

Breeding Atlantic Puffins, *Fratercula arctica*, and Other Bird Species of Coburg Island, Nunavut

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Coburg Island and neighbouring waters were recently designated a Canadian National Wildlife Area. The large seabird colony at Cambridge Point has been previously described, and is dominated by Thick-billed Murres (160 000 pairs). We found that a small offshore island, named Princess Charlotte Monument, also supported breeding populations of seven marine bird species; three of which did not breed at the main colony (i.e., Northern Fulmar, Common Eider, and Atlantic Puffin). This is the most northern confirmed breeding site for Atlantic Puffins in Canada. Puffins at both Coburg Island and northern Greenland nest in rock crevices, apparently because permafrost in soil prevents burrow nesting. We suggest that puffin populations in the high arctic may be limited by habitat, rather than prey availability.

Key Words: Atlantic Puffin, *Fratercula arctica*, Coburg Island, Northwater Polynya, breeding range, Nunavut, Canada.

Polynyas are areas of open water in the arctic that occur when much of the ocean is otherwise covered in ice. In general, polynyas are highly productive and provide foraging habitat for many marine mammal and seabird species (Stirling 1997; Falk and Moller 1995; Falk et al. 1997). Coburg Island is located on the west margin of the Northwater Polynya (Figure 1), and supports one of the largest seabird colonies in the Canadian Arctic (Birkhead and Nettleship 1981). It was protected as a National Wildlife Area (NWA) in 1995 in recognition of its biological importance (Nirjutigavvik NWA).

Coburg Island is a very significant seabird colony in Canada's high Arctic. Approximately 160 000 pairs of Thick-billed Murres, *Uria lomvia*, and 30 000 pairs of Black-legged Kittiwakes, *Rissa tridactyla*, nest along 6 km of coastline north of Cambridge Point (Birkhead and Nettleship 1981; Figure 2). A second, previously undescribed, colony exists on a rock tower named Princess Charlotte Monument 15 km east of the main colony. Here, we report the bird species observed between Cambridge Point and the Marina Peninsula on the south coast of Coburg Island, and particularly those that breed on Princess Charlotte Monument.

Methods and Study Area

Terrain and habitat

Coburg Island is located at the east end of Jones Sound, 25 km southeast of Ellesmere Island (Figure 1). The island is approximately 3450 ha in area. It consists of extensive ice fields and mountain nunataks up to 900 m in elevation, gravel beaches, sparse vegetation, and coastal cliffs up to 300 m in

height. Princess Charlotte Monument is a spectacular, small island (< 5 ha), located about 2 km east of the Marina Peninsula on the southeastern tip of Coburg Island (hereafter referred to as the Monument, Figure 2). A series of six sea-stacks leads from the mainland to the Monument which comprises two distinct summits: a 70 m summit on the west end and the main summit tower (100 m, Figure 3). East of the precipitous summit tower, the island drops to the ocean in a series of rocky ridges and cliffs, interspersed with grassy slopes (Figure 4). During July and August in 1998, the south coast of Coburg Island including Princess Charlotte Monument was routinely surrounded with pack ice.

Bird Census

We were present on Coburg Island from 11 July to 22 August 1998. We studied breeding ecology of Thick-billed Murres, Black-legged Kittiwakes, and Glaucous Gulls, *Larus hyperboreus*, at the main colony north of Cambridge Point (Figure 2). We also visited the Monument three times in 1998 (20 July, 21 July, and 21 August; 4–8 hours per visit). We accessed the Monument by inflatable boat from our base camp on Cambridge Point, 15 km to the northwest (Figure 2). During visits and travel to neighbouring areas, all avifauna were identified and counted directly; either from a boat as we circled the Monument, or on foot. We also documented the activity of birds and, if possible, breeding status. Fish observed in chick-meals were identified on the basis of body shape and fin morphology with the aid of a spotting scope at a range of 8–10 m. The Monument itself was photographed using medium

