Breeding range expansion of Barnacle and Brent Geese in the Russian European North

A. V. FILCHAGOV and V. V. LEONOVICH

Filchagov, A.V. & Leonovich, V.V. 1992: Breeding range expansion of Barnacle and Brent Geese in the Russian European North. *Polar Research 11(2)*, 41–46.

In 1990 a large settlement of Barnacle Geese, *Branta leucopsis*, was discovered in salt marsh grassland near Shoina (67°50′ N, 44°10′ E), on the Kanin Peninsula, Russia. The settlement consisted of approximately 350 breeding pairs in 1990 and 400–450 pairs in 1991. Three nests of the Brent Goose (*B.b.bernicla*) were also found at the edge of the Barnacle Goose colonies. These high Arctic goose species, which traditionally have their breeding grounds in northern Russia, have begun colonising on the Kanin Peninsula only recently, the Barnacle Goose since the early 1980s and the Brent Goose since 1990. Factors contributing to the successful colonisation of these two goose species on the Kanin Peninsula and to the present day expansion of the Barnacle Goose breeding range are discussed.

A.V. Filchagov and V.V. Leonovich, Institute of Evolutionary Animal Morphology and Ecology, Russian Academy of Sciences, Leninsky prospekt 33, Moscow 117071, Russia.

Introduction

When migrating from their wintering grounds in western Europe to their traditional breeding areas in northern Russia, Barnacle Geese (*Branta leucopsis*) and Dark-bellied Brent Geese (*B.b. bernicla*) pass through the Kanin Peninsula, a comparatively thin land tongue located just north of the Polar Circle and which separates the White Sea and Cheshskaya Bay of the Barents Sea (Fig. 1). Previous banding has shown that whole or nearly whole populations of both goose populations move through the Kanin Peninsula area during migrations (Kistchinsky 1979; Kistchinsky & Vronsky 1979). In essence, the geese reach their potential breeding grounds from the Kanin Peninsula: both species seem to have previously bred just ca. 150 km northeast of the Kanin Peninsula on Kolguev Island (Zhytkov & Buturlin 1901; Pleske 1928), and the Barnacle Goose has been breeding there since the mid-1980s (Ponomareva 1992). Ornithologists working in localities on the western and northern coasts of the Kanin Peninsula during the years previous to our findings have reported no evidence of geese breeding in these areas (Spangenberg & Leonovich 1960; Zubtsovsky & Ryabitsev 1976). This paper presents and discusses the first records of the Barnacle goose settlement discovered on the Shoina laida.

Study area and methods

During the periods 22–30 June 1990 and 7–30 June 1991, working with an ornithological expedition headed by E. E. Syroechkovsky, avifaunistic observations were made in the vicinity of the village of Shoina (67°50′N, 44°10′E) on the northwestern coast of the Kanin Peninsula (Figs. 1 and 2). Although this area has been studied more frequently than any other in the tundra zone of the Kanin Peninsula, most recently in 1957 and 1968 (Spangenberg & Leonovich 1960; Zubtsovsky & Ryabitsev 1976), its fauna of birds has been insufficiently described.

We investigated birds on the salt marsh grasslands, known locally as "laidas", which comprise short swards mainly of *Puccinellia phryganodes*, *Carex subspathacea*, *Dupontia fisheri*, *Calamagrostis deschampsioides*, and *Plantago* sp. (Sokolova 1956). This habitat, characteristic for river mouths, is restricted in the southern Kanin Peninsula but stretches for dozens of square kilometres further north. The low-lying parts of the laidas abound in brackish lakes or pools where the water level fluctuates in relation to tidal flow. The laidas which we inspected are located between the mouths of the Shoina and Thorna Rivers (Fig. 2). These laidas are the most northerly ones in the western area of the Kanin Peninsula. They extend almost without interruption

