

# Expanded Range Limits of Boreal Birds in the Torngat Mountains of Northern Labrador

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The Torngat Mountains lie at the southeastern limit of the Canadian Arctic in northern Labrador, and bird distributions in the region are poorly understood. I visited the Torngat Mountains every summer from 2008 to 2016 and recorded all birds observed. Several boreal bird species were widespread and breeding in the region, representing expansion of known ranges by 100–350 km north along the Labrador coast and 40–90 km east from Ungava Bay. Shrub thickets have expanded dramatically in the Torngat Mountains since the 1980s; thus, these observations may reflect range expansion by boreal birds in response to increased habitat availability.

Key Words: Boreal birds; climate change; Labrador; range shifts; shrubification; Torngat Mountains; treeline

## Introduction

Understanding and monitoring the range limits of species can offer important insights into environmental change and valuable information for conservation planning in a changing world. Environmental change is progressing rapidly in northern Canada, particularly along the boreal-arctic ecotone and is evident in the form of both climate change and widespread expansion of shrub communities (“shrubification”; Myers-Smith *et al.* 2011, 2015; IPCC 2014). Many species of birds have also shifted their ranges poleward in North America and Eurasia, a phenomenon that has been linked to climate change, although most such evidence comes from sub-arctic biomes (e.g., Thomas and Lennon 1999; Brommer 2004; Hitch and Leberg 2007; Chen *et al.* 2011). Although atlas projects and citizen science initiatives have provided detailed information on the breeding distribution of bird species throughout much of southern Canada (e.g., Cadman *et al.* 2007), such information across Canada’s North remains limited and imprecise.

As in much of the Arctic, the environment of northern Labrador is changing rapidly. Average air temperature has increased by about 2°C since the early 1990s and is expected to increase by another 2–4°C by 2050 (Allard and Lemay 2012; Finnis 2013; Way and Viau 2014). Coupled with this, growing seasons are becoming longer, with increases of about 20 days forecast by 2050 (He *et al.* 2008; Pouliot *et al.* 2009; Allard and Lemay 2012). These changes have implications for vegetation communities, and both remote sensing and Inuit knowledge indicate that cover of tall shrubs, including willow (*Salix* sp.), alder (*Alnus* sp.), and Dwarf Birch (*Betula glandulosa*), has increased approximately six-fold in the Torngat Mountains of northern Labrador since the 1980s (Parks Canada 2008; Fraser *et al.* 2011; Quirouette and Zorn 2015). Shrubification is occurring

across much of the Arctic (Myers-Smith *et al.* 2011, 2015), but the rate of change is much higher in the Torngat Mountains than in other parts of the Canadian North (Fraser *et al.* 2011; see also Tremblay *et al.* 2012). This may be the result of an interactive functional response of existing shrubs to climate amelioration combined with a large drop in grazing pressure with the decline of the Torngat Mountains Caribou (*Rangifer tarandus*) herd (Wilson *et al.* 2014; Christie *et al.* 2015; Couturier *et al.* 2015).

Studies of bird distributions in northern Labrador have been limited, although a number of ornithologists and naturalists have travelled the region over the past century, and their observations are well documented. Key historical works include those of Austin (1932) and Todd (1963), who report observations from more than 25 expeditions to Labrador and northern Quebec between 1901 and 1958 and also thoroughly review reports from numerous other naturalists who have travelled the region. More recently, Al Veitch spent five seasons at Hebron Fiord (1989–1993) and kept detailed records of his bird observations, which were summarized by Harrington (1994). These records are valuable because they offer detailed information about a seldom-surveyed location near the range limits of many species just before climate and vegetation change accelerated in the region.

From 2008 to 2016, I made annual summer visits to the Torngat Mountains, during which I travelled extensively between Saglek Bay and Seven Islands Bay. The survey area overlapped that of Austin (1932) and Todd (1963) and is 10–20 km north of the area travelled by Veitch (Harrington 1994). During these visits, I recorded information on the distribution and breeding status of all birds observed. Here I compare my observations with documented breeding limits for several species of boreal birds.

