

## A Specimen of the High Arctic Subspecies of Atlantic Puffin, *Fratercula arctica naumanni*, in Canada

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A fresh specimen of an adult Atlantic Puffin, *Fratercula arctica*, was obtained from a local hunter at the Minarets (Akpaît) on the east coast of Baffin Island on 3 August 2007. The measurements of this bird exceeded those of Atlantic Puffins from Newfoundland and Labrador (*F. a. arctica*) but fell within the limits of the High Arctic subspecies (*F. a. naumanni*). This specimen appears to be the first of the High Arctic subspecies to be collected on a potential breeding site in Canada. This subspecies is highly disjunct from the Low Arctic subspecies and is probably represented in Canada by only a few hundred individuals.

**Key Words:** Atlantic Puffin, *Fratercula arctica naumanni*, status, Akpaît, Baffin Island, large-billed form.

The Atlantic Puffin, *Fratercula arctica* L., is found in temperate, subarctic and arctic waters of the North Atlantic. In Europe, it breeds from the English Channel coasts north to Spitsbergen (in the Svalbard archipelago off the coast of Norway) (Snow and Perrins 1998), and in North America it breeds from Maine in the United States to the Canadian Arctic Archipelago (Lowther et al. 2002) and the Avanersuaq region, Greenland (Boertmann et al. 1996). It is most abundant in Scotland, Norway, Iceland, and Newfoundland and Labrador (Gaston and Jones 1998).

Three subspecies of Atlantic Puffin have been described: *Fratercula arctica grabae*, which is found in Britain and France to southern Norway; *F. a. arctica*, in northern Norway, Iceland, and eastern North America; and *F. a. naumanni*, in Spitsbergen, Jan Mayen Island (possibly), and northern Greenland (Salomonsen 1944; Bedard 1985). All breeding birds in North America to date have been referred to the subarctic subspecies, *F. a. arctica* (Lowther et al. 2002). The arctic subspecies, *F. a. naumanni*, is distinguished from *F. a. arctica* principally by its larger size.

In Canada, the Atlantic Puffin breeds from Machias Seal Island, New Brunswick, north to southern Labrador and in a small number of localities in the eastern Arctic (Gaston and Malone 1980; Nettleship and Evans 1985; Robards et al. 2000; Harris and Wanless 2011). Only one adult specimen was available hitherto from the Canadian Arctic: a bird found dead by AJG on 29 August 1980 near Ivujivik, Quebec, on a known breeding site (the Nuvuk Islands) (see Gaston et al. 1985). The specimen, deposited with the Canadian Museum of Nature (CMNAV 69844), was examined by the late Henri Ouellet, who assigned it to the subspecies *F. a. arctica* (H. Ouellet personal communication to AJG, 1980). Recently, a second specimen, shot on 3 August 2007 close to the large Thick-billed Murre, *Uria lomvia*, colony at the Minarets (also known as Akpaît), on

Cumberland Peninsula, eastern Baffin Island (66°54'N, 61°45'W; 10 km south of Reid Bay), was obtained from a local hunter, who mentioned that “a few” puffins occurred annually at the site.

The bird collected at the Minarets was a male, identified on the basis of gonads by JFP, who skinned it. It was in full summer plumage and the bill had three vertical grooves on the upper mandible, suggesting that it was >3 years old (Harris 1981). A brood patch was present, so it was probably breeding at the time. It was measured after skinning. The wing length, flattened along a ruler, was 182 mm; the bill depth at the base, measured with calipers, was 42.6 mm; and the culmen length, from bill tip to the base of the rostrum (as illustrated in Pethon [1967] and shown in Figure 1), was 57.3 mm. The bill was slightly damaged at the base of the lower mandible, presumably by the bird-shot that killed it, and the depth otherwise might have been 1–2 mm greater (Figure 1). Using a Pesola spring balance, the bird weighed 585 g.