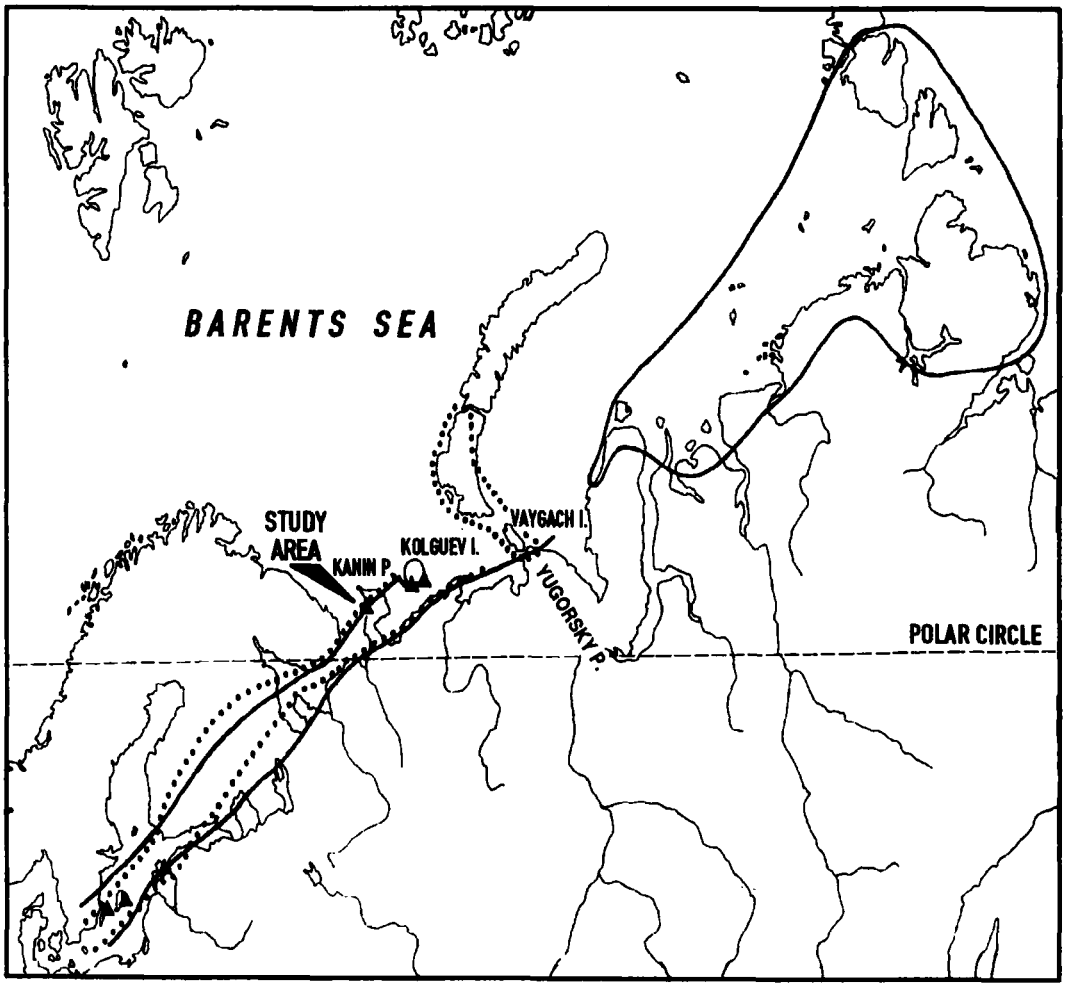

Fig. 1. The locality of the study area and the principal spring migration routes and breeding areas of the Russian Barnacle Goose (dotted lines) and Dark-bellied Brent Goose (solid lines). The black triangles indicate Barnacle Goose colonies arising during recent species expansion. (Sources: Kistchinsky 1979; Kistchinsky & Vronsky 1979; Kalyakin 1986; Forslund & Larsson 1991a; Ponomareva 1992; authors' data).

20 km along the coast and are separated from the sea by sand dunes. The area under study was about 120 km^2, including 40 km^2 of laidas.

A nest census was not made in the Shoina laida Barnacle Goose colony (Fig. 2) because we wanted to avoid disturbing the incubating geese. Nearly every day we walked across the laidas, covering a total distance of about 150 km. All parts of the settlement where the geese concentrated were inspected. The nest number was counted visually using binoculars (8 × 30), and not every nest was examined. The abundance estimate is approximate.

