Brent Geese *Branta bernicla*, Snow Geese *Anser caerulescens* and Barnacle Geese *Branta leucopsis* on Kilen, Kronprins Christian Land, Northeast Greenland, 1985

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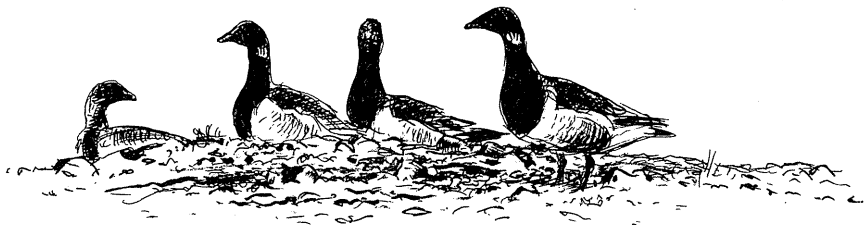

(Med et dansk resumé: Knortegås, Snegås og Bramgås på Kilen, Nordøstgrønland)

The pioneer expeditions to northeasternmost Greenland in the early part of this century regularly encountered the Light-bellied Brent Goose *Branta bernicla hrota* and sometimes found it quite common (Manniche 1910, Freuchen 1915, Rasmussen 1919, Mikkelsen 1922, Koch 1925). These geese also occurred down along the east coast, as scattered breeders southwards to Scoresby Sund (Nathorst 1900, Manniche 1910, Pedersen 1930). However, by the middle of this century they had decreased much in numbers. During the Danish Peary Land Expedition 1947-1950 (Johnsen 1953) none were observed in the areas around Independence Fjord and in Peary Land where only some 30 years before many were seen. This negative trend has continued since then, with only a few single observations made (Meltofte 1975, 1976, Dietz & Andersen 1984), and with only one breeding record (Håkansson et al. 1981). A similar trend can be observed on the east coast, from where the Brent Goose nowadays seems to have totally disappeared (Meltofte et al. 1981, Madsen et al. 1984).

The Snow Goose *Anser caerulescens* is in Greenland now known to breed from the Thule district northwards to at least Nyboe Land (Salomonsen 1967, Dietz & Andersen 1984, Bennike & Kelly 1986). Individuals, pairs and small flocks have been seen with increasing frequency in both eastern North Greenland (e.g. Johnsen 1953, Andersen 1970, Grant 1972, Bennike & Kelly 1986) and down along the east coast (e.g. Meltofte et al. 1981), but so far with no breeding reported.

However, during the *Kilen-85* expedition to the ice-free enclave Kilen in Kronprins Christian Land (Fig. 1), in July-August 1985 (Håkansson et al. in press), large numbers of breeding Brent Geese and one or two pairs of breeding Snow Geese were encountered – and a small flock of Barnacle Geese *Branta leucopsis*, which is the first record of this species that far north.

