

Trends and Fluctuations in Bird Populations on the Tundra at Cambridge Bay, Nunavut

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Lok, C. Martin, and Jaap A. J. Vink. 2012. Trends and fluctuations in bird populations on the tundra at Cambridge Bay, Nunavut. *Canadian Field-Naturalist* 126(2): 111–116.

Bird observations from the Cambridge Bay area on Victoria Island, Nunavut, in the summer of 2011 are presented and compared with those from the 1960s and 1980s. A total of 38 species was observed, compared with 42 in 1983 and 47 in 1986. Abundance of species of the High Arctic, such as Black Brant, *Branta bernicla nigricans*, Black-bellied Plover, *Pluvialis squatarola*, and Baird's Sandpiper, *Calidris bairdii*, decreased, whereas numbers of the Red-necked Phalarope, *Phalaropus lobatus*, usually associated with the Low Arctic, increased markedly. Overall, the number of each species observed is rather stable and, for several species, the relative abundance does not seem to have changed significantly.

Key Words: Black Brant, *Branta bernicla nigricans*, Black-bellied Plover, *Pluvialis squatarola*, Red-necked Phalarope, *Phalaropus lobatus*, High Arctic, Low Arctic, Cambridge Bay, Victoria Island, Nunavut.

Positioned at latitude 69.1°N and centrally located in the Canadian Arctic, the tundra north of the hamlet of Cambridge Bay (population 1400) is home to a variety of bird species. Here populations of migrant birds from the eastern and western Arctic and from the Low Arctic and High Arctic meet. Species of the High Arctic, such as the King Eider, *Somateria spectabilis*, Baird's Sandpiper, *Calidris bairdii*, Red Phalarope, *Phalaropus fulicarius*, and Black-bellied Plover, *Pluvialis squatarola*, overlap with species of the Low Arctic, such as the Sandhill Crane, *Grus canadensis*, American Golden-Plover, *Pluvialis dominica*, and Red-necked Phalarope, *Phalaropus lobatus*. In addition, bird life is enriched by the presence of some Pacific subspecies like the Black Brant, *Branta bernicla nigricans*. Moreover, some species with a limited distribution can be found, such as the Buff-breasted Sandpiper, *Tryngites subruficollis*, Stilt Sandpiper, *Calidris himantopus*, and Thayer's Gull, *Larus thayeri*. The location of Cambridge Bay puts it at the southern limit of the ranges of northern species and at the northern limit of the ranges of more southern species. This means that any changes in distribution due to climate change (or other factors) should be more visible than in areas more central to a population's distribution.

When we compared our observations made in 1983 (Lok and Vink 1986) and 1986 (Vink et al. 1988) with those of Parmelee et al. (1967), collected in the 1960s in the same area, some trends were observed. For example, the Brant (i.e., Black Brant), the most common goose in the 1960s, has almost disappeared as a breeding bird, whereas numbers of the Greater White-fronted Goose, *Anser albifrons*, and the Cackling Goose, *Branta hutchinsii*, have markedly increased. In addition, the ratio of the Black-bellied Plover to the American Golden-Plover has declined significantly.

In the summer of 2011, we revisited the tundra of Cambridge Bay in the same period as in 1983 and 1986, and we identified and confirmed some trends related to relative abundance in earlier years. Since the 1980s, numbers of a few species associated with the High Arctic have decreased, whereas the Red-necked Phalarope, *Phalaropus lobatus*, associated with the Low Arctic, has increased markedly. This report presents our 2011 observations and compares them to the findings from the 1960s and 1980s. In addition, some possible underlying causes of the changes observed are discussed.

Year-to-year variation in bird numbers in the Arctic can be influenced by a variety of physical and biological factors: temporary changes in the availability of food and/or nesting sites (determined by snow and ice coverage), timing of snow melt, temperature, precipitation, or by the cyclic occurrence of predators or food sources like lemmings. Conditions on the wintering grounds and the migratory routes may also influence bird populations in the Arctic (Donaldson et al. 2000). With these factors in mind, it is clear that differences between years do not necessarily reflect changes in status but rather weather conditions and food availability. Thus, differences in conditions in the census years should be noted (Table 1). A major difference between 2011 and the 1980s was that, in the 1980s, there were hardly any roads outside the settlement, whereas by 2011 there was an extensive infrastructure with gravel roads or tracks to Ovayok (Mount Pelly) and Long Point. In addition, an increased number of summer cabins for hunting and fishing have been constructed. This added human activity may have led to some increased disturbance or hunting pressure. This is likely a significant factor for the larger bird species that are hunted.