Results

Barnacle Geese

In 1990 approximately 350 breeding pairs of Barnacle Geese were found. The next year the number had increased to 400–450 pairs. It is possible that more geese were breeding in unexplored laida parts (V. Kazansky pers comm.). Local inhabitants were unanimous in reporting that Barnacle Geese had regularly bred near Shoina since the early 1980s, in initially small but steadily increasing numbers.

The Barnacle breeding sites were distributed

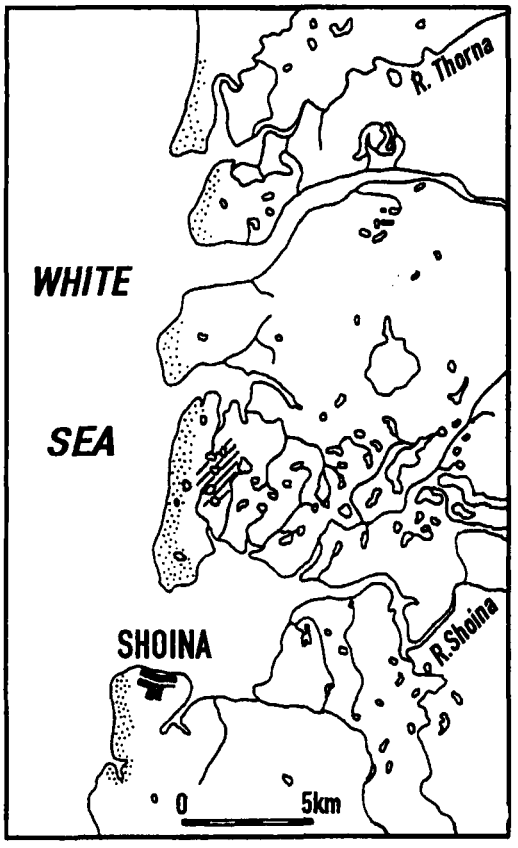

Fig. 2. Study area on the NW Kanin Peninsula. Shading shows Barnacle Goose breeding area. Sand dunes along the seacoast are dotted.

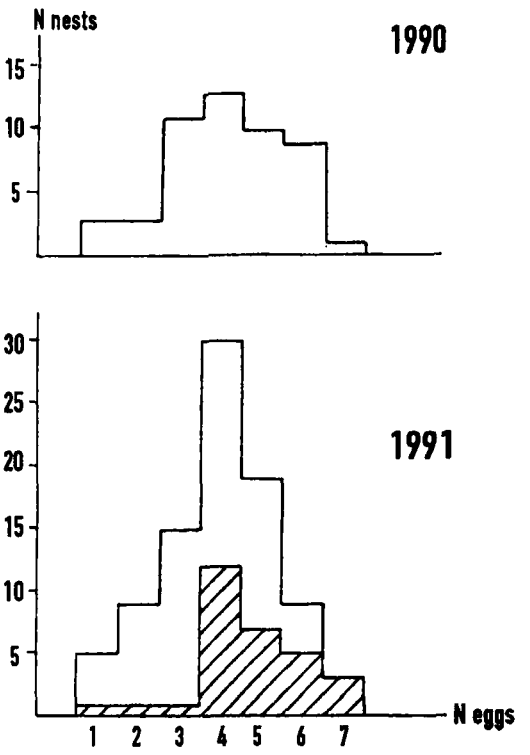

Fig. 3. Distribution of Barnacle Goose clutch sizes near Shoina in 1990 and 1991. Shading indicates distribution of clutch sizes when human disturbance was absent.

over about 5 km^2 and were located in unflooded parts of the laida, 2–4 km away from the river mouth and the seacoast (Fig. 2). The majority of the nests were situated on islets or along lake shores. The geese bred in dispersed groups of 15–70 pairs, the nest density varying according to the suitability of the habitat of the lake system. A few pairs nested in isolation from others. The geese nested in the same part of the laida in both years even though the colony configuration differed somewhat. Clutch size ranged from 1 to 7 eggs (Fig. 3). In 1990, when we ignored the possible effect of egg collection by local inhabitants, the mean clutch size during the second half of the incubation period was 4.10 ± 0.20 (SE) (n = 50). In 1991 it was 3.98 ± 0.15 (n = 90) under the same circumstances, but it was significantly ($P < 0.05$) larger (4.67 ± 0.25, n = 30) in the absence of the human disturbance effect. The first hatching nest was observed on 29 June 1991.