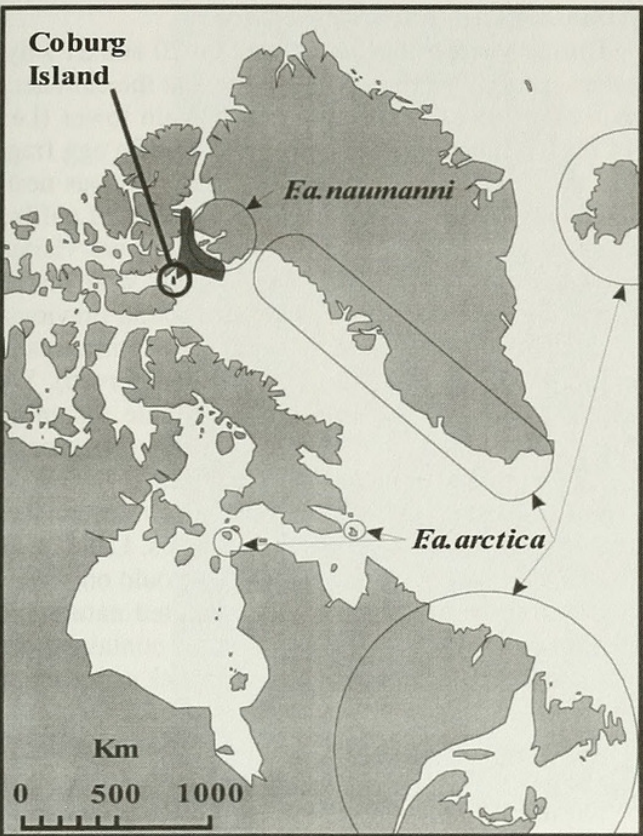


FIGURE 1. Map showing Coburg Island, the Northwater Polynya (shaded region between Coburg Island and Greenland), and the range of breeding Atlantic Puffin colonies for both *F. a. arctica* and *F. a. naumanni*.

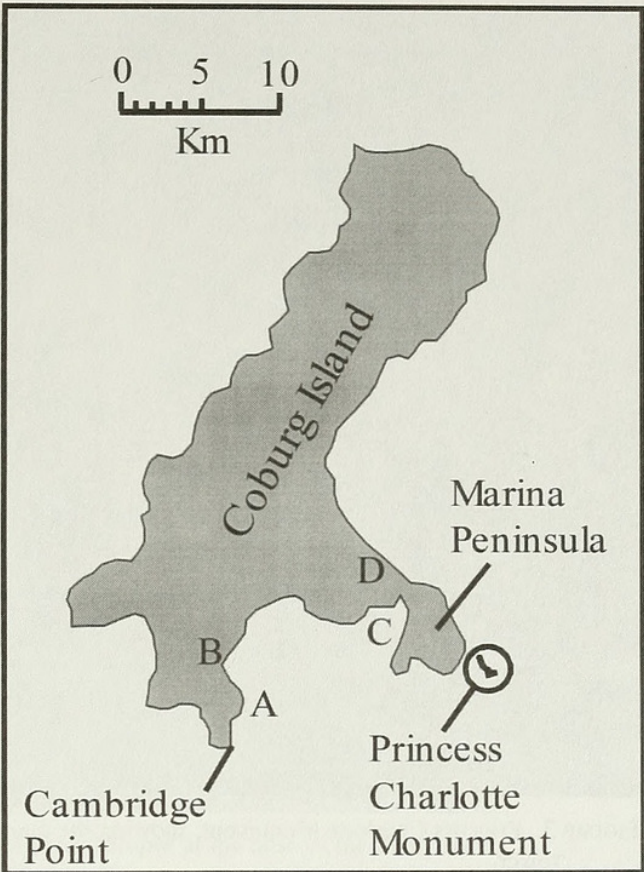


FIGURE 2. Area map of Coburg Island. Annotated locations refer to, (A) main colony; (B) Camp Beach, (C) Epic Bay; and (D) Cabin Beach.

format black-and-white film, which is now archived at the Canadian Wildlife Service, Yellowknife, Northwest Territories, Canada. We report only on bird species observed from land or while boating near shore.

We observed 17 bird species on Coburg Island in 1998; at least seven of which nested on Coburg Island (Table 1). Three of these species nested solely on Princess Charlotte Monument or on the cliff of the Marina Peninsula 100 m from the Monument (Northern Fulmar, Atlantic Puffin, Common Eider; Table 1).

