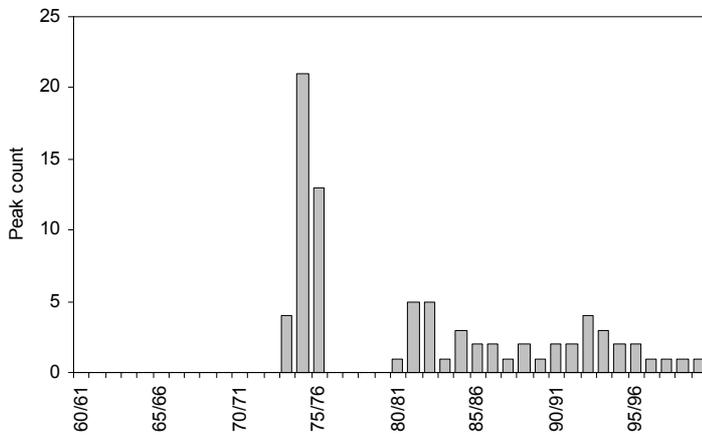




**Figure 16.** Bean Geese at Lower Derwent Ings, 1960/61-1999/2000: peak counts (bars) (circles denote years with no known data)



**Figure 17.** Bean Geese at Lindisfarne, 1960/61-1999/2000: peak counts (bars) (circles denote years with no known data)



**Figure 18.** Bean Geese at Martin Mere, 1960/61-1999/2000: peak counts (bars) (circles denote years with no known data)

## 2.2 Scotland

### 2.2.1 Background

Scotland houses Britain's other nationally important site for Taiga Bean Goose, the Slamannan Plateau. As in East Anglia, Bean Geese are scarce away from this site.

At Slamannan, a Bean Goose Working Group exists to ensure the best interests of the geese are considered. The group consists of representatives from SNH, RSPB, local councils, local enthusiasts and agricultural and other local land-users (e.g. farmers, foresters). In addition, goose watching facilities have recently been developed in one area to better manage birdwatchers visiting the site (see Simpson & Maciver 2000).

### 2.2.2 Historical status

The historical status of Bean Geese in Scotland is clouded by confusion, a summary of which appears in Section 1. Since the 1940s, however, it has been more clearly understood: the species has occurred in succession at three main sites, of which only one has been occupied since 1992.

The first of these contemporary strongholds was on the Dee Marshes at Threave, Castle Douglas. Evidence suggests that they were scarce in the area between 1900 and 1910 (Watson 1986); the first clear evidence of their presence was some 200 in December 1920. In the late 1930s, numbers increased to around 400-500 birds, but by 1952/53, when regular monitoring began, this had decreased to around 200 birds. Subsequently, numbers steadily declined over the next 30 years until the site was abandoned (Watson 1986).

At around the same time as the decline of the Dee Marshes population, Bean Geese started to winter regularly in the Carron Valley, Central. They were originally discovered there in early 1981, when a flock of 73 was present, although wildfowlers report their presence since the pre-World War II period (J. Simpson pers. comm.). The birds remained at this site until winter 1989/90, when they began to feed in the Slamannan area, although they returned to roost at Carron Valley Reservoir. Since 1992/93, the birds have roosted in the Slamannan area (primarily at Fannyside Lochs) and use of the Carron Valley has largely ceased, although occasional flocks have been recorded there.

### 2.2.3 Nationally important sites

#### i) Slamannan Plateau

Five-year mean 95/96-99/2000: 152

#### *Site conservation status*

None

#### *Site description and habitat*

The Slamannan Plateau (NS8475) consists principally of a mixed agricultural landscape, predominantly used for stock-rearing, with some arable areas for hay, silage and barley production (Smith *et al.* 1994). This is interspersed by plantations and shelter belts, and areas of open-cast mining. A number of small freshwater lochs and reservoirs provide suitable roost sites.