In each study year during the last part of June, 100–150 flocked Barnacle Geese appeared on the Shoina laida. They fed near or within the breeding colonies in groups of 10–80 birds. It is unlikely that these geese were failed breeders from the local population because in the two study years only 3 abandoned and 4 destroyed nests were found. They were more likely non-breeders arriving at the study area from other regions to moult.

Brent Geese

During the period 7–13 June 1991, we recorded the presence of 4 flocks of 30–100 Brent Geese on migration. These were feeding on the grass vegetation of the lowest laida parts. Later, between 20–30 June, only 5 small groups of 3–9 geese were seen both years. Apparently, the geese stayed near Shoina for the moult, which has been noted for this species on the large lakes of the central area of the Kanin Peninsula (Spangenberg & Loenovich 1960).

One Brent nest with 4 eggs was found in 1990, and only two with 4 and 5 eggs in 1991 despite thorough searches. The nests were located on the periphery of the Barnacle Goose colonies, and the Brent Geese maintained a considerable distance (70–130 metres) to the nearest Barnacle Goose nest.

Discussion

Our observations of nesting Barnacle Geese and Brent Geese on the northwestern coast of the Kanin Peninsula refer to an area recently colonised by these species. For the Barnacle Goose, the Kanin Peninsula is not an extreme case of range expansion, as this species has recently colonised islands of the Baltic Sea (Fig. 1) where the breeding numbers have rapidly increased (Larsson et al. 1988; Forslund & Larsson 1991a). As for the Brent Goose, our data are the first evidence of breeding outside the main breeding grounds which are located more than 1500 km to the northeast of the Kanin Peninsula (Fig. 1).

Different factors appear to have contributed to the successful colonisation of the laida near Shoina. This laida is the largest on the entire Kanin coast and provides the geese with plentiful feeding resources. The rivers and large tidal channels render parts of the laida inaccessible except for birds, and the many islands provide nesting areas safe from ground predators such as the Arctic Fox *Alopex logopus* and the Red Fox *Vulpes vulpes*. In addition, hunting man keeps the predator population at a low level. Large gulls (West-siberian Gull *Larus (fuscus) heuglini* and Glaucous Gull *L. hyperboreus*) do not seem to appreciably plunder the goose nests during the egg-laying and incubation periods even though they nest side by side with the geese and can reach quite a high density: on average 20 pairs/km^2 and locally twice this value. While predation of eggs and nests by gulls was not documented in our study, we twice observed another egg predator, the Arctic Skua *Stercorarius parasiticus*, pecking eggs when the geese were away from their nests for short periods. As a whole, avian predation at the egg stage appears to be very limited as the geese forage on the laida close to their nests which they actively defend.

The fact that human pressure on the wildlife near Shoina has appreciably declined during the last two decades has resulted in an increase in the wildfowl populations. Earlier, the number of inhabitants was significantly higher than today; intense hunting occurred during the entire snowless season, and people gathered large numbers of eggs on the laida, mainly from gull nests (Spangenberg & Leonovich 1960). Presently, almost no people visit the laida during the first half of the summer and shooting is limited to goose migration periods. As a result, the number of all wildfowl species (including the Bean Goose *Anser fabalis*, the White-fronted Goose *A. albifrons*, the King Eider *Somateria spectabilis*, and others) breeding on the laida has markedly increased over the thirty years since one of the authors (VVL) first visited the area. A number of Barnacle Goose eggs are still collected by the inhabitants in the first days of June, before the end of egg-laying. Under these conditions, the majority of pairs breed successfully, although some clutches are reduced.

The mean clutch size in undisturbed situations (4.67) for Barnacle Geese near Shoina is within the range reported for Gotland (4.42–4.80) (Forslund & Larsson 1991b); but this exceeds the highest mean value known for the northern

Table 1. The clutch size of Russian populations of Barnacle Geese.