Northern Fulmar *Fulmarus glacialis*

This species was commonly observed flying in the vicinity of the main colony. However, nest sites were only found on the Monument ($n = 323$ pairs) and adjacent cliffs of the Marina Peninsula ($n = 30$ pairs). Most nested high on the cliffs (range: 30-200 m in elevation), but ca. 100 pairs nested on steep vegetated slopes at the base of the Monument's main tower. Nest sites were occupied through July and August.

Mallard *Anas platyrhynchos*

One adult male was observed. Although at the extreme northern range limit for Canadian Mallards,

Mallards nest on the southwest coast of Greenland 500-800 km to the southeast of Coburg Island (Boertmann 1994).

Common Eider *Somateria mollissima*

Seen regularly in flocks (25-100 individuals) throughout July and August. Males consistently outnumbered females about 15:1 throughout the summer. Common Eiders were regularly seen close to glacial run-off creeks in Epic Bay. Four nests were found at the base of the Monument in 1988.

King Eider *Somateria spectabilis*

One flock of 15 males was observed on 14 July. Additionally, males were routinely seen on ice floes or on the sea, particularly in the area of glacial outflows in Epic Bay.

Oldsquaw *Clangula hyemalis*

We observed three groups of oldsquaw (2-4 birds each) loitering on coastal freshwater ponds near our base camp.

Glaucous Gull *Larus hyperboreus*

A common breeder at the main colony, nesting on most available promontories throughout the area (60-80 pairs). They also occurred at Princess Charlotte Monument, with 15 pairs observed on and around the two main towers. A total of 17 pairs with chicks

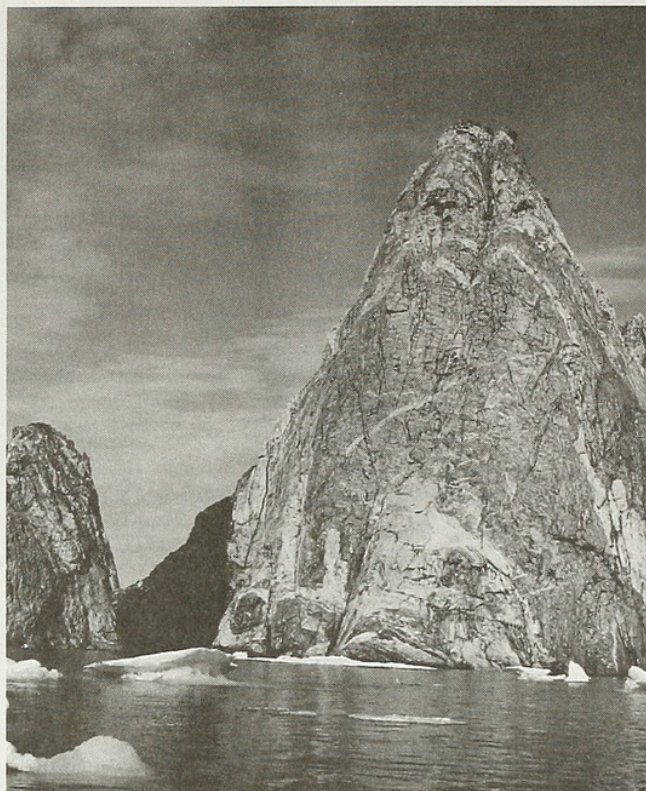


FIGURE 3. Princess Charlotte Monument, showing the main tower.

were also observed on all but one of the sea stacks leading to the Monument.

Black-legged Kittiwake *Rissa tridactyla*

This colonial seabird nested in large numbers at the main colony (30 000 pairs; Birkhead and Nettleship 1981), often interspersed with Thick-billed Murres. In addition, we found 198 active nests on the vertical cliffs of the Monument. We defined active nests as having at least one adult present, and in most cases these nests also contained eggs or chicks. Breeding phenology at the Monument was similar to the main colony in 1998, with chicks close to fledging by 21 August based upon feather development. Some flocks of adult kittiwakes (> 1000 birds) fed on amphipods (Amphipoda) near shore at the outflow areas of glacier creeks in Epic Bay. Kittiwakes also made extensive use of coastal freshwater ponds in which they bathed.