#### *Numbers and trends*

Bean Geese first used the Slamannan area during 1985/86 and, since then, they have been recorded annually with the exception of 1988/89. During this period the number of birds there has steadily increased: the mean peak winter count for 1985/86-1989/90 was 88, compared to 152 during 1995/96-1999/2000 (Fig. 19).

#### *Site use*

The arrival of Bean Geese at Slamannan usually occurs during October, with the peak winter count reached during early November (Fig. 20). Fluctuations between then and the departure period in late February and early March tend to be an artefact of counting opportunity, rather than a true fluctuation in the number of birds present (A. Maciver pers. comm.).

The majority of feeding occurs at the western end of the Slamannan Plateau area, around Beam and Tippetcraig (NS8376). The flock started to roost in the Slamannan area in 1992/93 and favour East Fannyside Loch (NS8073). Occasional use is also made of West Fannyside Loch (NS8073) and Loch Elrig (NS8874). Anecdotal evidence suggests that these sites may have been used prior to 1992, but no counts are available.

### 2.2.4 Other sites

Excluding the Slamannan Plateau, Bean Geese have been recorded in Scotland by WeBS from 40 sites in 16 regions. Of these, four in three regions have records in five or more winters. In addition, counts from outside WeBS are included here for the Dee Marshes, due to its former importance:

#### i) Dee Marshes, Dumfries & Galloway

The Dee Marshes (NX7361) was formerly the key site for Bean Geese in Scotland, supporting a flock of several hundred Taiga Bean Geese during the first half of the 20th century (Watson 1986). Birds have not wintered there consistently, however, since the early 1980s (Fig. 21). The decline is thought to be associated with changes in the management of the site, primarily the drainage of marshes and reseeded of grasslands (Watson 1986).

#### ii) Carron Valley Reservoir

After the cessation of wintering at the Dee Marshes, Carron Valley Reservoir (NS6884) briefly held the Scottish population (Fig. 22), and presumably represented a redistribution of the Dee Marshes flock, before they moved again to the Slamannan Plateau. Although numbers decreased considerably after the establishment of the Slamannan Plateau as the key wintering site, Bean Geese were still recorded at Carron Valley Reservoir on occasions and these are likely to be parts of the Slamannan flock visiting this former haunt.

#### iii) Bute Lochs (Quien, Fad & Dhu)

Bean Geese have been recorded on the Isle of Bute (NS0661) by WeBS in five consecutive winters (1968/69-1972/73), peaking at 54 birds in January 1971; the mean over these five winters was 36 birds. In these years, low counts were recorded at the then foremost wintering site, the Dee Marshes, and it thus seems likely that part of the Dee Marshes flock wintered on Bute in those years.

#### iv) Loch of Strathbeg

There are ten counts at the Loch of Strathbeg (NK0758) between 1970/71 and 1992/93, with a peak of 7 in January 1973. All other counts are of fewer than seven birds.

#### v) Ythan Estuary and Slains Lochs

Bean Geese were recorded by WeBS at the Ythan Estuary and Slains Lochs (NK0128) in six winter periods: 1965/66 (7 birds), 1969/70 (2), 1971/72 (6), 1972/73 (6), 1975/76 (11) and 1984/85 (3). In addition, an exceptional flock of 107 was recorded on 8 November 1968, as well as flocks of 13 in November 1976 and 12 in March 1978 (Duncan 2000).

#### 2.2.4.1 Key references

Watson (1986), Smith *et al.* (1994), Robertson & Fraser (1995), Percival & Votier (1996), Bourne & Ralph (2000), Simpson & Maciver (2000)

## 2.3 Wales

### 2.3.1 Background

Bean Geese have been recorded by WeBS from six sites in three regions of Wales. Of these, just one site has records in five or more winters:

#### i) Llyn Alaw

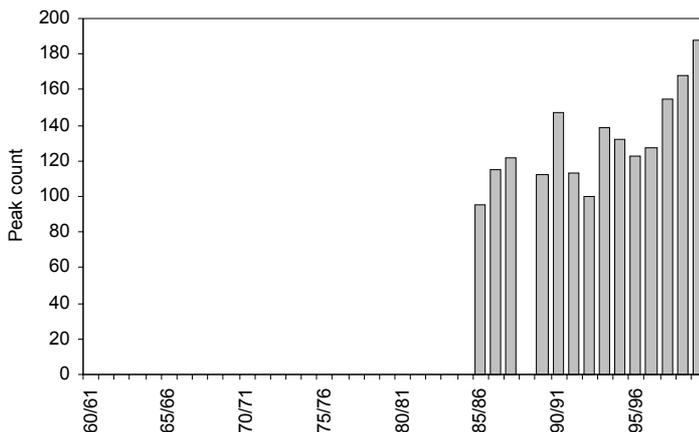
Bean Geese have been recorded at Llyn Alaw (SH3986) in six winters between 1981/82 and 1996/97. All records are of single birds, except two there in March 1986. In addition, Bean Geese have been recorded at two other sites on Anglesey: one at Llyn Coron in February 1983; and singles at Llyn Traffll in 1986/87, 1991/92 and 1997/98.

## 2.4 Northern Ireland

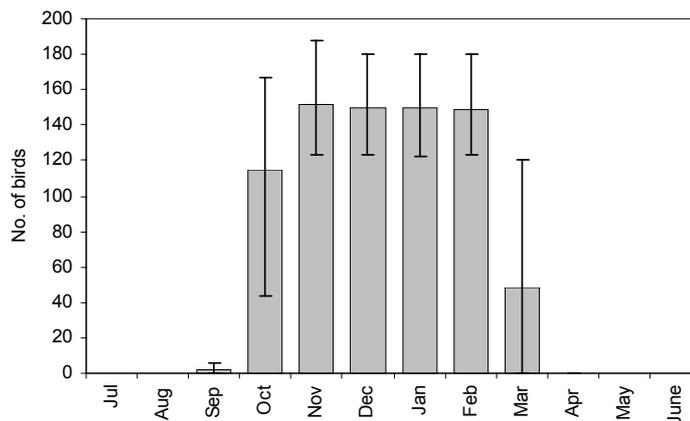
### 2.4.1 Background

Bean Geese are rare in Northern Ireland. The only records are of a flock of 13 at Myroe Levels, Lough Foyle, Co. Londonderry (C7935) in April 1982 and a single bird, also at Myroe Levels, in October 1997.

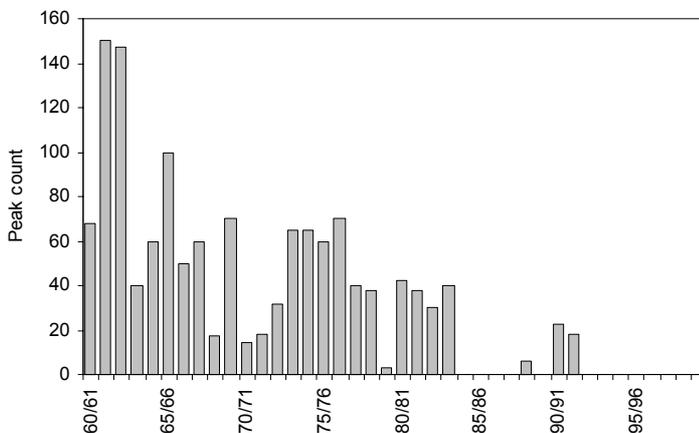
**Figure 19.** Bean Geese at Slamannan Plateau, 1960/61-1999/2000: peak counts (bars) (circles denote years with no known data)