## Methods

The Torngat Mountains ecoregion (Notzl *et al.* 2013) represents the southeastern limit of the Canadian Arctic Cordillera and spans the northernmost ~300 km of Labrador from Mugford Bay in the south to Killiniq Island in the north (Figure 1). The region is dominated by the Torngat Mountains, with summits exceeding 1500 m, large river valleys, and a complex coast that includes numerous islands, bays, and fiords. Torngat Mountains National Park (9700 km<sup>2</sup>) was established in 2005 and occupies the northern half of the ecoregion.

The boreal-arctic ecotone (i.e., the “treeline”) in Labrador occurs in the vicinity of Okak (Payette 1983) about 120 km south of the park, and the Torngat Mountains are dominated by arctic vegetation. However, some northern boreal plant communities are found in favourable habitat north of Okak, including small isolated stands of Black Spruce (*Picea mariana* (Mill.) Britton, Sterns & Poggenb.) as far north as Hebron Fiord and a handful of small (i.e., < 1 ha) stands of Balsam Poplar (*Populus balsamifera* L.) and Mountain Ash (*Sorbus americana* Marshall) around Saglek Fiord. Dense 1–4 m tall willow and alder thickets are found in riparian areas and the lower slopes of valleys, but are increasingly sparse in the north and reach a limit near the Eclipse River. To the west in Quebec, conifer stands extend farther north along the George River and in sheltered valleys along the coast of Ungava Bay, reaching a northern limit at Ablviak Fiord (Payette 1983). Black Spruce and Eastern Larch (*Larix laricina* (Du Roi) K. Koch) also extend far inland in the Koroc River Valley, where scattered stands reach a limit near the headwaters of Nakvak Brook (Ouellet 1978; Payette 1983; KRG 2005).

Observations reported here were made during nine years of summer fieldwork in Torngat Mountains National Park (2008–2016), including some made just south of the park. During these visits, I documented all birds observed following an approach similar to that employed in breeding bird atlas studies (e.g., Cadman *et al.* 2007); for each encounter, I recorded species, date, location, and evidence of breeding (Table 1). Although opportunistic, this approach allowed rapid as-

essment of bird communities at many coastal and inland sites and yielded over 1400 observations of 76 species (data available from eBird [<http://ebird.org/>] or Natureserve [[www.natureserve.org/](http://www.natureserve.org/)] or upon request to D.W.).

However, there were limitations to this approach. Most notably, visits were limited to 3–5 weeks between mid-July and late August each year; thus, it was not possible to observe birds at the peak of breeding in June and early July when they would have been singing and displaying more aggressively. The timing also increased the likelihood of observing post-breeding individuals that may have immigrated from other areas, such as conifer forests along the Ungava coast. Operational constraints limited my travels to the region between Saglek Bay and Kangalaksiorvik Lake, which spans about 100 km at the centre of the Torngat Mountains ecoregion but does not encompass the northernmost ~100 km of Labrador or the ~120 km gap between Saglek and the boreal ecotone near Okak (Figure 1).

## Results and Discussion

My observations from 2008 to 2016 indicate that several northern boreal bird species are far more widespread and abundant in the central Torngat Mountains than has been reported previously (Table 2). Further, I found evidence that most of these species are occasionally or regularly breeding 10s to 100s of kilometres north and east of previously reported range limits (Table 2). Admittedly, available historical information on the distribution of these species is incomplete and biased toward more accessible coastal locations. However, it seems implausible that the ornithologists and other naturalists who visited the region over a period of more than 100 years would have consistently missed a whole suite of northern boreal birds. This is especially true given that these species are all found in and around willow and alder thickets that are easily accessed along the coast; because they have the greatest diversity and abundance of birds in the region these thickets would surely have attracted the attention of observers. Thus, it seems likely that the breeding ranges or at least the abundance of several northern boreal birds has increased in the central Torngat Mountains in recent decades.