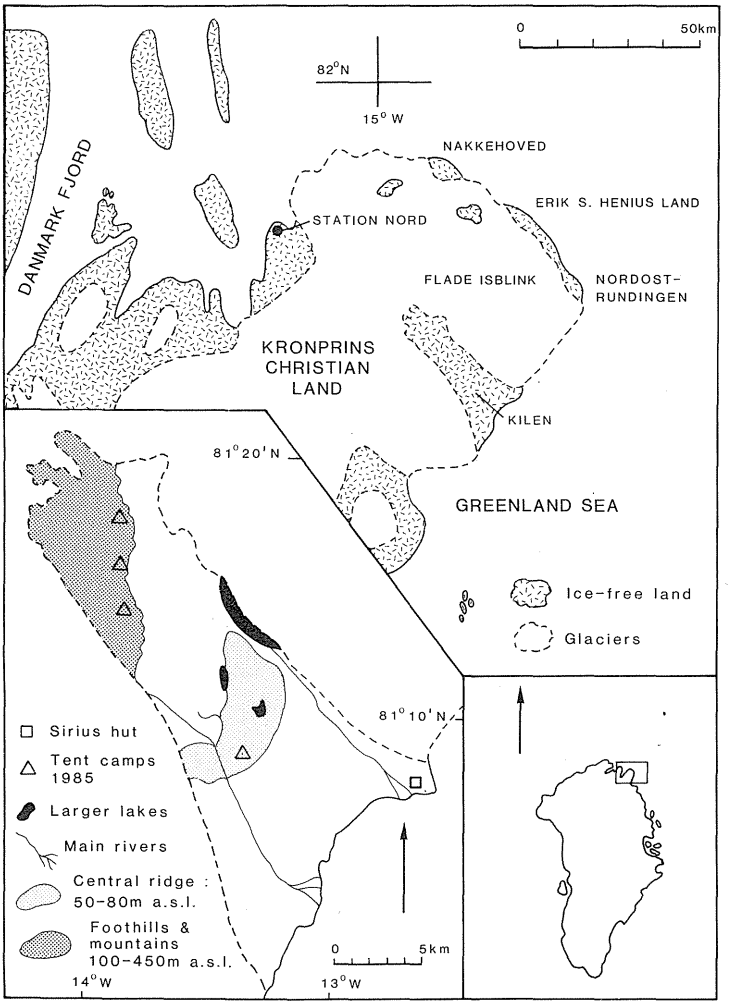

Fig. 1. Maps of Greenland, northern Kronprins Christian Land, and Kilen.
Kort over Grønland, nordlige Kronprins Christian Land, og Kilen.

The Kilen-85 expedition

The main objective of this expedition was the geology of Kilen (Håkansson et al. in press), ornithology being only of secondary importance. Travelling via Station Nord (Fig. 1) we arrived at Kilen 30 July, and left again 25 August. We operated out of four tented camps and one hut (Fig. 1), using our feet, two three-wheeled Honda motorcycles and a rubber boat for transport within the area. Our coverage of Kilen was almost total. The only area not visited by us was the large sandur in the southeast – although we touched upon its northern edge. Most areas were visited more than once during our stay.

Kilen

Topography

Kilen is a wedge-shaped ice-free area (in Danish »Kilen« means »the wedge«), situated on the east coast of Kronprins Christian Land (Fig 1), some 30 km south of Greenland's northeasternmost point. On all sides except along the coast it is surrounded by ice-caps of the Flade Isblink complex. At the coast the land is 15 km wide, narrowing to about 5 km 35 km inland. Kilen's center lies on 81°10'N, 13°20'W.

Most of Kilen is extremely flat (Figs 2 and 3). The substratum is only sparsely covered by Quarternary deposits. From the coast and 15 km in-

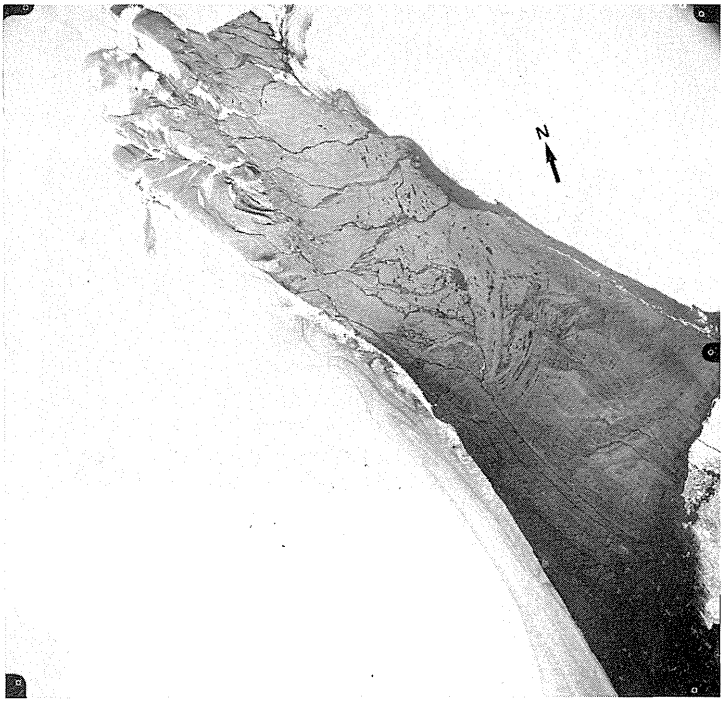

Fig. 2. Air-photo of Kilen, taken 4 August 1978 (876L 2858). Published with permission A369/86 of the Geodetic Institute, Copenhagen. Copyright.
Luftfoto over Kilen, fra 4. august 1978.

land, to the central ridge (Figs 1 and 2), the land slowly rises towards 70–80 m, across a wide plain of silt-covered flats interspersed with low beach-ridges. The central ridge is only about 30 m higher than the surroundings. On its inner side is another silty plain. Several shallow lakes occur, particularly around the central ridge and along the ice-edge to the northwest. More or less ephemeral water-bodies exist behind many beach-ridges. Two major rivers drain the area, one running along the southern, another along the northern edge.