Ivory Gull *Pagophila eburnea*

Two Ivory Gulls were observed at Cabin Beach. This species appears to be a rare summer visitor in spite of the fact that one of Canada's two major breeding concentrations exists on the nearby nunataks of Ellesmere Island, 150 km to the north-east (Thomas and MacDonald 1987).

Sabine's Gull *Xema sabini*

A single individual was observed on the sea north of the main colony on 11 July 1998.

Atlantic Puffin *Fratercula arctica*

During visits to the Monument on 20 and 21 July, seven pairs of puffins were observed at the entrances to rock crevices at the base of the main tower (i.e., 14 birds). In two crevices, we found puffin egg fragments (at least 1 year old), indicating previous nesting attempts. On 21 August, fourteen pairs of puffins were observed on the same slopes that we visited previously in July. Seven of these pairs were standing at crevice entrances that we had found previously, and a further seven pairs stood at the entrances to seven other crevices (i.e., 28 puffins observed). We suggest that this is a minimum estimate assuming that some adults may have remained underground during our visits or were foraging at sea.

Puffins nested in deep and convoluted rock crevices and fissures, rather than among boulders. Little or no soil existed within these crevices. We could only view one nest chamber due to the convoluted nature and depth of crevices. The nest chamber contained dry grass, several feathers, and a puffin chick estimated to be between one and two weeks old on 21 August. This suggests a laying date of late June, assuming a 37-45 day incubation period (Harris 1984).

During 1.5 hours of continuous observations on 21 August, we observed Puffins returning with fish at five nest sites and we were able to quantify bill loads. Meals consisted of 10-15 very fresh fish, comprised almost entirely of Northern Sand Lance (*Ammodytes dubius*). Up to three juvenile Capelin (*Mallotus villosus*) were also present in some bill loads. All fish observed were 50-100 mm long.

Black Guillemot *Cephus grylle*

Black Guillemots nested in crevices at the northern tip of the main seabird colony (ca. 30 pairs) and on the west side of Cambridge Point (ca. 20 pairs). A further 100-125 pairs nested on the Monument, most at the eastern end in steep boulder-strewn slopes. Several solitary nests and small groups (< 5 pairs) were also observed on the main tower and neighboring sea stacks. The nesting colony on the Monument permitted close observation of fish species carried to chicks. We observed 30 feeds which consisted of the following: 24 sculpins (Cottidae), 2 Greenland Shrimps (*Pandalus borealis*), 2 gunnels (Pholidae), 1 Capelin (*Mallotus villosus*), and 1 Arctic Cod (*Boreogadus saida*). Most fish were 100-200 mm long.

Thick-Billed Murre *Uria lomvia*

The estimated 160 000 breeding pairs nesting at the main colony dominate the avifauna of Coburg Island (Nettleship and Evans 1985). We also found that the Monument also supports another 350-380 breeding pairs on the southern cliff-face of the main tower. Breeding was confirmed at the Monument in August when chicks were observed on ledges with adults. Based upon size of murre chicks on 21 August, phenology at the Monument was similar to the main colony. Peak of hatch occurred on 3 July.