The measurements of the Minarets bird can be compared with means for birds from Labrador and the island of Newfoundland (*F. a. arctica*) and with means for birds from Svalbard (*F. a. naumanni*). Average measurements of *F. a. arctica* from the Gannet Islands, Labrador, are wing 172 (SD 4.0) mm, bill depth 37.8 mm (SD 2.0), and culmen length 50.4 mm (SD 2.2) (I. L. Jones, unpublished data). Average measurements of *F. a. arctica* from Newfoundland are wing 169 (SD 5.0) mm, bill depth 37.2 mm (SD 2.2), and culmen length 48.1 mm (SD 2.1) (Lowther et al. 2002). Average measurements of *F. a. naumanni* from Svalbard are wing 185 mm (range 177–195 mm), bill depth 47.1 mm (range 42–51 mm), and bill length 55.4 mm (range 51–59 mm) (Vaurie 1965).

The measurements of the bird from the Minarets fall outside of the 95% confidence limits for all three dimensions for samples of *F. a. arctica* from both



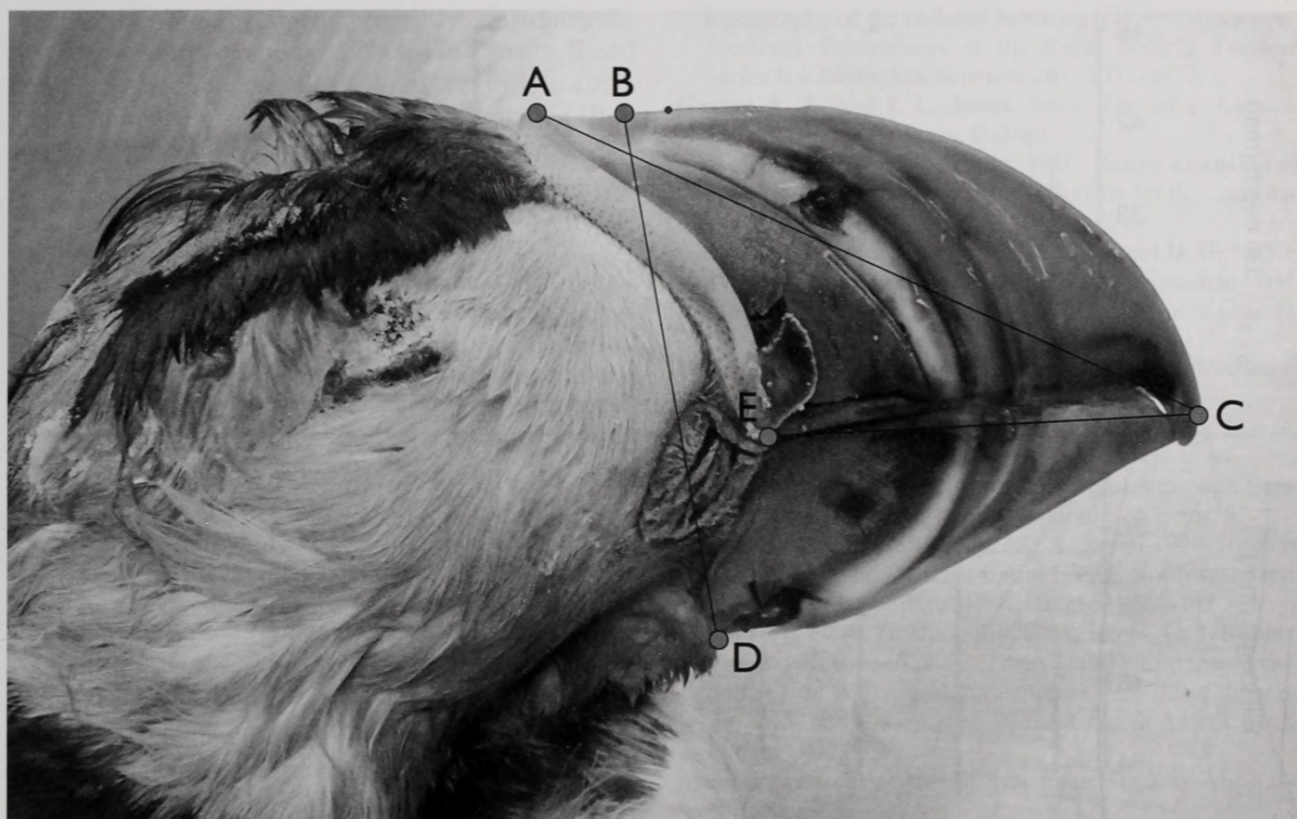


FIGURE 1. Measurements made on the specimen of the Atlantic Puffin collected from the Minarets (Akpaît), Baffin Island, in 2007: culmen length measurement used is A–C and depth was B–D, perpendicular to the closure of the two mandibles. See also Appendix 1.

Labrador and the island of Newfoundland. Its mass also falls outside the 95% confidence interval for the mass of birds at the nearest Canadian population of *F. a. arctica*, on the Gannet Islands, Labrador (mean 481 g,  $n = 692$ , CI 420–542 g). When the measurements for the bird from the Minarets are plotted alongside a series of samples from elsewhere (Figure 2), it is clear that the measurements are well above the range for the majority of Atlantic Puffins but within the range for *F. a. naumanni* from Svalbard. Culmen length actually exceeded the range given for Svalbard birds by Pethon (1967); see Appendix 1 for notes on bill measurements of Atlantic Puffins.

