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CANADA'S ARCTIC SOVEREIGNTY AND THE NORTHWEST PASSAGE

Donat Pharand

With the thinning and shrinking of the ice pack in the Arctic, there is much debate as to how this could affect Canada's sovereignty in the region. The debate concerns not only the Arctic waters in general and those of the Northwest Passage in particular, but extends to the land areas and their prolongation under the sea. The very concept of sovereignty is being discussed, as well as how to preserve such sovereignty while cooperating with other States.[1]

Although those questions involve rather complex points of international law, the general public – which is becoming increasingly sophisticated – must be informed as accurately as possible about the nature of the legal situation. Because some public statements have been ambiguous as to this situation, the tentative purpose of this paper is to help clarify what the main issues are and suggest how they might be dealt with in international law.

1. THE MEANING OF SOVEREIGNTY

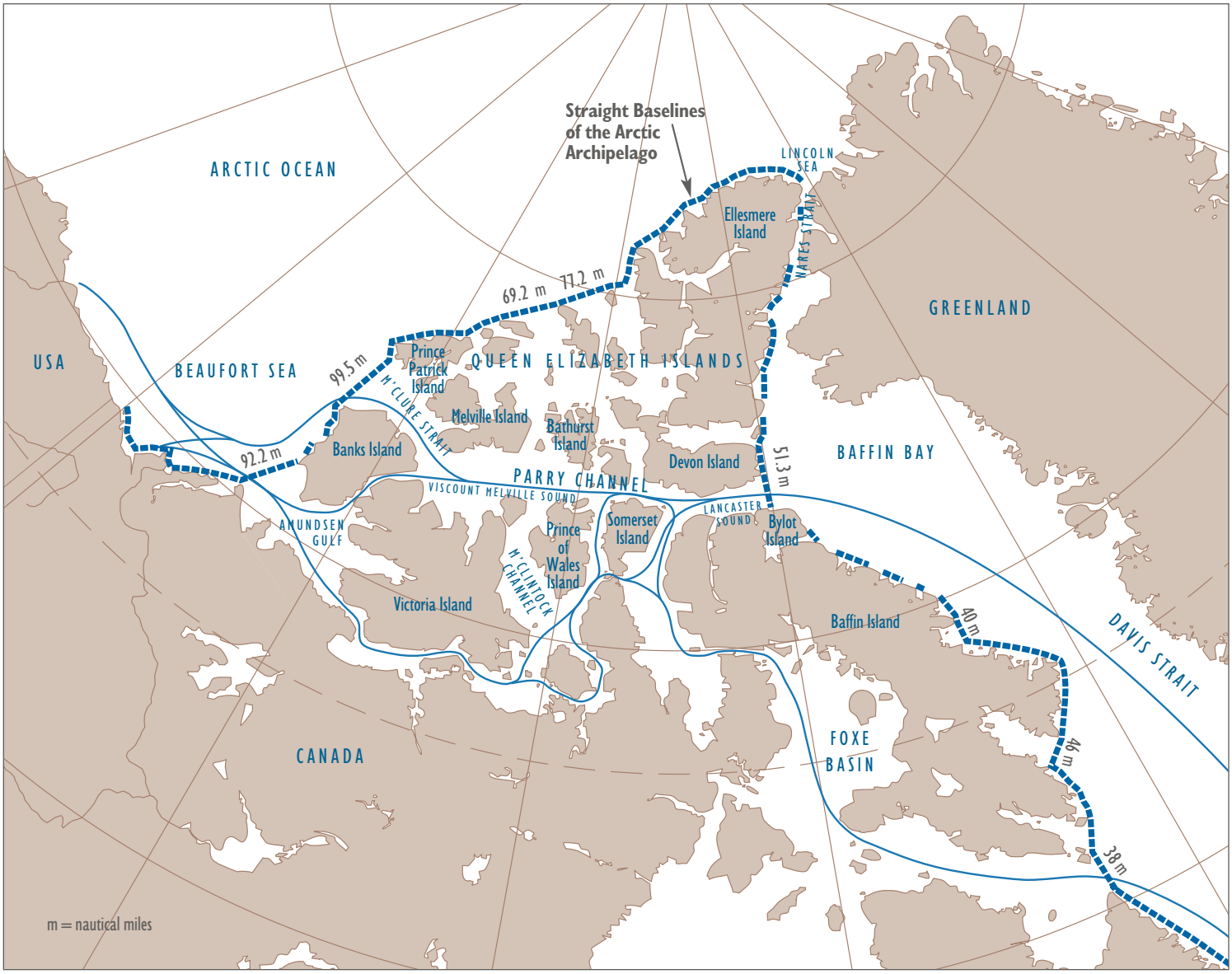
To put it simply, sovereignty is the totality of the various forms of exclusive jurisdiction which a State may exercise within its boundaries. This jurisdiction extends not only horizontally, but also vertically. In the words of the ancient Roman Law, it extends *usque ad coelum et ad infernos.* It is important to note, however, that absolute sovereignty no longer exists in contemporary international law, as it would mean the very denial of an international legal order. Consequently, "the sovereignty of such State is always subject to the supremacy of international law" (UN Declaration of Rights and Duties of States, 6 December, 1949). All UN member States have accepted the sovereignty limitations imposed upon them by the Charter. In addition, States themselves sometimes limit their sovereignty by giving rights to other States, such as the right to fly through their airspace. Sovereignty applies mainly to land, but it may also apply to certain water or sea areas. These areas are called "internal waters".