In the innermost parts of Kilen the terrain rises to c. 500 m high mountains, through a belt of low irregular foot-hills.

Vegetation

Snow cover on Kilen is extensive and long-lasting, and most of the plains are probably not snow-free before the middle of July. Vegetation is very poor, with the overall coverage far less than 1%. The number of vascular plant species found is only 36 (Mølgaard, in Håkansson et al. in press). The extremely cool and foggy coastal zone, some 3–4 km wide, supports the poorest vegetation. The plains, from around the 20 m level almost 30 km inland (the central ridge is ecologically part of the plains), have a slightly higher plant density and diversity than the coastal zone. But really coherent vegetation is only found as small patches in ice-wedge polygons or in the lee of boulders. In the latter case it is usually fertilized by goose droppings and much grazed by the geese. Bryophytes contribute much to this 'goose-stone' vegetation (Fig. 4). The narrow foot-hill zone, due to a comparatively (but only comparatively!) genial climate, has the greatest diversity and productivity of the plants. In the mountains, finally, the vegetation gradually peters out with increasing altitude.

The most abundant plant, almost everywhere on Kilen, is the arctic poppy *Papaver radicatum*. Only where soil moisture is too high is the dominance passed on to the chickweed *Cerastium regelii*. The grass *Alopecurus alpinus* is also very abundant, preferably growing along shallow ponds and lakes or in the ice-wedge polygons, but also around the 'goose-stones'. Although other grass species, such as *Poa abbreviata, Phippsia algida* and *Puccinellia angustata,* are widespread only *Alopecurus* is able to establish a more coherent plant cover. Sometimes it is associated with the buttercup *Ranunculus sabinei.*

Fig. 3. Near the camp on the central ridge (position in Fig. 1), showing the central part of the area across which the grazing transect documented in Fig. 5 was made. Note the extreme flatness of the terrain and the poor vegetation. Photo PM.
Ved lejren på centralryggen (Fig. 1). Billedet viser den centrale del af det område, hvor græsningsundersøgelsen, der præsenteres i Fig. 5, blev lavet. Bemærk områdets ekstreme fladhed og minimale vegetationsdække.

Goose observations

Brent Geese

Distribution and numbers

Generally seen the numbers of Brent Geese increased from the coast towards the central ridge, with its shallow lakes, and then decreased towards the interior. The largest single concentration (230 birds) was seen 12 August on the largest lake immediately east of the central ridge. During the same day another 85 birds were seen around the central ridge, a further 165 along the southern river and in its delta, and about 40 in the plains east of the central ridge. This amounts to 520 birds – and then only some 50% of the areas frequented by the geese were covered that day. On 24 August 350–400 Brent Geese were flushed by an approaching Twin-Otter, from the area around the southern part of the central ridge. In the mountains only some small flocks (maximum size 5 birds and containing no young) were encountered. A conservative estimate gives a grand total, young included, of c. 850 Brent Geese encountered on Kilen.

Strangely, no Brent Geese were identified on Kilen during our reconnaissance visits in 1980. In the light of our present knowledge, however, we believe that the two flocks of 'Eiders' seen from the air on the lakes around the central ridge 31 July (Hjort et al. 1983, p. 110), and also some flocks of unidentified 'ducks' spotted from a helicopter in the same area 29 August, were indeed Brent Geese. In 1985 lots of geese were present on these lakes, whereas not a single Eider *Somateria mollissima* or King Eider *Somateria spectabilis* was seen.

Breeding habitats

We were too late to find any nests with eggs. But some empty nests of the year were found, as well as many old nest sites (Fig. 4). These showed that the Brent Geese mostly nested on flat open ground. Nests were typically placed close to a large stone, upon slight elevations on the wide open plain. These stones furnish some lee from the winds, and as the prevailing direction of strong winds on Kilen is from NW most nests were placed E-SE of the stones. But probably more important is that the stones protrude early through the snow cover, trap heat and enhance snow melt and thus give rise to early snow-free patches where the nests can be placed and a little close-to-nest food obtained.

Feeding

Observations on foraging birds, and also their tracks across the wet silt, showed that the main food was arctic poppy *Papaver radicatum*. Where the geese had foraged intensely most individuals of this species had been grazed almost to ground level. The second most common food plant was the grass *Alopecurus alpinus*, whereas other common grasses were taken much less frequently. The buttercup *Ranunculus sabinei* and the scurvygrass *Cochlearia groenlandica* were eaten where they occurred, and also the chickweed *Cerastium regelii* was regularly taken.