TABLE 1. Behavioural observations used to assess the breeding status of birds observed in the Torngat Mountains of northern Labrador, 2008–2016.

Breeding status	Behavioural evidence
No evidence of breeding	No behaviour or physical evidence suggestive of breeding
Possible breeding	Seen or heard singing in nesting habitat during breeding period Pair seen in nesting habitat Territorial nesting behaviour in nesting habitat for > 1 week Courtship between male and female Visiting possible nest site
Confirmed breeding	Nest building Distraction display Recently fledged or downy young Adult carrying food or fecal sac Nest with eggs, egg shells, or young

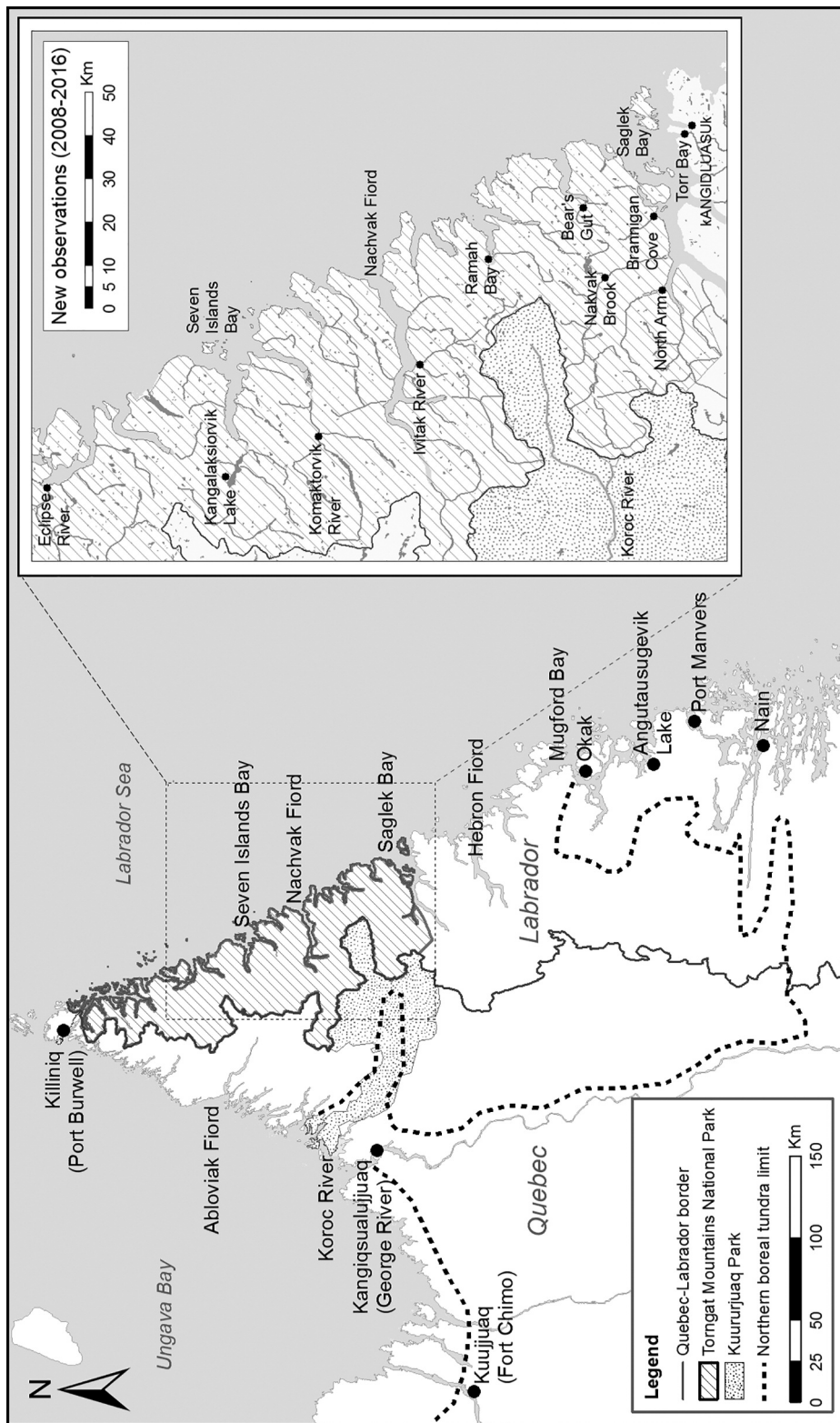


FIGURE 1. Location of the study area in northern Labrador. The dashed line indicates the approximate northern limit of the boreal forest tundra ecozone (from Payette 1983). The inset map depicts the region where new observations were made during July and August, 2008-2016.

TABLE 2. Summary of observations of boreal birds in the Torngat Mountains of Labrador, 2008–2016.

Species	Historical range limits ( <i>sources</i> *)	Locations observed (no. observations)	Years observed	Confirmed breeding	Expansion of known breeding range
Spotted Sandpiper ( <i>Actitis macularia</i> ) 19 observations 4 breeding records	Labrador: Nain and probably Okak (1, 2, 5) NE Quebec: Kuujuaq and Koroc R. (4, 5, 8) Additional sightings from Hebron F., Saglek B., and Abloviak F. (2, 3, 6)	Saglek B. (10; 6 areas) Ramah B. (1) Ivitak R. (3) Komaktorvik F. (1) Kangalaksiorvik L. (4)	2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015	Torr B. (2009) KANGIDLUSUK (2012) Kangalaksiorvik L. (2015)	230 km NNW of Okak 90 km NNE of Koroc R.
American Robin ( <i>Turdus migratorius</i> ) 27 observations 4 breeding records	Labrador: Historically Okak (2, 5) but Hebron F. by 1990s (6) NE Quebec: Koroc R. (4, 5, 8) Additional sightings from Hebron F. and Nachvak F.; nested at Killiniq in 1920 and 1933 (1, 2)	Saglek B. (13; 4 areas) Nakvak Br. (4) Ivitak R. (7) Komaktorvik R. (1) Kangalaksiorvik L. (2)	2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016	Torr B. (2008, 2011) Ivitak R. (2012, 2013)	190 km NNW of Okak; 100 km NNW of Hebron F. 50 km NE of Koroc R.