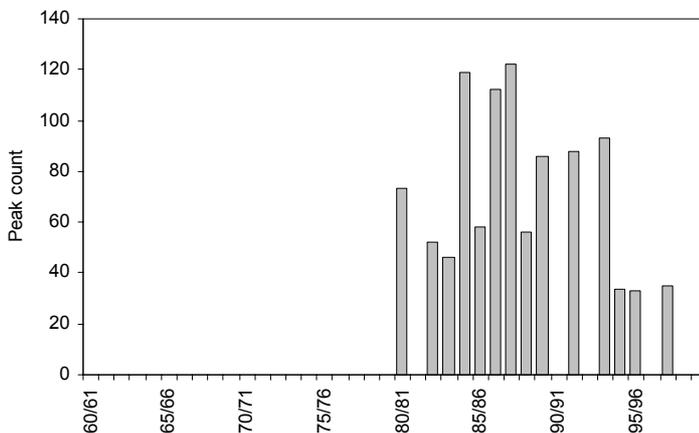
**Figure 20.** Bean Geese at Slamannan Plateau, 1995/96-1999/2000: mean peak counts per month (error bars denote minimum and maximum peak counts during the period)



**Figure 21.** Bean Geese at Dee Marshes, 1960/61-1999/2000: peak counts (bars) (circles denote years with no known data)



**Figure 22.** Bean Geese at Carron Valley Reservoir, 1960/61-1999/2000: peak counts (bars) (circles denote years with no known data)



### 3 FUTURE RESEARCH NEEDS

The Bean Goose is likely to remain an uncommon winter visitor to the UK in the near future. There are, however, some important monitoring issues to address with respect to these small, edge-of-range populations.

Enhanced monitoring effort and improved data quality are both needed in the future. Currently, the monitoring of abundance at the two key sites is good, but little is known about other demographic parameters, such as annual reproductive success and movements. Furthermore, this monitoring effort is entirely reliant on the continued input of interested volunteer counters.

Bean Goose numbers in Britain, particularly away from the key sites, fluctuate considerably between years depending on the severity of the winter in other parts of their wintering range. Currently, anecdotal records, such as those published in annual County Bird Reports, are not collated centrally, yet these are an important source of data that would allow a more thorough assessment of the numbers in Britain during such cold weather influxes. Regular collation of such records would allow future assessments to more thoroughly assess the occurrence of Bean Geese away from the two main sites.

At a flyway scale, it is important that improvements are made to our ability to identify the sub-specific populations of Bean Geese during censuses in northwest Europe. Currently, this poses a serious limitation to the estimation of population size and trend of either race. There is also a great need to better understand the delimitation between different Bean Goose flyways, and develop integrated population monitoring across these flyways, including the collation of accurate estimates of hunting mortality.

To this end, greater international co-ordination of and commitment to censuses, productivity assessments and ringing is needed as these populations, in particular Tundra Bean Goose, winter across large parts of Europe. Such integrated monitoring is a requirement under the African-Eurasian Waterbird Agreement, although, of course, not all range states are Party to this agreement.

The development of a Flyway Management Plan is considered essential if such co-ordination is to be effectively implemented.

## 4 ACKNOWLEDGEMENTS

This review would not have been possible without the dedicated network of volunteer and professional counters that contribute to the Wetland Bird Survey, and the vast number of birdwatchers that contribute records to their County Bird Recorder.

Unfortunately they are too numerous to list here individually, but my sincere thanks go to them all.

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I would also like to thank Mark Smart (RSPB Berney Marshes) and Carl Mitchell (RSPB Insh Marshes) for contributing counts and other information. Helen Baker and Carl Mitchell kindly reviewed and improved earlier drafts of this review. Paul Marshall, Helen Rowell, James Robinson and Peter Cranswick assisted with design, layout, maps and proof reading.

The author has made every effort to include all known data in this review. Given, however, that a number of unpublished reports and databases may have been overlooked, we urge readers to submit new and additional data to the authors, especially where there are apparent gaps in our datasets.