Neither Bedard (1985), on morphological grounds, nor Moen (1991), on the basis of measurements and allozyme analysis, found any support for separating the subspecies of Atlantic Puffin, although Bedard (1985), who examined few *F. a. naumanni*, felt that a distinction might be made for this subspecies. Moen (1991) actually had no DNA material from any *F. a. naumanni* population, so was unable to evaluate the subspecies on the basis of allozymes. Currently, the official British List of the British Ornithologists' Union shows *Fratercula arctica* as monotypic (Dudley et al. 2006), but Harris and Wanless (2011), in a recent monograph on the species, supported the idea that *F. a. naumanni* should be considered distinct from the more southern puffins, referring to it as “the large-billed

form”. Harris and Wanless (2011) note the distribution of the large-billed form as including Svalbard (population <10 000 pairs), eastern Greenland (a few pairs), and northwestern Greenland (north of 73°N, <100; Boertmann et al. 1996). Even if the 2500 puffins breeding on Jan Mayen Island, Norway, are considered to be large-billed, it seems unlikely that the world population of this subspecies exceeds 20 000 breeding pairs.

Based simply on bill measurements (Figure 1), it appears that the Svalbard population could meet the “75% non-overlap rule” (75% of population *a* falls outside the 99% confidence interval for population *b*) for separating subspecies based on size (Amadon 1949; Mayr 1969), but data to test this rigorously are not available (only ranges are available in the literature for Svalbard birds). In any case, this criterion has been challenged (e.g., Pethon 1967) and is now, given the increasing availability of DNA evidence, largely ignored.

All of the recognized populations of large-billed Atlantic Puffins are geographically well separated from the populations of *F. a. arctica* in the Atlantic—those on Svalbard by 240 km from the nearest *F. a. arctica* on Bear Island (Bjørnøya), the southernmost island in the Svalbard archipelago; those in northwestern Greenland by a 250-km stretch of Melville Bay, where the coast of Greenland is entirely covered by glaciers; and the very small population in east Greenland by >1000 km of Greenland coast (see maps in Harris