Gray-cheeked Thrush ( <i>Catharus minimus</i> ) 5 observations	Labrador: Okak (2) and possibly to Saglek B. (5, 6) NE Quebec: Koroc R. (4, 8)	North Arm (1) Nakvak Br. (1) Ivitak R. (3)	2008, 2009, 2012, 2014	None	
Yellow-rumped Warbler ( <i>Setophaga coronata</i> ) 7 observations 1 breeding record	Labrador: Nain (2, 5); likely breeding at Angutausgevik L. in 1928 (1) NE Quebec: Koroc R. and south Ungava B. (4, 5, 8) Additional sightings from Okak and Hebron F. (2, 6)	Saglek B. (3; 3 areas) Ivitak R. (3) Kangalaksiorvik L. (1)	2009, 2011, 2012, 2014, 2015, 2016	Ivitak R. (2012)	290 km NNW of Nain; 240 km NNW of Angutausgevik L. 50 km NE of Koroc R.
Blackpoll Warbler ( <i>Setophaga striata</i> ) 33 observations 5 breeding records	Labrador: Okak, possibly to Hebron F. (1, 2, 5, 6) NE Quebec: Koroc R., possibly to Abloviak F. (3, 4, 5, 8)	Saglek B. (15; 6 areas) Nakvak Br. (3) Bear's Gut (2) Ivitak R. (9) Kangalaksiorvik L. (4)	2008, 2009, 2012, 2013, 2014, 2015, 2016	Torr B. (2008, 2016) Brammigan C. (2016) Nakvak Br. (2016) Kangalaksiorvik L. (2015)	230 km NNW of Okak; 160 km NNW of Hebron F. 90 km NNE of Koroc R.; 40 km E of Abloviak F.
Wilson's Warbler ( <i>Cardellina pusilla</i> ) 20 observations 4 breeding records	Labrador: Makkovik but almost certainly to Nain (1, 2, 5) NE Quebec: Koroc R., possibly to Abloviak F. (3, 4, 5, 8)	Saglek B. (8; 5 areas) Nakvak Br. (1) Ivitak R. (5) Komaktorvik F. (2) Kangalaksiorvik L. (4)	2008, 2009, 2011, 2012, 2013, 2014, 2015, 2016	North shore Saglek F. (2015) Brammigan C. (2016) Ivitak R. (2009) Kangalaksiorvik L. (2016)	350 km NNW of Nain 90 km NNE of Koroc R.; 40 km E of Abloviak F.
Northern Waterthrush ( <i>Parkesia noveboracensis</i> ) 3 observations 1 breeding record	Labrador: Nain and possibly Okak (1, 2, 5, 7) NE Quebec: Koroc R. (2, 4, 5, 8)	Torr B. (2) Nakvak Br. (1)	2013, 2014, 2016	Nakvak Br. (2013)	250 km NNW of Nain; 140 km NNW of Okak 50 km E of Koroc R.