## 5 REFERENCES

- Allport, G.A. 1989. Norfolk's Bean Geese and their Management. *RSPB Conservation Review* 3: 59-60.
- Allport, G.A. 1991. The feeding ecology and habitat requirements of overwintering Western Taiga Bean Geese (*Anser fabalis fabalis*). Unpublished PhD Thesis, University of East Anglia, Norwich.
- Alpheraky, S. 1905. *The Geese of Europe and Asia*. London.
- Bannerman, D. A. 1957. *The Birds of the British Isles*. Vol. 6. Oliver & Boyd, Edinburgh.
- Berry, J. 1939. *The Status and Distribution of Wild Geese and Wild Duck in Scotland, International Wildfowl Inquiry Vol. II*. Cambridge.
- Bianki, V.V. 1981. Swans and geese in Murmansk region and northern Karelia. *Proceedings of Symposium Mapping Waterfowl Distribution*. Alushta 1976 - Moskva 1981.
- Bourne, W.R.P. & Ralph, R. 2000. The past history of the grey geese in Scotland. *Birding Scotland* 3: 150-151.
- Burgers, J., Smit, J.J. & van der Voet, H. 1991. Origins and systematics of two types of the bean goose *Anser fabalis* (Latham, 1787) wintering in the Netherlands. *Ardea* 79: 307-316.
- Clark, J.M. & Eyre, J.A. 1993. *The Birds of Hampshire*. Hampshire Ornithological Society.
- Cramp, S. & Simmons, K.E.L. (eds.) 1977. *The Birds of the Western Palearctic*. Vol. 1. OUP, Oxford.
- Cranswick, P.A., Waters, R.J., Musgrove, A.J. & Pollitt, M.S. 1997. *The Wetland Bird Survey 1995-96: Wildfowl and Wader Counts*. BTO/WWT/RSPB/JNCC. Slimbridge.
- Duncan, J. 2000. Do you still need Bean Goose? *Birding Scotland* 3:14-15.
- Eriksson, P. & Henricsson, T. 1990. Sädgäsen *Anser fabalis*: Åsele lappmark. *Vår Fågelvärld* 49: 7-14.
- Fairbank, R. 2000. A review of the status of Taiga and Tundra Bean Geese in Sussex. *Sussex Bird Report* 52: 176-182.
- Filchagov, A.V., Bianki, V.V. & Mikhailov, K.T. 1985. Bean goose *Anser fabalis* on the Kola Peninsula. *Ornitologiya* 20: 26-32. [In Russian with English summary]
- Fraser, I. in prep. Falkirk Area and North Lanarkshire Local Biodiversity Action Plan: Bean Goose Action Plan. In: Perks, A. in prep. (ed.) *The Falkirk Area Biodiversity Action Plan*. Falkirk Area Biodiversity Partnership.
- Gilissen, N., Haanstra, L., Delany, S., Boere, G. & Hagameijer, W. 2002. *Numbers and distribution of wintering waterbirds in the Western Palearctic and Southwest Asia in 1997, 1998 and 1999*. Results from the International Waterbird Census. Wetlands International Global Series No. 11. Wageningen, the Netherlands.
- Gregory, R.D., Wilkinson, N.I., Noble, D.G., Robinson, J.A., Brown, A.F., Hughes, J., Procter, D.A., Gibbons, D.W. & Galbraith, C.A. 2002. The population status of birds in the United Kingdom, Channel Islands and Isle of Man: an analysis of conservation concern 2002-2007. *British Birds* 95: 410-450.
- Heath, M.F. & Evans, M.I. (eds.) 2000. *Important Bird Areas in Europe: Priority sites for conservation. I: Northern Europe*. Cambridge, UK: Birdlife International (BirdLife Conservation Series No. 8).
- James, P. (ed.) 1996. *Birds of Sussex*. Sussex Ornithological Society.
- Jonsson, B., Karlsson, J. & Svensson, S. 1985. Incidence of lead shot in tissues of the Bean Goose (*Anser fabalis*) wintering in South Sweden. *Swedish Wildlife Research* 13: 257-271
- Kalchreuter, H. 1991. On the impact of hunting on goose populations, a literature search. *IWRB Special Publication* 14: 211-216.
- Kershaw, M. & Cranswick, P.A. 2003. Numbers of wintering waterbirds in Great Britain, 1994/1995 – 1998/1999: I. Wildfowl and selected waterbirds. *Biological Conservation* 111: 91-104.
- Kirby, J.S. 1995. Winter population estimates for selected waterfowl species in Britain. *Biological Conservation* 73: 189-198.