The lowland tundra north of the hamlet of Cambridge Bay is rather flat, with a multitude of shallow ponds and

TABLE 1. Mean summer temperatures and number of lemmings observed at Cambridge Bay, Victoria Island, Nunavut, in 1983, 1986, and 2011.

Year	Mean June temperature (°C)	Mean July temperature (°C)	No. of lemmings observed (density)
1983	3.6	9.0	1 (low)
1986	-0.4	7.1	20 (moderate)
2011	+1.1	10.8	4 (low)

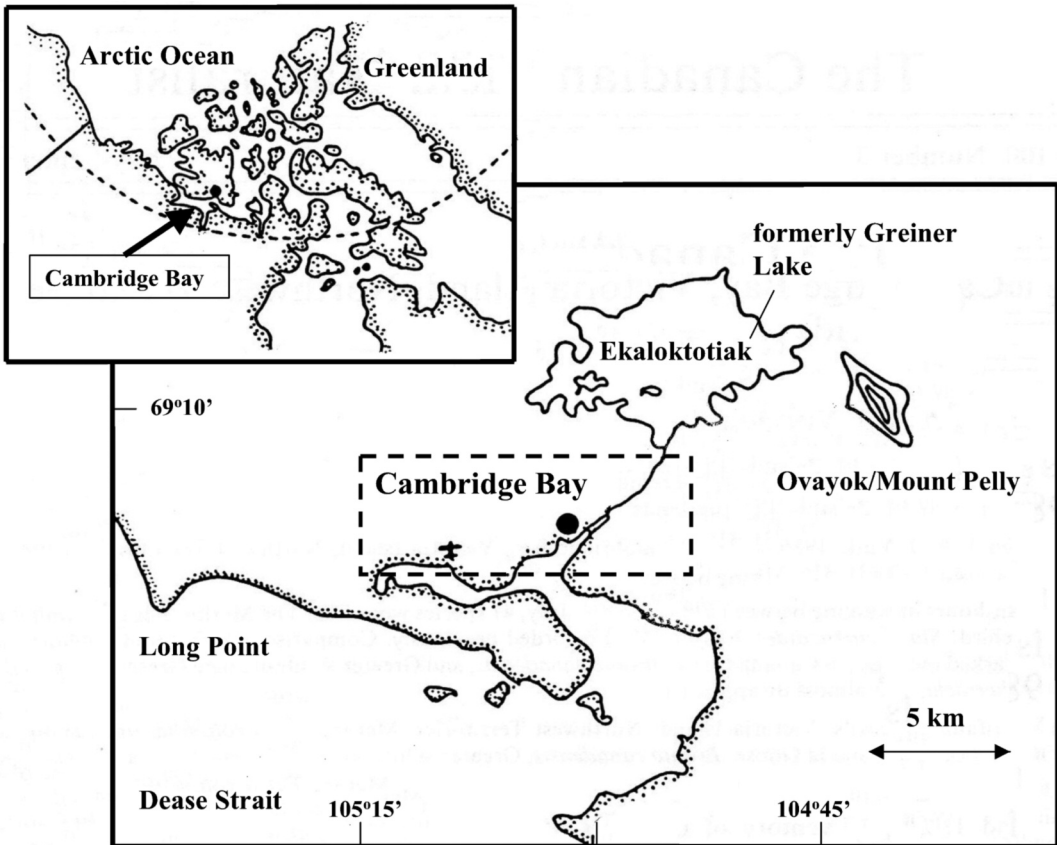


FIGURE 1. The Cambridge Bay area, Victoria Island, Nunavut, Canada. Dashed rectangle indicates the main study area in 2011.

lakes. Well-vegetated zones can often be found near these waters. The poorly drained wetlands are separated by dry, stony ridges with little vegetation. The smaller ponds are usually ice-free at the end of June, whereas the larger lakes and the sea remain frozen until well into July or beyond. In this area, the only higher land is Ovayok (Mount Pelly), with an elevation of over 200 m.

Study Area and Methods

Figure 1 shows our main study area in 2011. Each day, all birds seen were counted, and the accumulated totals for the period 25 June to 7 July 2011, collected during 300 person-hours of observation, are given in Table 2. The total number of each species can be used

as an indication of its relative abundance. Table 2 also includes the totals for 23 June to 6 July 1983 and 19 June to 3 July 1986. Unfortunately, the area near Ovayok (Mount Pelly), our main focus in the 1980s, was not accessible in 2011 due to high water levels. Instead, we concentrated mostly on the tundra round the Distant Early Warning (DEW) line road north of the airport (Figure 1). This tundra is similar in structure to the area round Ovayok (Mount Pelly), and the bird population here is very likely similar to that of our 1983 and 1986 study area. In addition, four trips to Long Point and surrounding tundra were made. A clear difference in the study area in 2011 was the absence of high land over 150 m.