The geese did not show any obvious preferences for special foraging areas, probably due to the ubiquitous occurrence of *Papaver* and *Alopecurus* in the mostly rather uniform habitats.

Fig. 4. A 'goose-stone' with vegetation and an old Brent Goose nest (arrow) on its leeward side. Photo CH.
En »gåsesten« med vegetation og en gammel Knortegås-rede på læsiden.

However, as illustrated in Fig. 5, for a section across the central ridge, a pronounced small scale grazing strategy, based on actual food availability, was clearly employed.

Breeding success

Single pairs with young were rather scarce, as closely mixed groups of several families were already established on our arrival, so our material on brood size is small. Of the 9 single family groups encountered 6 contained 4 young, 1 contained 3 young and the other two families only 2 young. The larger flocks of Brent Geese usually contained a sizeable but quite varying proportion of young: like 180 adults/50 young, 50/100, 25/35 and 10/20. Out of 683 aged birds 275 (40%) were young.

Moult, fledging of young and the pre-migratory behaviour

No larger flocks of non-breeders were seen, but the age structure (180 adults/50 young) of the largest flock at the central ridge indicated that it contained both breeders with young and non-breeders.

At our first encounters with the Brent Geese, around 1 August, all seemed incapable of flight, and were running for shelter in the typical way of moulting geese. The first 3 flying adults were seen 10 August, although a small flock of unidentified flying geese 6 August were probably also Brents. From 11 August onwards the numbers of flying adults were rapidly increasing.

The first fledged juveniles were seen 16 August, and with a fledging period of about 40 days and an incubation period of c. 24 days (Cramp & Simmons 1977) this indicates a start of egg-laying not later than 10 June and probably a few days earlier.

As mentioned, multi-family flocks, often quite large, were encountered already on our first visits to the goose areas in early August (e.g. 74 ad. with 'many' young 8 August, and 230 whereof about 50 were young 12 August). These flocks did not seem to increase much in size before our departure 25 August, although the pre-migratory restlessness became increasingly evident during the last week of our stay.

Why so many Brent Geese on Kilen?

The vegetation cover on Kilen is certainly not outstanding in a North Greenland context, it is in fact much poorer than in several entirely goose-free areas further north and west. So abundance of food or protection by vegetation cover are not factors behind the large Brent Goose population.

A possible reason why the geese are so common there could be a lack of predators – most notably the lack of arctic foxes *Alopex lagopus*! During our entire stay we saw no foxes and encountered only one single set of fox tracks – and the wet silts of Kilen are excellent for the preservation of tracks. This is very much less than what one sees elsewhere in northern Greenland, even in extremely poor fox years, and it was in fact less than the numbers of wolf *Canis lupus* tracks seen! The reason for this lack of foxes may be the general isolation of Kilen, with 20 km or more across glaciers to the surrounding (simi-