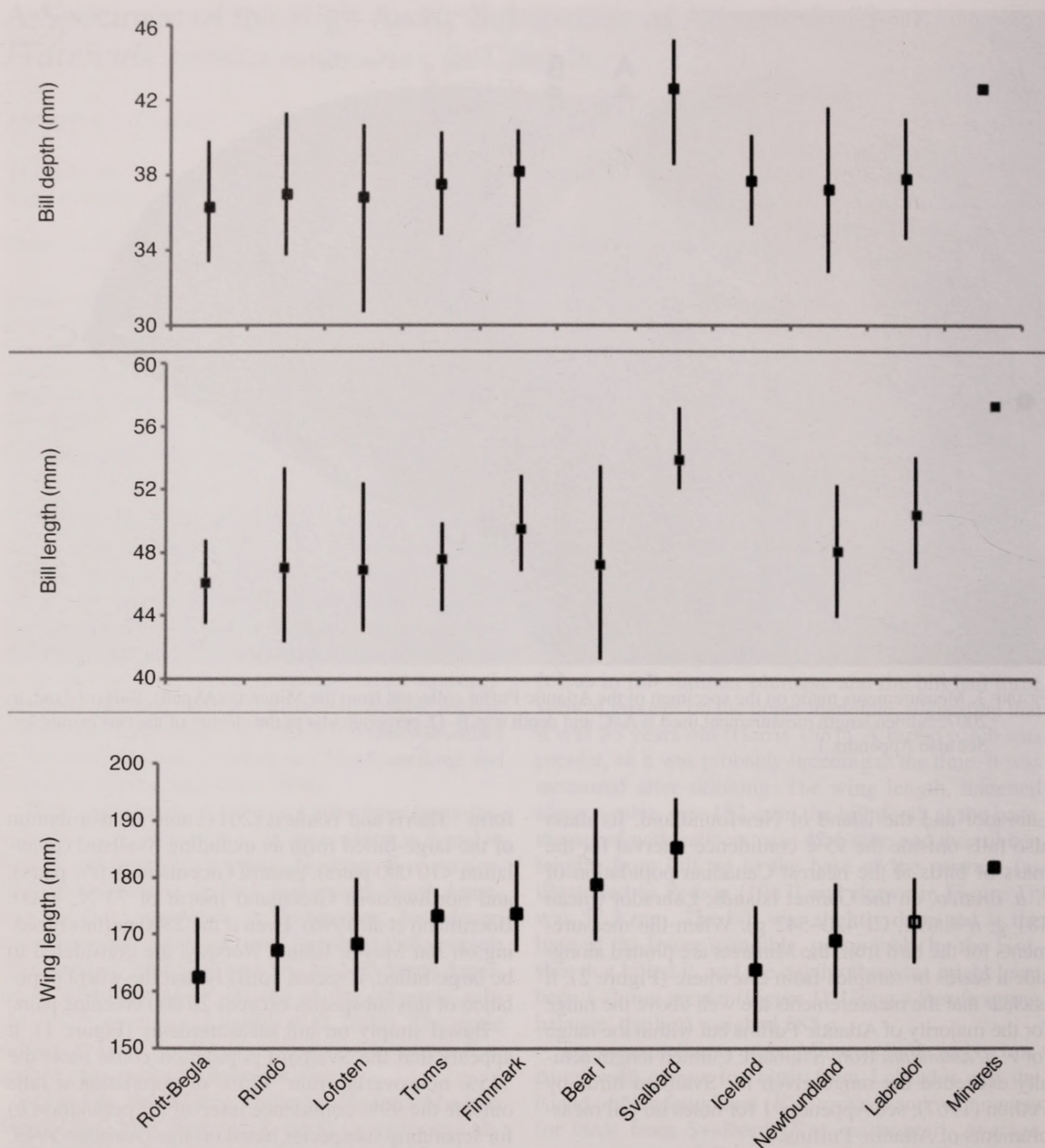


FIGURE 2. Measurements of Atlantic Puffins from five Norwegian localities (Pethon 1967), arranged from south to north (Rott-Begla at 60°N, Rundö, Lofoten, Troms, and Finnmark at 71°N); from Bear Island (Bjørnøya), Svalbard archipelago, Norway (H. Strom, unpublished data); from Spitsbergen, Svalbard archipelago, Norway (Pethon 1967); from Iceland (Petersen 1976); from the island of Newfoundland, Newfoundland and Labrador, Canada (Lowther et al. 2002); and from the Gannet Islands, Labrador, Newfoundland and Labrador, Canada (I. L. Jones, unpublished data). Error bars for all sites from Norway show ranges; error bars for Iceland, Newfoundland, and Labrador show 95% confidence intervals.

and Wanless 2011). If these birds are mainly philopatric, it seems possible that some genetic differentiation could have taken place. Moreover, the distribution and phylogeography of several arctic species suggests the possibility that some may have persisted in refugia in the High Arctic through the last glaciations (e.g., Fedorov and Stenseth 2002). The possibility of such an

origin for large-billed Atlantic Puffins raises the potential of a much deeper phylogenetic separation than would be likely if the differentiation took place post-Pleistocene.