TABLE 2. Birds observed near Cambridge Bay, Victoria Island, Nunavut, between 23 June and 6 July 1983, between 19 June and 3 July 1986, and between 25 June and 7 July 2011 (* includes *Acanthis* (formerly *Carduelis*) species; ++ common, not quantified).

Species observed		1983	1986	2011
Red-throated Loon	<i>Gavia stellata</i>	3	2	0
Pacific Loon	<i>Gavia pacifica</i>	14	66	43
Yellow-billed Loon	<i>Gavia adamsii</i>	5	5	0
Tundra Swan	<i>Cygnus columbianus</i>	48	184	133
Greater White-fronted Goose	<i>Anser albifrons</i>	130	420	164
Snow Goose	<i>Chen caerulescens</i>	0	107	0
Cackling Goose	<i>Branta hutchinsii</i>	170	298	97
Black Brant	<i>Branta bernicla nigricans</i>	12	28	15
Northern Pintail	<i>Anas acuta</i>	14	48	4
Greater Scaup	<i>Aythya marila</i>	0	2	0
Common Eider	<i>Somateria mollissima</i>	12	390	50
King Eider	<i>Somateria spectabilis</i>	340	501	327
Long-tailed Duck	<i>Clangula hyemalis</i>	260	156	218
Red-breasted Merganser	<i>Mergus serrator</i>	14	8	5
Rough-legged Hawk	<i>Buteo lagopus</i>	6	8	10
Merlin	<i>Falco columbarius</i>	1	0	0
Peregrine Falcon	<i>Falco peregrinus</i>	1	4	1
Willow Ptarmigan	<i>Lagopus lagopus</i>	0	24	0
Rock Ptarmigan	<i>Lagopus muta</i>	4	289	0
Sandhill Crane	<i>Grus canadensis</i>	0	7	26
Ruddy Turnstone	<i>Arenaria interpres</i>	75	90	3
Semipalmated Sandpiper	<i>Calidris pusilla</i>	210	++	187
White-rumped Sandpiper	<i>Calidris fuscicollis</i>	1	0	0
Baird's Sandpiper	<i>Calidris bairdii</i>	110	++	37
Pectoral Sandpiper	<i>Calidris melanotos</i>	70	20	33
Stilt Sandpiper	<i>Calidris himantopus</i>	120	111	17
Buff-breasted Sandpiper	<i>Tryngites subruficollis</i>	1	12	2
Red-necked Phalarope	<i>Phalaropus lobatus</i>	3	23	92
Red Phalarope	<i>Phalaropus fulicarius</i>	175	292	54
American Golden-Plover	<i>Pluvialis dominica</i>	140	174	50
Black-bellied Plover	<i>Pluvialis squatarola</i>	60	24	0
Semipalmated Plover	<i>Charadrius semipalmatus</i>	10	29	18
Glaucous Gull	<i>Larus hyperboreus</i>	170	151	543
Thayer's Gull	<i>Larus thayeri</i>	9	86	3
American Herring Gull	<i>Larus argentatus smithsonianus</i>	0	2	1
Sabine's Gull	<i>Xema sabini</i>	140	268	126
Arctic Tern	<i>Sterna paradisaea</i>	160	92	71
Pomarine Jaeger	<i>Stercorarius pomarinus</i>	6	61	1
Parasitic Jaeger	<i>Stercorarius parasiticus</i>	26	40	2
Long-tailed Jaeger	<i>Stercorarius longicaudus</i>	72	120	78
Snowy Owl	<i>Bubo scandiacus</i>	0	5	0
Short-eared Owl	<i>Asio flammeus</i>	0	1	0
Common Raven	<i>Corvus corax</i>	1	1	22
Mountain Bluebird	<i>Sialia currucoides</i>	1	0	0
Horned Lark	<i>Eremophila alpestris</i>	85	124	112
American Pipit	<i>Anthus rubescens</i>	12	12	9
Arctic Redpoll*	<i>Acanthis</i> (formerly <i>Carduelis</i>) <i>hornemanni</i>	3	4	26
Lapland Longspur	<i>Calcarius lapponicus</i>	++	++	347
Snow Bunting	<i>Plectrophenax nivalis</i>	70	177	113
Savannah Sparrow	<i>Passerculus sandwichensis</i>	0	1	1

It should be noted that the 2011 data likely include some double counts of, for example, the Glaucous Gull, *Larus hyperboreus*, on the Cambridge Bay waste dump site. We visited this site only once in each of 1983 and 1986 but more often in 2011. As we do not know which birds were transient and which stayed for longer periods, we have not tried to correct the numbers for pos-

sible double counts. In 1983 and 1986, we travelled on foot while changing our base every one or two days. In contrast, in 2011 we had our base in the settlement and mainly patrolled the road and track system round Cambridge Bay from Long Point to part of the Mount Pelly road by all-terrain vehicle (ATV) and on foot on the surrounding tundra.