2. CANADA'S SOVEREIGNTY OVER THE ARCTIC ISLANDS

Since the transfer of title from Great Britain in 1880, Canada's sovereignty over the islands of its Arctic Archipelago has been questioned only twice: once by Denmark and once by Norway. In 1920, the Canadian government requested that Denmark restrain its Eskimos (as they were still known then) from killing muskoxen on Ellesmere Island because it feared their extinction. The Danish government stated in its reply that it thought it could

1 For a more complete treatment of this question relating to the Arctic Waters, see the writer's article, "The Arctic Waters and the Northwest Passage: A Final Revisit". 38 *Ocean Development & International Law,* 3–69 (2007).

Canada



Main routes of the Northwest Passage

subscribe to the view, expressed by the Danish explorer Rasmussen, that Ellesmere Island was "no man's land". This resulted in an appropriate communication being sent to Denmark by Great Britain, on behalf and at the request of Canada, and Denmark did not pursue the matter. (The present minor dispute with Denmark over a rock of about 1.3 sq. km, known as Hans Island, located in the middle of Nares Strait between Ellesmere Island and Greenland, is completely outside the Archipelago.)

As for Norway, the problem related to the Sverdrup Islands, west of Ellesmere, which had been explored by its national, Otto Sverdrup. A reservation of rights over the islands was expressed, in 1928, in a letter by the Norwegian consul in Montreal. Talks between Canada and Norway ensued and resulted in Canada paying a modest sum to the widow of the Norwegian explorer, representing the expenses for his scientific research on the islands. The matter was closed by an Exchange of Notes in August 1930, whereby Norway recognized Canada's sovereignty over the islands.

Since 1930, no State has ever challenged Canada's complete sovereignty over any of the islands of the Canadian Arctic Archipelago.

3. CANADA'S "SOVEREIGN RIGHTS" OVER THE ARCTIC CONTINENTAL SHELF

The continental shelf of a State "comprises the sea-bed and subsoil of the submarine areas ... throughout the natural prolongation of its land territory" under the sea (Law of the Sea Convention, 1982, Art. 76). The coastal State does not have sovereignty over the continental shelf, but only "sovereign rights for the

purpose of exploring it and exploiting its natural resources" (Art. 77). The absence of sovereignty in the full sense means that the legal status of the superjacent waters and air space is unaffected, and the freedom of navigation continues to apply. Nobody disputes these sovereign rights but Canada, like many other States, has delimitation problems with its neighbours. These problems are of two kinds: lateral and seaward.

Canada has lateral delimitation problems with its two adjacent neighbours: the United States (Alaska) in the Beaufort Sea, and Denmark (Greenland) in the Lincoln Sea. The law governing delimitation between States with opposite or adjacent coasts simply provides that "the delimitation ... shall be effected by agreement on the basis of international law ... in order to achieve an equitable solution" (Art. 83). If no agreement is reached, an international tribunal will decide on the basis of a number of equitable criteria and methods. These have been developed by the International Court of Justice and special arbitral tribunals, and are still being developed as new cases are decided. Among the many criteria and methods already accepted are the following: the general direction of the coast, special configurations (convexity, concavity, exceptional projections), length of the coast, equidistance, historic usage, geological data, and off-shore islands.

