

Year-round itinerary of a GPS-tracked Brent Goose *Branta b. bernicla* that visited the Bassin d’Arcachon, France

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Abstract

The year-round itinerary for a Dark-bellied Brent Goose *Branta b. bernicla* is described for a bird fitted with a GPS tracking device at Terschelling Island, the Netherlands, in spring 2012. Spring migration commenced when the bird left the Dutch Wadden Sea on 27 May and continued until it reached the Taimyr Peninsula in arctic Russia on 8 June. During the summer months it moved along the coast of the Taimyr Peninsula, prior to moulting on Taimyr Island to the north of the peninsula in July. During autumn migration it frequented eelgrass *Zostera* sp. beds around Langeness Island in Schleswig-Holstein, Germany and then proceeded to the Bassin d’Arcachon in France, another famous eelgrass area, where it remained from 18 October 2012–12 January 2013 before returning to feed on grassland polders on Terschelling Island in January 2013. The timing of the location data showed that the bird flew large distances in short periods of time during migration. Over the year it covered *c.* 4,600 km during local movements and *c.* 15,000 km on migration. The results form part of a larger study investigating the importance of non-breeding habitats (particularly eelgrass vegetation) for the species.

Key words: Dark-bellied Brent Goose, flyway, habitat use, tracking, *Zostera*.

The Dark-bellied Brent Goose *Branta b. bernicla* breeds in the Russian high arctic and migrates to winter along the coasts of western Europe. It feeds extensively on intertidal mudflats in autumn where the birds graze mainly on eelgrass *Zostera* sp. (Madsen 1988), with salt marshes providing important habitat at the spring staging sites

(Ebbinge *et al.* 1999). Eelgrass beds are a restricted and endangered habitat, not only in Europe but at sites used by other Brent Goose subspecies in North America (Elkinton *et al.* 2013). Dark-bellied Brent Goose numbers collapsed following a decline of eelgrass beds in the Dutch Wadden Sea during the 1930s (Rasmussen

1977) but subsequently recovered in response to conservation actions and a change in habitat use, with the geese transferring to lower salt marsh vegetation and agricultural fields. Peak numbers were recorded in 1992 but the population has again declined, following a series of poor breeding years in the last two decades (Ebbingge *et al.* 2013). Brent Geese were among the first migratory birds for which it was shown that spring conditions in the temperate region carry over to breeding performance in the arctic (Ebbingge & Spaans 1995), so the quality of wintering and stopover sites is of vital importance for population processes in this species.

In 2012 a 5-year study was initiated, which aims to investigate the importance of non-breeding habitats (particularly eelgrass beds), for Brent Goose population dynamics and individual fitness. The study is part of the project Metawad-1 (<http://www.metawad.nl/>), funded by the Dutch Wadden Fund, and is being carried out by a consortium involving the Netherlands Institute of Sea Research (NIOZ), the University of Groningen, The Netherlands Institute of Ecology (NIOO), Alterra, The Nature Information Foundation (Stichting Natuurinformatie) and the Dutch Centre for Field Ornithology (SOVON). As part of the study, 30 Dark-bellied Brent Geese were tracked using GPS devices in 2012–2103. Here we present preliminary information on year-round habitat use by one of these birds.

Methods

Thirty adult male Dark-bellied Brent Geese *Branta b. bernicla* caught in the Dutch

Wadden Sea (on Terschelling Island and Schiermonnikoog Island) in spring 2012 were fitted with Global Positioning System (GPS) tracking devices to investigate the importance of non-breeding habitats (particularly eelgrass) for the species. The tags record the birds' geographic position (latitude and longitude) to 10 m accuracy every hour throughout the year, and thus record in detail habitat use by Brent Geese along their flyway. The devices, powered by small solar panels, have been developed by the University of Amsterdam (<http://www.uva-bits.nl/>). Logged data can be downloaded when the birds are near receiving stations, which can either be hand-held, or stationary as deployed at the two catching sites.

Results and Discussion

A Brent Goose with colour-ring code RONR (left leg, red ring with code O; right leg, black ring with code R) was fitted with a GPS logger (number 707) on Terschelling Island, the Netherlands on 2 April 2012 and was tracked until its last data download on 10 May 2013 when the bird was again on Terschelling (Fig. 1). The bird moved to the Wadden Sea coast of Friesland province (30 km southeast of Terschelling Island) on 9 May 2012, and spring migration commenced when the bird left this area at 03:00 h on 27 May 2012. Spring migration continued for *c.* 12 days, until goose RONR passed the Yenisei Gulf and reached the Taimyr Peninsula on 8 June. Dark-bellied Brent Geese had a very poor breeding season in 2012, and this bird did not stay at one site (indicative of nesting) during the summer months, but roamed