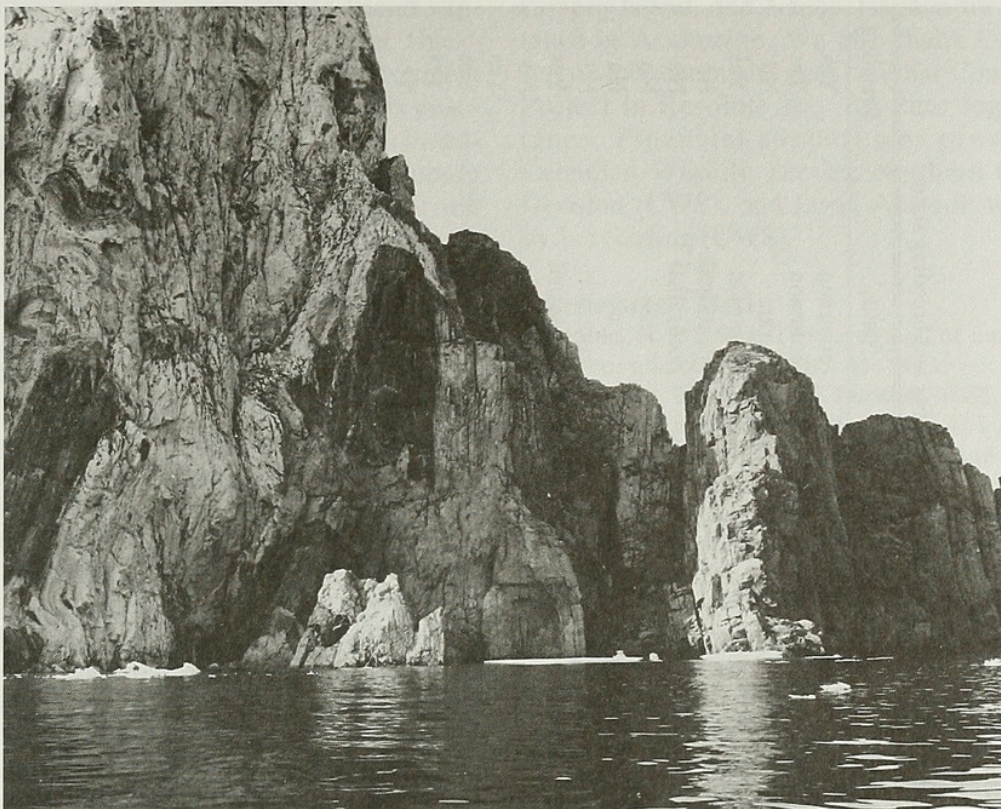


FIGURE 4. Princess Charlotte Monument, showing steep slopes at the base of the main tower where Northern Fulmars and Atlantic Puffins nested.

Common Ringed Plover *Charadrius hiaticula*

One individual was observed at Main Camp on the edge of a freshwater pond. This species appears to be an uncommon fall transient.

Ruddy Turnstone *Arenaria interpres*

Turnstones were observed regularly in July and August at Camp Beach, north to the Marina Peninsula ($n = 32$). All appeared to be young of the year. No adult-plumaged turnstones were observed in 1998.

Parasitic Jaeger *Stercorarius parasiticus*

A pair of birds were seen on the glacial flats west of the Marina Peninsula pass on 15 July in 1998 and a second pair was observed on a visit to Cabin Beach in 1997. In both cases, no nests were found, but their behaviour suggested that both pairs were nesting.

Gyr Falcon *Falco rusticolus*

A single white-phase bird was observed at the Monument on 20 July 1998.

Common Raven *Corvus corax*

Ravens were routinely observed around Camp Beach during the course of the study. Single ravens hunted at the main colony and around the Monument. In mid-August, we observed two juveniles (presumably young-of-the-year) which accompanied a pair of adult ravens, suggesting that ravens breed on Coburg Island.

Snow Bunting *Plectrophenax nivalis*

One breeding pair and three juveniles were observed daily at Camp Beach during July and August.

Discussion

In 1998, we confirmed the existence of the most northern colony of Atlantic Puffins in Canada, located at Princess Charlotte Monument. Their presence as breeders had been previously suggested, based on the observation of one puffin carrying fish (Nettle-ship and Evans 1985), and by occasional sightings of lone individuals flying in the area and standing on grassy slopes on the Monument (A. Gaston and J. Chardine, personal communication.)

Although we did not capture or measure any of the puffins nesting on the Monument, they may be *Fratercula arctica naumanni*. This is an arctic race characterized by large body size which occurs along the north west coast of Greenland (Gaston and Jones 1998). Coburg Island is located at the northwestern margin of the range for *F. a. naumanni* nesting in west Greenland. Indeed, the nearest Greenland colony is only 250 km to the east at Saunder's Island (< 10 pairs; Harris 1984; Boertmann et al. 1996). In contrast, the closest puffin *F. a. arctica* colonies in Canada occur on Hantzsch and Dome Islands, over 1500 km to the south (Gaston and Malone 1980; Gaston et al. 1985).

TABLE 1. Summary of bird species observed on and around Princess Charlotte Monument, Coburg Island, Nunavut, in 1998, in relation to number and breeding status.