TABLE 2 (continued). Summary of observations of boreal birds in the Torngat Mountains of Labrador, 2008–2016.

Species	Historical range limits ( <i>sources</i> *)	Locations observed (no. observations)	Years observed	Confirmed breeding	Expansion of known breeding range
Fox Sparrow ( <i>Passerella iliaca</i> ) 28 observations 3 breeding records	Labrador: Historically Okak, possibly further north (1, 2) and recently to Hebron F. (6) NE Quebec: Koroc R. (2, 5, 8)	Saglek B. (16, 5 areas) Nakvak Br. (1) Bear's Gut (1) Ramah B. (1) Ivitak R. (8) Kangalaksiorvik L. (1)	2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016	Torr B. (2016) Brannigan C. (2016) Ivitak R. (2012)	100 km NNW of Hebron F. 50 km NE of Koroc R.
White-throated Sparrow ( <i>Zonotrichia albicollis</i> ) 1 observation	Labrador: Lake Melville (2, 5) NE Quebec: Schefferville then rare north along Kokoak R. possibly to Kuujuaq (2, 5, 8)	Brannigan C. (1)	2016	None	
Lincoln's Sparrow ( <i>Melospiza lincolni</i> ) 1 observation	Labrador: Nain (2, 5) NE Quebec: Kuujuaq (2, 5, 8)	Torr B. (1)	2014	None	
Dark-eyed Junco ( <i>Junco hyemalis</i> ) 7 observations 1 breeding record	Labrador: Okak but not to Hebron F. (1, 2, 5, 6) NE Quebec: Koroc R. (4, 8)	Saglek B. (3; 3 areas) Nakvak Br. (1) Bear's Gut (1) Ivitak R. (2)	2008, 2011, 2012, 2013, 2014, 2015	Ivitak R. (2012)	190 km NNW of Okak 50 km NE of Koroc R.

Note: B. = Bay; Br. = Brook; C. = Cove; F. = Fiord; L. = Lake; R. = River.

\*1. Austin (1932); 2. Todd (1963); 3. Ouellet (1973); 4. Ouellet (1978); 5. Godfrey (1986); 6. Veitch, reported in Harrington (1994); 7. Whitaker and Eaton (2014); 8. Québec Breeding Bird Atlas (2016).