- Lack, P. 1986. *The Atlas of Wintering Birds in Britain and Ireland*. T. & A.D. Poyser, Calton.
- Lampio, T. 1984. On the spring migration of the Bean Goose, *Anser fabalis*, in Finland. *Swedish Wildlife Research* 13: 59-72.
- Madge, S. & Burn, H. 1988. *Wildfowl: An identification guide to the ducks, geese and swans of the world*. Helm, London.
- Madsen, J., Cracknell, G. & Fox, A.D. (eds.) 1999. *Goose populations of the Western Palearctic. A review of status and distribution*. Wetlands International Publ. No. 48, Wetlands International, Wageningen, The Netherlands. National Environmental Research Institute, Rönne, Denmark.
- Markgren, G. 1963. Migrating and wintering geese in southern Sweden: Ecology and behaviour studies. *Acta Vertebratica* 2: 297-418.
- Mellquist, H. & von Bothmer, R. 1984. Effects of haymaking on Bean Geese *Anser fabalis* breeding habitats in Sweden. *Viltrevy* 13: 49-58.
- Mineyev, Y.N. 1981. Waterfowl population distribution in the Bol'shezemelskaya Tundra. *Proceedings of Symposium Mapping Waterfowl Distribution*. Alushta 1976 - Moskva 1981.
- Mooij, J. 1991. Numbers and distribution of grey geese (Genus *Anser*) in the FRG with special reference to the lower Rhine region. *Ardea* 79: 125-134.
- Mooij, J. 1992. National report Federal Republic of Germany. Pp. 137-142 in van Roomen, M. & Madsen, J. (eds.) *Waterfowl and agriculture*. IWRB Special Publication 21.
- Nilsson, L. & Persson, H. 1984. Non-breeding distribution, numbers and ecology of Bean Goose *Anser fabalis*. *Swedish Wildlife Research* 13: 107-170.
- Nilsson, L. & Persson, H. 1991a. Selection and exploitation of feeding areas by staging and wintering geese in southernmost Sweden. *Ornis Svecica* 1: 81-92.
- Nilsson, L. & Persson, H. 1991b. Site tenacity and turnover rate of staging and wintering Bean Geese *Anser fabalis* in southern Sweden. *Wildfowl* 42: 53-59.
- Nilsson, L., van den Bergh, L. & Madsen J. 1999. Taiga Bean Goose *Anser fabalis fabalis*. In: Madsen, J., Cracknell, G. & Fox, A.D. (eds.) (1999) *Goose populations of the Western Palearctic. A review of status and distribution*. Wetlands International Publ. No. 48, Wetlands International, Wageningen, The Netherlands. National Environmental Research Institute, Rönne, Denmark.
- Parslow-Otsu, M. 1991a. Bean Geese in the Yare Valley, Norfolk. *British Birds* 84: 161-170.
- Parslow-Otsu, M. 1991b. Norfolk's Bean Geese. *Norfolk Bird and Mammal Report* 1991: 273-276.
- Percival, S. & Votier, S. 1996. *A dietary analysis of Bean Geese on the Slamannan Plateau and Whooper Swans at Inchinnan/Black Cart*. Report to SNH. 10 pp.
- Piotrowski, S. 2003. *The Birds of Suffolk*. Christopher Helm, London.
- Pirkola, M.K. & Kalinainen, P. 1984a. Metsähanhen levinneisyys ja elinympäristöt Suomessa viime vuosikymmeninä. *Suomen Riista* 31: 83-91. [In Finnish with English summary]
- Pirkola, M.K. & Kalinainen, P. 1984b. The status, habitats and productivity of breeding populations of Bean Goose, *Anser fabalis fabalis*, in Finland. *Swedish Wildlife Research* 13: 9-48.
- Pollitt, M.S., Hall, C., Holloway, S.J., Hearn, R.D., Marshall, P.E., Musgrove, A.J., Robinson, J.A. & Cranswick, P.A. 2003. *The Wetland Bird Survey 2000-01: Wildfowl and Wader Counts*. BTO/WWT/RSPB/JNCC, Slimbridge.
- Ramsar. 1999. *Strategic Framework for the List of Wetlands of International Importance*. Ramsar Bureau, Gland, Switzerland.
- Robertson, D. & Fraser, I. 1995. *Bean Goose Field Grazings: sward species composition, Slamannan*. Report to SNH.
- Sangster, G. & Oreel, G.J. 1996. Progress in taxonomy of Taiga and Tundra Bean Geese. *Dutch Birding* 18: 310-316.
- Scott, D.A. & Rose, P.M. 1996. *Atlas of Anatidae Populations in Africa and Western Eurasia*. Wetlands International Publ. No. 41, Wetlands International, Wageningen.
- Simpson, J. & Maciver, A. 2000. *Population and distribution of Bean Geese in the Slamannan area, 1999/2000*. Bean Goose Working Group Report.