Results and Discussion

A total of 38 species was observed in 2011, compared with 42 in 1983 and 47 in 1986. A comparison of our 2011 observations with those in the 1980s shows that the number of each species observed has been rather stable. For several species, the status does not seem to have changed significantly. Some of the changes observed can be explained by temporary factors. Thus in 1986, upon our arrival, snow cover was still 90% and much migration was observed after the onset of snow melt. In 2011, most breeding birds had already arrived and had started nesting or were occupying territories. Tundra Swans, *Cygnus columbianus*, and some ducks still formed concentrations on coastal lakes waiting for the larger lakes to become ice-free, and they started to disperse over the tundra at the end of our visit.

The only significant migration observed in 2011 was that of the Sandhill Crane; this migration explains the higher numbers in 2011. In addition, small groups of Black Brant arrived and spent some time foraging at the coast before moving further within 24 hours.

In 2011, no breeding pairs of Black Brant were observed. In contrast, in the 1960s, the Brant (i.e., Black Brant) was decidedly the most common goose (Parmelee et al. 1967). Already in the 1980s, the species had considerably declined and was outnumbered by Cackling Goose and Greater White-fronted Goose (Lok and Vink 1986; Vink et al. 1988). It is possible that the Cackling Goose has displaced the Black Brant from its favourite breeding sites, small islands in ponds. Indeed, this possibility is supported by observations of interspecific competition between goose species in the Arctic (Fox et al. 1996; Flint et al. 2008).

Our observations suggest a change in status of the Black-bellied Plover. The ratio of the Black-bellied Plover to the American Golden-Plover changed from well over 1 in the 1960s to 0.43 in 1983, 0.14 in 1986, and as low as zero in 2011. A decrease in numbers of Black-bellied Plovers on certain Canadian sites was thought to be a response to a local increase in the number of American Golden-Plovers (Parker and Ross 1973; Pattie 1990; Byrkjedal and Thompson 2002). A clear negative correlation between the two populations on Devon Island has been found, suggesting species replacement or competition (Pattie 1990). In contrast, Gratto-Trevor et al. (1998) found significant decreases for both Black-bellied Plover and American Golden-Plover on Rasmussen Lowlands. Buff-breasted Sandpipers in the Cambridge Bay area have been reported to breed in close association with Black-bellied Plovers (Paulsen and Erkmann 1985). The two nests of Buff-breasted Sandpipers observed on dry tundra west of Cambridge Bay in 2011 obviously had to manage without the presence of Black-bellied Plovers. Another High Arctic species that was seen less often was Baird's Sandpiper. In 1983, we observed 110 Baird's Sandpipers, but in 2011 only 37 were counted. Similarly, the

number of Stilt Sandpipers observed was lower than in the 1980s.

A long-term trend seems to be northward expansion of the Red-necked Phalarope from the Low Arctic. Before the 1960s, the Red-necked Phalarope had not been reported from Cambridge Bay and in the 1960s it was probably a rare breeder (Parmelee et al. 1967). In 1983 and 1986, we counted 3 and 23, respectively. In 2011, with 92 observations, this species outnumbered even the Red Phalarope. The ratio of Red-necked Phalarope to Red Phalarope was 0.02 in 1983, 0.08 in 1986, and 1.7 in 2011.

The Common Raven, *Corvus corax*, has clearly increased, likely due to the increased human activity. There was only one observation each in 1983 and 1986, so the observation of 22 Common Ravens in 2011 suggests a real increase.

As expected for a year with low numbers of lemmings, no Snowy Owls, *Bubo scandiacus*, were seen, and only one Pomarine Jaeger, *Stercorarius pomarinus*, and two Parasitic Jaegers, *Stercorarius parasiticus*, were observed. In years with higher numbers of lemmings, the density of Snowy Owls and Pomarine Jaegers can be high (Parmelee et al. 1967). In contrast, the Long-tailed Jaeger, *Stercorarius longicaudus*, seems to have bred in normal numbers. In addition, Rough-legged Hawks, *Buteo lagopus*, managed to breed (one nest with young and one nest with five eggs were observed).