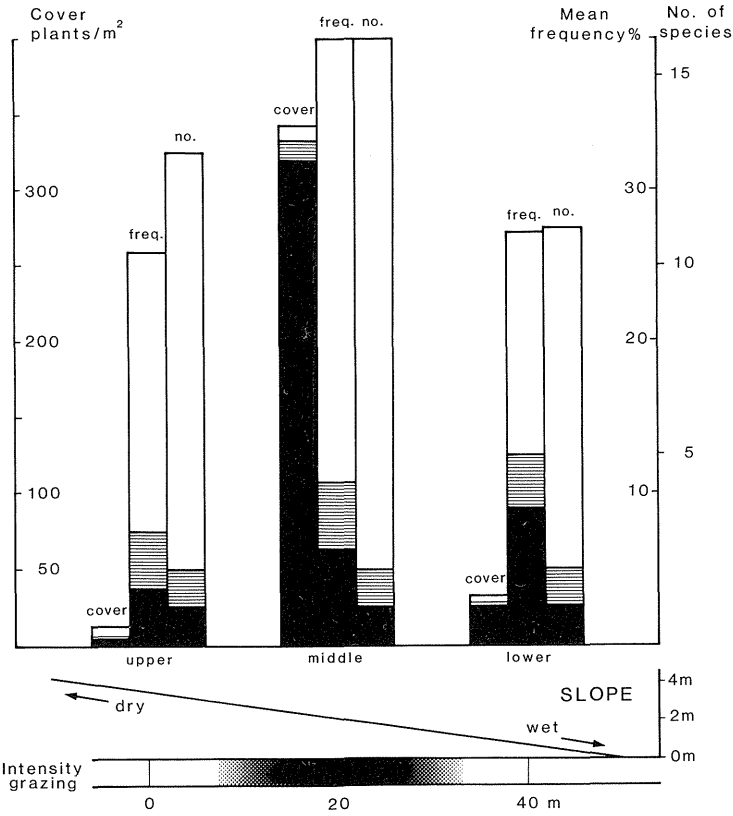

Fig. 5. Grazing intensity (as estimated from the number of grazed plants) in relation to the distribution of vascular plants in three sub-zones on the slope of the central ridge (Fig. 3), 65 m elevation, 14 August. The plant cover is visualized in three ways: (1) as the number of plants/m², (2) as mean frequencies of the occurring species, and (3) as the total numbers of species. Black indicates the contribution by *Alopecurus*, horizontal lines that by *Papaver*.
Græsningen i relation til fordelingen af frøplanter i tre vegetationssubzoner på skråningen af den centrale ryg (Fig. 3), 65 m over havet, 14. august. Plantedækket beskrives på tre måder: (1) antallet planter/m², (2) middelfrekvensen af de forekommende planter, (3) det totale antal arter i hvert delområde. Sort angiver Alopecurus, *vandrette linier* Papaver.

larly bleak) land areas, in combination with a near total snow cover in winter and a probably always very small population of lemmings *Dicrostonyx groenlandicus* (judging from the poor vegetation, the mostly unsuitable soils, and our very few observations of winter nests). For a ground-nester placing its nest on those small and easily detected snow-free patches available in mid-June, a near total absence of predators would certainly promote breeding success (cf. Meltofte et al. 1981 for a description of early nesting Pink-footed Geese *Anser brachyrhynchus* versus foxes on Hochstetter Forland). This must especially be the case this far north, where the extremely short season probably makes relayings abortive. At Station Nord, 100 km west of Kilen on the other side of Flade Isblink (Fig. 1), the summer 1985 ended 29 August with the establishment of a thin snow cover and below zero temperatures. That was quite normal, but still only 13 days after the very first airborne juvenile Brent Geese had been seen on Kilen. So the margin is very small!

In this context it is interesting to read that when, on 12 June 1910, Einar Mikkelsen and Ivar Iversen came sledging past the narrow strip of ice-free land called Erik S. Henius Land, on the very north coast of Kronprins Christian Land some 40 km north of Kilen (Fig. 1), they noted that: 'The low gravelled beach in front of the glacier, on which and along which we were sledging, seemed to be the breeding place of rather great numbers of geese, as we saw many on the wing and a very large flock sleeping on the ground. We killed two.' (Mikkelsen 1922, p. 111). Although it is not stated of which species these geese were, an educated guess would clearly suggest Brent Geese – in large numbers on a stretch of land even more isolated than Kilen! However, two overflyings and one short helicopter landing in that area, made by one of us (EH) in the summer 1980, did not produce any goose observations – but that could of course be a parallel case to our failure to note their presence on Kilen during our reconnaissance visits there the same summer?

To which Brent Goose population do the Kilen birds belong?

The near total absence of recent Brent Goose

observations in Peary Land, and in the areas south and west thereof (e.g. Dietz & Andersen 1984, Bennike & Kelly 1986), even in the years of the Greenland Geological Survey (GGU) expeditions 1978-80 and 1984-85 when these areas were scrutinized as never before, leads to the conclusion that the Brent Goose population in northern Kronprins Christian Land (which includes the breeding record on Nakkehoved 1978; Håkansson et al. 1981) is presently isolated from that of northwesternmost Greenland and the Canadian arctic. As it is also many years since migrating Brent Geese were seen along the coasts of Northeast Greenland south of Kilen (where, from Germania Land and southwards, many ornithologists have worked in recent years), it is in no way certain that the geese on Kilen and Nakkehoved must arrive along the 'traditional' route via Iceland and the coasts of northeastern Greenland. The possibility has to be taken into account that they may instead migrate via Norway – like, as it has recently turned out, many Nearctic Knots *Calidris canutus* do (Davidson 1985, Strann 1985). If so, they may in reality constitute the westernmost part of the Svalbard – Franz Josef Land population of *Branta bernicla hrota*. These birds winter in Denmark and northeastern England (e.g. Madsen 1984). The birds from northwesternmost Greenland and adjacent parts of the Canadian arctic winter in Ireland, from where the route northwards goes via Iceland across the Greenland Inlandice.