- Smith, P.H. & Forshaw, W.D. 1988. Occurrence of 'Russian' Bean Geese in Lancashire/Merseyside. *British Birds* 81: 68-70.
- Smith, T., Bainbridge, I. & O'Brien, M. 1994. *Distribution and habitat use by Bean Geese in the Slamannan area*. RSPB report to SNH. 71 pp.
- Snow, D.W. & Perrins, C.M. 1998. *The Birds of the Western Palearctic Concise Edition*. Oxford University Press, Oxford.
- Sterbetz, I. 1979. Feeding ecology of *Anser albifrons*, *Anser erythropus* and *Anser fabalis* in Hungary. *Aquila* 85: 93-106.
- Stroud, D.A., Chambers, D., Cook, S., Buxton, N., Fraser, B., Clement, P., Lewis, I., McLean, I., Baker, H. & Whitehead, S. (eds.) 2001. *The UK SPA network: its scope and content*. JNCC, Peterborough. 3 volumes.
- Swaine, C.M. 1982. *Birds of Gloucestershire*. Alan Sutton, Gloucester.
- Taylor, M., Seago, M., Allard, P. & Dorling, D. 2000. *The Birds of Norfolk*. Pica Press, Sussex.
- Tucker, G.M. & Heath, M.F. 1994. *Birds in Europe: their conservation status*. BirdLife International, Cambridge. (BirdLife Conservation Series No. 3).
- van den Bergh, L. 1999. Tundra Bean Goose *Anser fabalis rossicus*. In: Madsen, J., Cracknell, G. & Fox, A.D. (eds.) 1999. *Goose populations of the Western Palearctic. A review of status and distribution*. Wetlands International Publ. No. 48, Wetlands International, Wageningen, The Netherlands. National Environmental Research Institute, Rønde, Denmark.
- van Oostenbrugge, R., Stolk, P.C.A.M.M. & van Roomen, M.W.J. 1992. National report of the Netherlands. Pp. 151-158 in van Roomen, M. & Madsen, J. (eds.) *Waterfowl and agriculture*. IWRB Special Publication 21.
- van Roomen, M. & Madsen, J. (eds.) 1992. *Waterfowl and agriculture. Proceedings of International Workshop: Farmers and Waterfowl*. IWRB Special Publication 21.
- Watson, A.D. 1986. Bean Geese in South-West Scotland. *Scottish Birds* 14: 17-24.
- Wetlands International. 2002. *Waterbird Population Estimates – Third Edition*. Wetlands International Global Series No.12. Wageningen, The Netherlands.
- Witherby, H.F., Jourdain, F.C.R., Ticehurst, N.F. & Tucker, B.W. 1939. *The Handbook of British Birds*. Witherby, London.
- Zharkova, Y. & Borzhonov, B. 1972. Nourishment of geese in the Taimyr Peninsula. In: E. Kumari (Ed.) *Geese of the USSR*. Tartu.