Area	Range	Mean ± SE	N	Years	Source
Gotland	—	4.42 – 4.80	—	1985–90	Forslund & Larsson 1991b
Kanin P.	1–7	4.67 ± 0.25	30	1991	this study
Kolguev I.	1–8	3.99 ± 0.09*	195	1989–90	Ponomareva 1992
NW Yugorsky P.	1–8	4.08 ± 0.26	38	1990	V. V. Morozov, pers. comm.
NW Vaygach I.	1–8**	4.32 ± 0.12	109	1991	V. V. Morozov, pers. comm.
NW Vaygach I.	1–6**	4.0 ± 0.2	20	1988	E. V. Syroechkovsky, pers comm.

SE = Standard error.
N = Number of nests counted.
* = This index was calculated on the basis of clutch size distribution described by the author.
** = Supranormal clutches with more than 8 eggs were not included.

colonies of the Russian population (Table 1) and for Greenland and Spitsbergen (3.3–4.3) (after Larsson et al. 1988). The clutch size was probably similar in both years since there was almost no difference in the clutch mean size (4.10 in 1990 and 3.98 in 1991) when we ignored the effect of egg collection.

The factors favouring a better realisation of reproductive potentiality, compared to more northern breeding areas, seem to be the same on the Kanin Peninsula and Gotland. In our opinion, the main factors are the low pressure of predation and the early snow melting which occurs prior to the initiation of nesting. The latter allows easy access to food, enabling the females to maintain the level of body reserves accumulated on winter grounds, to at least recover from the loss linked to migration, and even to gain additional reserves before and during egg-laying. A greater amount of reserves can thus be devoted to eggs than is the case on northern, less favourable breeding grounds where the high predation level, late snow melting and severe spring weather prevent geese from normal reproduction in some years. In Arctic breeding grounds it is also more difficult for these birds to recover the body reserves expended over a longer migration route. Our present stage of knowledge, however, is insufficient to allow evaluation of the contribution of each factor to the decrease of clutch size. One factor complicating the comparison is intraspecific nest parasitism which exaggerates normal clutch size. The level of parasitism in colonies of the Barnacle Goose is unknown. It is probably higher in the northern colonies, however, since there parasitism is initiated by predation and other factors, preventing goose reproduction, typical only to the northern regions (Syroechkovsky 1979). Thus, the level of egg dumping is high on Vaygach Island (Syroechkovsky et al. 1991) but appears to be reduced on the Kanin Peninsula where no supranormal clutch was found in ca. 300 clutches examined, and on Gotland where only one nest with such a clutch was found out of 248 checked (Larsson et al. 1988).

The reasons for initiation of southward range expansion of the Russian Barnacle Geese are debatable. Since the population size has increased due to better protection throughout the year (Ogilvie 1978; Ebbinge 1985; Ebbinge et al. 1991), one can propose that the carrying capacity of the traditional breeding grounds has been reached, as has been the case for two other Barnacle Goose populations (Madsen 1984; Prop et al. 1984). However, there are still plenty of unoccupied suitable breeding biotopes in the north, for example on Vaygach Island where a significant part of the entire population now breeds (Kalyakin 1986; E. V. Syroechkovsky pers. comm.). Also, the extension of the northern part of the population range illustrates that the capacity of the main breeding area is not yet fully realised (Kalyakin 1986; Ebbinge et al. 1991). Lastly, the situation observed on Gotland, where a sharp increase in number has been shown to result mainly from the colony's own dynamics (Larsson et al. 1988), indicates that the development of new colonies could occur almost independently of the situation on the main breeding grounds of the population. The emergence of new colonies along the migration route in the staging areas or close to them (Fig. 1) was probably initiated mainly due to the favourable conditions the geese encountered there during the recent decades.

Acknowledgements. – We are much obliged to E. E. Syroechkovsky who headed the expedition which enabled us to carry out our observations. E. V. Syroechkovsky's consultations on the problems of geese, the reprints sent by B. s. Ebbinge and K. Larsson, and the critical comments of two anonymous referees and P. Yesou are also gratefully appreciated.

References

Ebbinge, B. S. 1985: Factors determining the population size of arctic breeding geese wintering in western Europe. *Ardea 73*, 121–128.