If the Brent Goose population of Kronprins Christian Land should be an extension of the Svalbard – Franz Josef Land population, they would constitute about 25% of it. According to counts in Denmark that population today counts some 3500-4000 birds (Madsen 1984). Whether the 850 or more Brent Geese on Kilen can be accomodated within that total is difficult to judge at present, as the size of the sub-populations on Svalbard and Franz Josef Land are not too well known (e.g. Persen 1986).

Snow Geese

The first observation of Snow Geese on Kilen was made on the central ridge 10 August, when one pair with most probably 2 young was seen at a distance. On 12 August one pair with 3 young was seen at close range (<100 m) in the same area, and on 17 and 19 August again a pair with 2 young. As only one pair was seen at any one occasion it is not clear whether 1 or 2 pairs were actually involved. If, however, it was only one pair, then one young had disappeared between 12 and 17 August.

The Snow Geese spent their time in the same general area and habitats as the largest Brent Goose flocks, but they were somewhat shyer. Neither the adults nor the young were seen flying during our stay, and no observations on their food were made.

The breeding on Kilen could be the result of an accidentally prolonged migration, e.g. by birds coming too far south when crossing the northwestern part of the Inlandice on their way to breeding grounds in Nyboe Land or Wulff Land. But it could also be a more permanent result of the general increase and expansion which this species has experienced during recent parts of this century (Salomonsen 1981, Bennike & Kelly 1986), and which is probably the background for most observations made in North and Northeast Greenland during the last decades.

Barnacle Geese

Seven adults flew over the foothills in the interior on 31 July. This is so far the northernmost observation of that species in Greenland.

Acknowledgments

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Resumé

Knortegås, Snegås og Bramgås på Kilen, Nordøstgrønland

Kilen er en isfri enklave, omgivet af Flade Isblink's gletschere og beliggende på kysten umiddelbart syd for Nordostrundingen, Grønlands nordøstspids. Under en ekspedition til Kilen i juli-august 1985 (*Kilen-85*) blev der observeret en hidtil ganske ukendt population af Knortegæs *Branta bernicla hrota*, et eller to par Snegæs *Anser caerulescens* med unger, samt en flok på 7 Bramgæs *Branta leucopsis*. Snegåsen er aldrig tidligere blevet konstateret ynglende på Grønlands østkyst, selv om den er blevet observeret dér flere gange; hvad angår Bramgåsen, var det den hidtil nordligste observation af denne art. Knortegås-populationen omfattede mindst 850 fugle, ungfugle iberegnet. Den største, enkelte flok var på 230 individer, og af de ialt 683 aldersbestemte fugle var 40% unger.

Knortegæssene ynglede på jorden ude på Kilens flade, åbne sletter. Rederne var ofte placeret i læsiden af en større sten. Dette giver en vis beskyttelse mod den kraftige Kilen-vind, men først og fremmest giver det mulighed for tidlig redeplacering p.g.a. en hurtigere snesmeltning omkring de opstikkende sten. Føden bestod hovedsageligt af fjeld-valmue *Papaver radicatum* og polar-rævehale *Alopecurus alpinus*, med indslag af snegræs *Phippsia algida*, sabine-ranunkel *Ranunculus sabinei* og polar-hønsetarm *Cerastium regelii*.

De første flyvende unge Knortegæs blev set den 16. august, og regnet bagud derfra må klækningen have fundet sted omkring 8. juli, og æglægningen fra omkring 10. juni. Ved Station Nord, 100 km vest for Kilen, men i øvrigt sammenligneligt, faldt den første sne allerede 29. august, knapt 2 uger efter at de allerførste ungfugle på Kilen var blevet flyvedygtige. Dette viser, hvor snævre marginalerne er heroppe, hvilket sandsynligvis udelukker omlægning af et mistet første-kuld. Dette gør naturligvis arten yderst følsom for prædation, og muligvis derfor er Kilen blevet et refugium for disse jordrugende gæs; dette yderst isolerede område virker praktisk taget rævefrit.

Man kan spekulere på om den isolerede Knortegåspopulation på Grønlands nordøstspids hører til den nearktiske population eller til Svalbard – Franz Josef Land populationen. Den første synes for øjeblikket at have sine østligste forekomster på Hall Land og Nyboe Land, 700 km vest for Kilen, og trækker til Vesteuropa (frem for alt Irland) via Indlandsisen og Island. Den anden population ruger som det nærmeste 450 km øst for Kilen og trækker via Norge, først og fremmest til Danmark.

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