Common name	Scientific name	Location	Number	Status ¹	Breeding
Northern Fulmar	<i>Fulmarus glacialis</i>	Monument	353 pairs	common	Yes
		Cliffs opposite Monument	30 pairs	common	Yes
Mallard	<i>Anas platyrhynchos</i>	Nearshore	1	rare	No
Common Eider	<i>Somateria mollissima</i>	Monument	4 pairs	common	Yes
King Eider	<i>Somateria spectabilis</i>	Nearshore	15	occasional	No
Oldsquaw	<i>Clangula hyemalis</i>	Camp Beach	10	occasional	No
Gyrfalcon	<i>Falco rusticolus</i>	Monument	1	rare	No
Common Ringed Plover	<i>Charadrius hiaticula</i>	Cabin Beach	1	rare	No
Ruddy Turnstone	<i>Arenaria interpres</i>	Camp Beach	32	common	No
Parasitic Jaeger	<i>Stercorarius parasiticus</i>	Pass Beach	4	occasional	Yes
Sabine's Gull	<i>Xema sabini</i>	Camp Beach	1	rare	No
Glaucous Gull	<i>Larus hyperboreus</i>	Main Colony*	60-100 pairs	common	Yes
		Monument	32 pairs	common	Yes
Black-legged Kittiwake	<i>Rissa tridactyla</i>	Main Colony*	30 000 pairs	common	Yes
		Monument	198 pairs	common	Yes
Thick-billed Murre	<i>Uria lomvia</i>	Main Colony*	160 000 pairs	common	Yes
		Monument	350 pairs	common	Yes
Black Guillemot	<i>Cephus grylle</i>	Main Colony	12 pairs	common	Yes
		Monument	115 pairs ²	common	Yes
Atlantic Puffin	<i>Fratercula arctica</i>	Monument	14 pairs	common	Yes
Common Raven	<i>Corvus corax</i>	General	1 pair	common	Yes
Snow Bunting	<i>Plectrophenax nivalis</i>	Camp Beach	1 pair + 4 juveniles	common	Yes

¹Status: Common, observed daily; Occasional, observed weekly; Rare, observed monthly

²Estimated, based on birds simultaneously seen at crevice entrances and on the water.

*Estimated previously, Birkhead and Nettleship 1981.

Given that the waters around Coburg Island support approximately 160 000 breeding pairs of Thick-billed Murres, it is likely that the marine environment can support more than 14 pairs of puffins. This poses the question as to why there are so few puffins breeding at Coburg Island. The puffins breeding at Coburg Island and in northern Greenland nest in rock crevices on small islands. In contrast, puffins breeding at much larger colonies in temperate regions usually nest in earth burrows (e.g., south Greenland and Newfoundland; Harris 1984; Gaston and Jones 1998). Puffins breeding in the high arctic typically cannot dig burrows due to lack of soil on rocky islands. Where soil or peat does exist (e.g., at the base of large Thick-billed Murre colonies), permafrost within soils may prevent burrow nesting (Harris 1984).

On Coburg Island, there are extensive grassy slopes at the base of the Thick-billed Murre colony and on top of a rounded headland at Cambridge Point (3-5 ha.). However, holes and depressions in grass tussocks contain ice and permafrost throughout the summer. Extensive ice in burrows would prevent development of eggs and kill chicks. We suggest that puffins on Coburg Island are restricted to nesting in rock crevices free of soil, and hypothesize that the population size of puffins nesting on Coburg Island is constrained by suitable nesting habitat rather than food availability. This is in contrast to most other colonial seabird populations (Ashmole 1963; Birkhead and Furness 1985).

Another explanation considers that puffins may be constrained by the extremely short breeding season in the high arctic. Puffins typically require 36-43 days of incubation and 38-53 days for chick-rearing (Gaston and Jones 1998). In contrast, Thick-billed Murres require 29-39 days of incubation and only 21-24 days before their chicks depart to sea (Gaston and Jones 1998). Poor survival of puffin chicks may limit the potential of this colony to expand even if chicks were highly philopatric and food and nest sites were not limiting.

The high species diversity at the Monument apparently results from an absence of Arctic Foxes, *Alopex lagopus*, and the variety of nesting habitats present (i.e., cliffs, slopes, crevices, and rock scree). Strong tidal currents around the Monument may also create good feeding conditions for both near-shore (Black Guillemots) and offshore feeding seabirds (kittiwakes, murres, puffins).

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