Some of these species are well established and widespread in suitable habitat (Spotted Sandpiper [*Actitis macularius*], American Robin [*Turdus migratorius*], Blackpoll Warbler [*Setophaga striata*], Wilson's Warbler [*Cardellina pusilla*], Fox Sparrow [*Passerella iliaca*]), while others were infrequently observed (Gray-cheeked Thrush [*Catharus minimus*], Yellow-rumped Warbler [*Setophaga coronata*], Northern Waterthrush [*Parkesia noveboracensis*], Dark-eyed Junco [*Junco hyemalis*]), Lincoln's Sparrow (*Melospiza lincolni*) and White-throated Sparrow (*Zonotrichia albicollis*) are more southern species that were only seen once and, thus, were likely vagrants.

Although several studies have shown that many bird species are shifting their ranges poleward, this process does not appear to be directly constrained by ambient temperature, as most tolerate colder temperatures in their breeding range than occur at their poleward range limit (Cristine and Kerr 2015). Rather, range limits may be constrained by composite climatic factors, lags in the expansion of plant communities that afford appropriate breeding and foraging habitat, geographic barriers, competition, and intrinsic life history traits (Bateman *et al.* 2015; Cristine and Kerr 2015; Stralberg *et al. in press*). With the exception of Spotted Sandpipers, which were seen primarily along shorelines, the boreal birds I encountered were most often found in and around low-lying willow and alder thickets. American Robins, Fox Sparrows, and Dark-eyed Juncos were somewhat more catholic, also making regular use of Dwarf Birch thickets and other tundra shrub habitats and occurring in both low-lying areas and on the mid-slopes of valleys and fiords. Thus, it seems likely that expansion of boreal birds in the central Torngat Mountains has been facilitated by the recent rapid expansion of tall shrub habitats in the region. Such shrubification is becoming widespread in the Arctic, albeit typically at a much slower rate, so a similar trend of increasing habitat availability for many northern boreal and Taiga bird species is expected throughout the North (Sokolov *et al.* 2012; Henden *et al.* 2013; Boelman *et al.* 2015; Mizel *et al.* 2016). Given their high mobility, birds are physically capable of rapidly tracking expansion of suitable breeding habitat, and, consistent with Stralberg *et al. in press*, my observations suggest that mountainous terrain *per se* has not hindered this process in northern Labrador. Indeed, I regularly found several boreal birds in small riparian shrub thickets in isolated river valleys separated by large bays and fiords and highlands exceeding 1000 m.

Future changes in bird communities of the Torngat Mountains are difficult to predict and will depend on the habitat needs of individual species (Thompson *et al.* 2016). A number of conifer-associated boreal birds (e.g., Spruce Grouse [*Falcipectus canadensis*], Gray Jay [*Perisoreus canadensis*], and Boreal Chickadee [*Poecile hudsonicus*]) also breed along the Koroc River (Ouellet 1978; Québec Breeding Bird Atlas 2016).

However, expansion of such species into northern Labrador seems improbable unless conifers spread into the region first, a process that may take many decades if it occurs at all. It is also unclear whether the species I observed in the central Torngat Mountains could eventually occupy the entire Ungava Peninsula. The shrub expansion that has been documented to date is most pronounced in the southern and central Torngat Mountains (Fraser *et al.* 2011; Quirouette and Zorn 2015), and well developed shrub thickets are rare north of the Eclipse River. Thus, shrubification in the northernmost Torngat Mountains may be increasingly constrained by plant dispersal rather than simple infilling and growth of existing shrubs and, as a result, may proceed at a slower rate (Myers-Smith *et al.* 2011, 2015). Further, if the Caribou herd in the Torngat Mountains recovers and grazing pressure returns to past levels, then shrubs may once again become suppressed, with negative consequences for any associated bird species (e.g., Ims and Henden 2012; Henden *et al.* 2013; Christie *et al.* 2015).

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