Striking was the complete absence of both ptarmigan species in 2011. In 1983 and 1986, we observed 4 and 289 Rock Ptarmigans, *Lagopus muta*, respectively, and 0 and 24 Willow Ptarmigans, *Lagopus lagopus*, respectively. Ptarmigan numbers are known to fluctuate. For example, during a 50-year study in Scotland, a 10-year cycle was observed (Watson et al. 2000). In addition, in years with low numbers of lemmings, Arctic Foxes, *Vulpes lagopus*, have been shown to switch from lemmings to ptarmigans (Angelstam et al. 1984).

For other areas in the Canadian Arctic, long-term multi-species studies were summarized recently by Trefry et al. (2010). During a long-term study on Ellesmere Island from 1980 to 2008, the assemblage of breeding bird species appeared to have changed little, except for an increase in the Lapland Longspur, *Calcarius lapponicus* (Trefry et al. 2010). This increase was attributed to increased production of vegetation due to higher temperatures (an increase of 2 Celsius degrees in the average July temperature between 1981 and 2008). So far, it has not been possible to identify key factors for most changes observed, and Trefry et al. (2010) concluded that year-to-year variation remains a poorly understood component of monitoring studies of birds breeding in the Arctic.

Recent analyses of trends in shorebird populations in various parts of Canada and the U.S. indicate that many species are declining, including the Black-bellied Plover, the American Golden-Plover, and both the

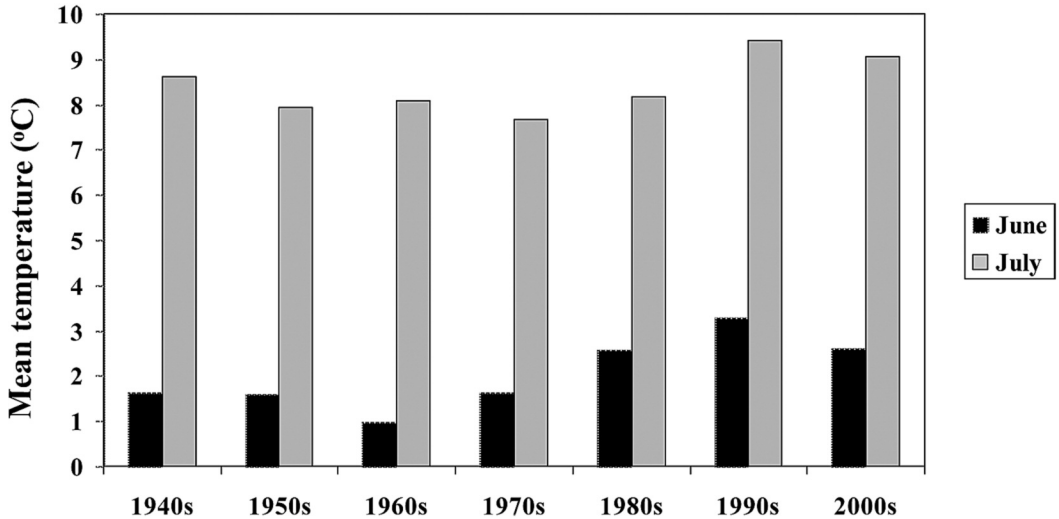


FIGURE 2. Mean June and July temperatures at Cambridge Bay, Victoria Island, Nunavut, per decade (data processed from Monthly Data Report, Environment Canada)

Red-necked Phalarope and the Red Phalarope (Morrison et al. 2001, Gratto-Trevor et al. 2011*). These range-wide status changes are often attributed to factors outside the breeding grounds in the Arctic (Donaldson et al. 2000). Whereas numbers of some shorebirds in Cambridge Bay have declined, in line with the change in the status of general populations, numbers of the Red-necked Phalarope, which shows a general population decline, have increased markedly at Cambridge Bay. In parallel to this northward expansion, the numbers of this species seem to have decreased at the southern limit of its range (Cramp and Simmons 1983, Del Hoyo et al. 1996, Jehl and Lin 2001).

The question of whether some of the longer term trends at Cambridge Bay are related to climate change (see also Meltofte et al. 2007) is also still open to debate. Compared to the 1960s (1961–1970), the mean June and July temperatures at Cambridge Bay for the period 2001–2010 have risen, but relative to the 1990s these temperatures have decreased slightly (Figure 2). Therefore, it will be interesting to observe whether the northward expansion of the Red-necked Phalarope will continue, stop, or even be reversed.

Acknowledgements

We thank A. J. Erskine and one anonymous reviewer for their helpful comments on a previous draft.

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Received 18 November 2011

Accepted 10 April 2012