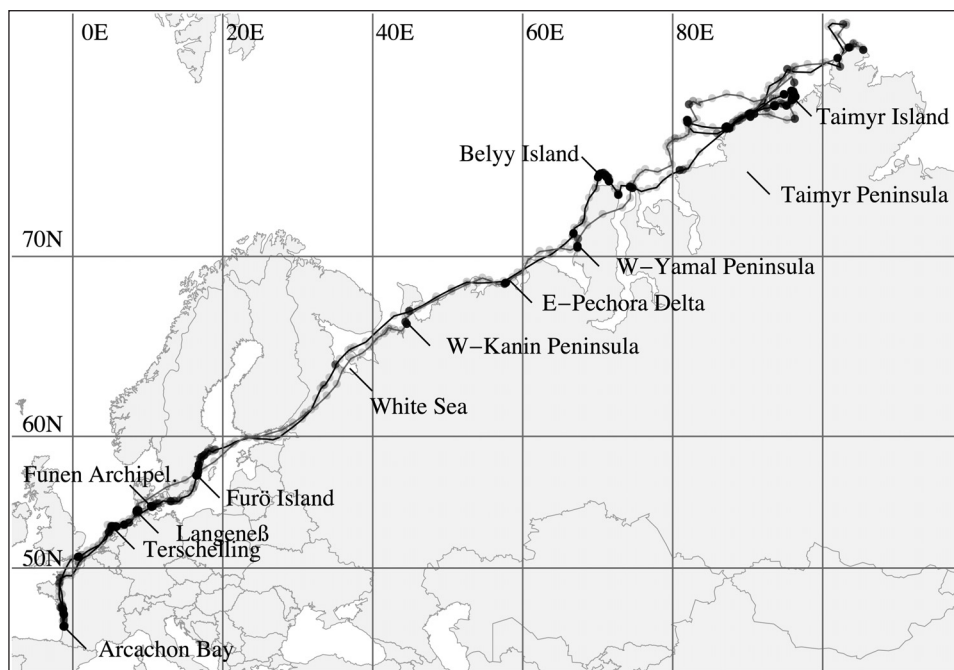


Figure 1. Itinerary of Brent Goose with GPS device 707 and colour-ring code RONR (left red O; right black R) from April 2012 to May 2013. Spring migration (to 15 June) is indicated in grey; autumn migration is in black. Black dots are for fixes at stopover sites and transparent grey are in-flight fixes. Names are given for those places where the bird stayed for a prolonged period.

widely along the north coast of the Taimyr Peninsula until the end of June. During this period it moved up and down the entire Taimyr coastline and visited several islands, possibly exploring potential nesting sites. The bird finally moulted on Taimyr Island, to the north of the Taimyr Peninsula (Fig. 1), and completed its moult by late July.

Westward movement commenced on 8 August, with goose RONR reaching the Yamal Peninsula on 13 August where it remained for 2 weeks. It left the peninsula on 28 August and stopped for only 10 h on the Kanin Peninsula before reaching the east

coast of Sweden on 31 August. From 17 September–6 October 2012 it frequented the eelgrass beds around Langeneß Island in the Halligen (exposed salt marsh islands) of Schleswig-Holstein, Germany, a well-established and important staging site where thousands of Dark-bellied Brent Geese occur in autumn and spring (Ebbinge *et al.* 1999; Fig. 2). Then in early October it proceeded to the Bassin d'Arcachon in France, another famous eelgrass area, where it remained from 18 October 2012–12 January 2013 (Fig 3). On 12 January it headed back to Terschelling Island, alighting only briefly (for 2 days) near Rye Harbour



Figure 2. Brent Goose RONR locations whilst on eelgrass beds at Langeness Island, Schleswig-Holstein, Germany during autumn migration, from 17 September–6 October.

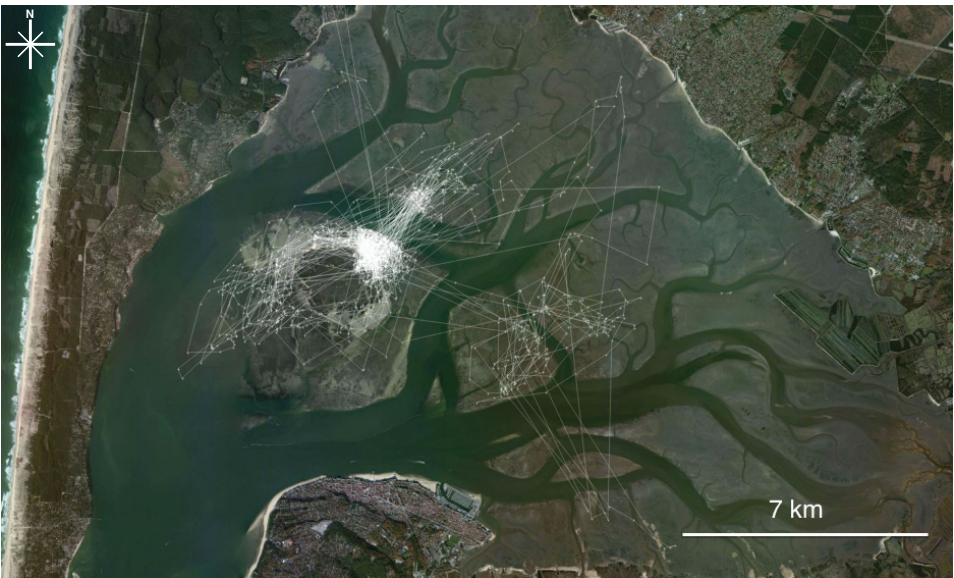


Figure 3. Brent Goose RONR locations whilst on the eelgrass beds at Bassin d'Arcachon, France. Track lines and fixes are white and semi-transparent. Pure white areas indicate the most intensively used areas.