The measurements of the bird collected on the Cumberland Peninsula of Baffin Island in 2007 place it among specimens of the large-billed subspecies, *F.*



*a. naumanni*. The specimen apparently constitutes the first of this subspecies to be collected in Canada. Based on the single specimen collected near Ivujivik in 1980, the small numbers of Atlantic Puffins breeding in Hudson Strait probably belong to the Low Arctic *F. a. arctica*. Hence, the small population at the Minarets, along with a similarly small population on Princess Charlotte Monument, off Coburg Island (at least 14 pairs, presumably of this subspecies; Robards et al. 2000), would therefore represent the only breeding populations of *F. a. naumanni* in North America. There is a possibility that additional breeding locations may be found in the Lancaster Sound/Jones Sound region (Nettleship and Evans 1985; Lepage et al. 1998). However, given the ubiquity of cruise ships, kayak expeditions, and other birdwatching activity in the region, it is unlikely that large numbers remain to be discovered. Consequently, it seems unlikely that the Canadian population exceeds a few hundred pairs, perhaps less than 100. Moreover, if the subspecies constitutes a phylogenetically distinct stock from the rest of the Atlantic Puffins, these small populations may be of some conservation concern. As a High Arctic endemic subspecies with a population of less than 20 000 pairs, it is likely to be vulnerable to the effects of global warming, as well as resource developments increasingly planned for the Arctic (Kelmelis 2011; Parsons et al. 2011). A better understanding of the phylogenetic position of these High Arctic populations of Atlantic Puffins would be highly desirable.

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Appendix 1.

Not everyone measures puffin bills in the same way. The “bill length” given by Moen (1991) differs from the bill length of Pethon (1967). Pethon’s (1967) bill length measurement (= culmen length) is the one used in this paper—it is easier to make on museum specimens. The same measurement is referred to as “bill curve length” by Moen, who cites Corkhill (1972), although Corkhill makes no mention of a bill curve length measurement and instead used line “B” in the diagram below. Bill depth measured by H. Strom at Bear Island, Svalbard archipelago (line C on Figure A1), is not comparable with the measurements of Pethon (1967) or those used here. Likewise, bill length measured in Iceland differs from Pethon’s technique. Consequently, Figure 2 does not include length measurements from Iceland or depth measurements from Bear Island.

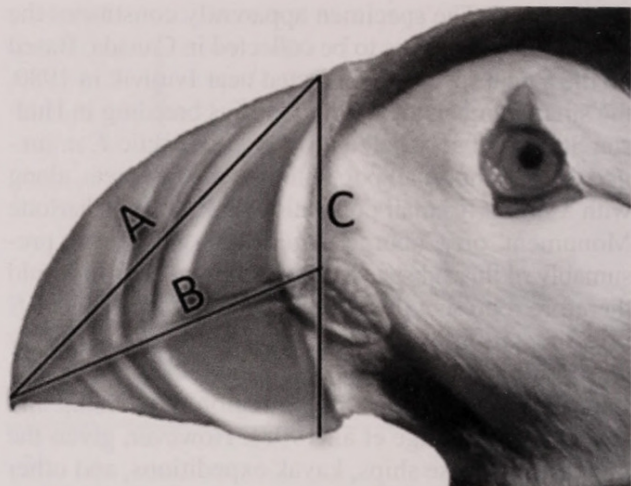


FIGURE A1. Atlantic Puffin bill measurements used in Norway (H. Strom, personal communication). Note difference in bill-depth measurement (line C) from line B–D on Figure 1.



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