Ebbinge, B. S., van Biezen, J.B. & van der Voet, N. 1991: Estimation of annual survival rates of Barnacle Geese *Branta leucopsis* using multiple resightings of marked individuals. *Ardea 79*, 73–112.

Forslund, P. & Larsson, K. 1991a: Breeding range expansion of the Barnacle Goose *Branta leucopsis* in the Baltic area. *Ardea 79*, 343–346.

Forslund, P. & Larsson, K. 1991b: The effect of mate change and new partner's age on reproductive success in the Barnacle Goose, *Branta leucopsis*. *Behavioral Ecology 2*, 116–122.

Kalyakin, V. N. 1986: On the distribution and ecology of Barnacle Goose on Vaigach Island and Yugorsky Peninsula. Pp. 93–104 in Ilichev, V.D. (ed.): *Actual problems of ornithology*. Moscow. Izdat. Nauka (in Russian).

Kistchinsky, A. A. 1979: Migration of Barnacle Goose. Pp. 183–188 in Kistchinsky, A. A. (ed.): Migrations of birds of eastern Europe and northern Asia. *Ciconiiformes – Anseriformes*. Moscow. Izdat. Nauka (in Russian).

Kistchinsky, A.A. & Vronsky, N.V. 1979: Migration of Brent. Pp. 189–202 in Kistchinsky, A. A. (ed.): Migrations of birds of eastern Europe and northern Asia. *Ciconiiformes – Anseriformes*. Moscow. Izdat. Nauka (in Russian).

Larsson, K., Forslund, P., Gustafsson, L. & Ebbinge, B. S

1988: From the high Arctic to the Baltic: the successful establishment of a Barnacle Goose *Branta leucopsis* population on Gotland, Sweden. *Ornis Scandinavica 19*, 182–189.

Madsen, J. 1984: Study of the possible impact of oil exploration on goose populations in Jameson Land, East Greenland. A progress report. *Norsk Polarinst. Skr. 181*, 141–151.

Ogilvie, M. A. 1978: *Wild Geese*. Berkhasted, Poyser, Ltd.

Pleske, Th. 1928: Birds of the Eurasian tundra. *Mem. Boston Soc. Nat. Hist. 6(3)*. Boston.

Ponomareva, T. S. 1992: Barnacle Goose nesting in the Kolguev Island region. *Byull. Mosk. Ob. Ispyt. Prirodi. Otd. Biol. 98(2)*, 39–44 (in Russian).

Prop, J., van Eerden, M. R. & Drent, R. N. 1984: Reproductive success of the Barnacle Goose *Branta leucopsis* in relation to food exploitation on the breeding grounds, western Spitsbergen. *Norsk Polarinst. Skr. 181*, 87–117.

Sokolova, L. A. 1956: Saltmarsh grasslands in tundra zone. Pp. 503–506 in Lavrenko, E. M. & Sochava, V. B. (eds.): Vegetation cover of the USSR. Explanatory text to "Geobotanic map of the USSR" M 1:4,000,000. Vol. 2. Moscow-Leningrad. Izdat. Akad. Nauk SSSR (in Russian).

Sprangenberg, E. P. & Leonovich, V. V. 1960: Birds of the White Sea north-eastern coast. Pp. 228–331 in Trudi Kandalakshskogo zapovednika, 2. Murmansk. Murm. Knizhn. Izdat. (in Russian).

Syroechkovsky, E. V. 1979: Egg dumping by Snow Geese. Zoologichesky Zhyrnal 58, 1033–1041 (in Russian).

Syroechkovsky, E. V., Litvin, K. E. & Ebbinge, B. S. 1991: Breeding success of geese and swans on Vaygach Island, USSR, 1986–1988: interplay of weather and Arctic Fox predation. *Ardea 79*, 373–382.

Zhytkov, B. M. & Buturlin, S. A. 1901: In the Russian North. Zemlevedenie 3/4, 29–206 (in Russian).

Zubtsovsky, N. E. & Ryabitsev, V. K. 1976: New data on birds of the Kanin Peninsula. Ornighologiya 12, 228–231 (in Russian).