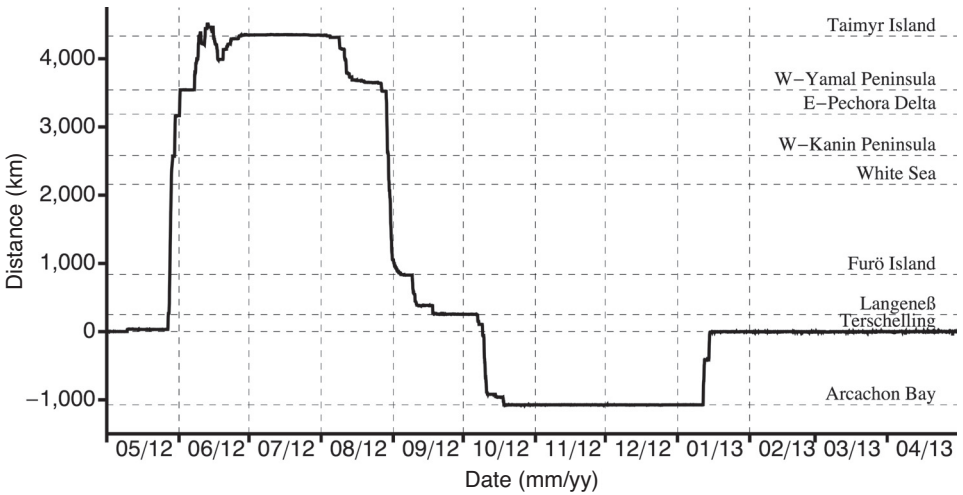


Figure 4. Distances travelled by Brent Goose RONR, tracked from Terschelling Island, the Netherlands, between May 2012 and May 2013. Names are for key sites at varying distances from Terschelling.



Figure 5. Brent Goose RONR locations near Terschelling Island, the Netherlands after 18 January 2013. Track lines and fixes are white and semi-transparent, with the thicker line illustrating the route taken on arrival and thinner lines showing local movements thereafter. Pure white areas indicate the most intensively used areas.

on the south coast of England *en route*. On approaching Terschelling Island on the night of 14 January (Fig. 5), goose RONR suddenly changed direction when west of the island and headed straight towards the Brandaris lighthouse, before turning in a northerly direction and landing on the North Sea. He floated westwards on the ebb tide for 6 h, until the tide turned taking him northeast again until sunrise, at which time he flew to the island to feed in the grassland polder for the months to come. Thereafter he stayed at Terschelling for the rest of the winter, from 14 January–9 May 2013, and invariably roosted on the Wadden Sea, rather than the North Sea, at night (Fig. 5).

The timing of the location data recorded for Brent Goose RONR between May 2012 and May 2013 show that the geese cover large distances in short periods of time (Fig. 4). Distances flown were calculated by summing the length of the linear track segments derived from the hourly GPS fixes. These indicate that it took 126 h to travel 3,860 km from Terschelling Island to the Yamal Peninsula northbound, and 64 h to reach the Swedish east coast from the Yamal Peninsula (a 2,721 km flight) during autumn migration. During a full year this bird covered 15,000 km on migration (migratory movements being defined as displacements > 10 km within 1 h), and 4,600 km during local movements (< 10 km displacements within an hour).

The tracking data illustrate that *Zostera* eelgrasses form a major component of the Brent Goose diet in autumn and winter. For instance, following the wing moult the bird moved first to Bely Island in the northern

part of the Yamal Peninsula, and then flew southwest to Sweden, Schleswig-Holstein and France, all areas rich in eelgrass. It is interesting that the Dutch Wadden Sea, which has hardly any eelgrass, was completely ignored in autumn. These movement patterns of Brent Goose RONR suggest that, when eelgrass is available, it is preferred over other resources. The extent to which foraging on eelgrass provides fitness benefits in comparison with foraging in other habitats (*e.g.* salt marshes and agricultural land) is an important question for further investigation, particularly given the continuing decline of eelgrass habitats worldwide.

Acknowledgements

We thank all people involved with trapping and tagging the birds, and Vereniging Natuurmonumenten and the landowners on Terschelling for permission to work on their land. This work was financed by the Waddenfonds (project Metawad-1, grant WF209925).

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Photograph: Brent goose “RONR” (adult male) tagged at Kinnum, Terschelling, the Netherlands on 3 April 2012, by Adriaan Dokter.