In the Beaufort Sea, the Canadian position is based mainly on historic usage of the 141st meridian, provided for in the 1825 Convention of St. Petersburg between Russia and Britain, to delimit the land boundary between what are now Alaska and the Yukon. The delimitation of the continental shelf would follow the 141st meridian, and Canada invokes the notorious and long-time use of that meridian for various legislative and administrative purposes in support of its position. Whether this historic usage is such as to place the United States in a situation of acquiescence remains a question. The United States proposes a line based on the equidistance method, beginning at the termination of the land boundary, taking advantage of the concavity of Canada's coast. Such special configuration has been held in a number of decisions to disqualify a delimitation based on a strict application of the equidistance method. As is often the case, the eventual delimitation line will probably be situated somewhere between the lines advocated by the Parties.

In the Lincoln Sea, Canada and Denmark have agreed to use the equidistance method, but there is a slight disagreement as to the precise positioning of certain straight baselines. In particular, Canada objects to Denmark using a few small islands in the Lincoln Sea (in particular Beaumont Island) as base-points for the baselines, which has the effect of pushing the equidistance line on the Canadian side. It seems, however, that there are two relatively small areas in dispute, each slightly more that 30 square nautical miles, and the two countries might well agree on an eventual adjustment of the equidistance line.

Canada has a seaward delimitation problem in the Lincoln Sea and, possibly, in the Beaufort Sea. The seaward limit of the continental shelf is defined as being "200 nautical miles from the baselines from which the territorial sea is measured" or beyond, to the outer edge of the continental margin as determined mainly by the thickness of sedimentary rocks. Should it turn out that the Lomonosov Ridge crossing the Arctic Basin is a geological continuation of the land mass in the Lincoln Sea, there would be a three-way delimitation problem between Russia, Denmark and Canada. The last two countries are cooperating closely to determine if the Ridge is a geological continuation of their landmass. There is also a possibility of a similar natural prolongation beyond 200 miles in the Beaufort Sea. This would bring another three-way problem, this time between Russia, the United States and Canada. At the moment, the three States are preparing the submission of their claim to a special Commission on the Limits of the Continental Shelf, as provided in the Law of the Sea Convention (Art. 3, Annex II).

4. CANADA'S SOVEREIGNTY OVER THE ARCTIC WATERS

There are two possible legal bases for Canada's claim of sovereignty over the waters within its Arctic Archipelago: an historic title and straight baselines, both resulting in internal waters. Canada has chosen to rely on an historic title and draw straight baselines around the Archipelago to delimit the extent of historic waters.

(1) Historic Waters

The requirements for the acquisition of an historic title, resulting in maritime sovereignty, are similar to those pertaining to territorial sovereignty: exercise of exclusive State jurisdiction, long usage, and acquiescence by foreign States, particularly those whose interests are primarily affected. The burden of proof for such title is a heavy one, since it represents an exception to the status which the waters in question would normally have. Without an historic title, they would be territorial waters, exclusive economic zone, or high seas.

After a thorough study, including an examination of the journals and reports of British explorers at the Scott Polar Institute in Cambridge, this writer strongly believes that Canada cannot discharge its heavy burden of proof. Neither British nor Canadian explorers have ever taken possession of any part of the Arctic waters, especially not those of the Northwest Passage. In addition, as soon as Canada delineated its claim of historic waters, by drawing straight baselines around the Archipelago in 1985, the United States and Member States of the European Union sent Notes of protest. These Notes object both to the claim of historic waters and the validity of the straight baselines.

(2) Straight Baselines

The purpose of straight baselines is to enable a coastal State with the required geography to measure its territorial waters from those lines instead of following the sinuosities of the coast. The rules governing the use of straight baselines were first formulated by the International Court of Justice in the *Fisheries Case* of 1951. Similar rules were then incorporated in the 1958 Territorial Sea Convention (Art. 3) and retained in the 1982 Convention on the Law of the Sea (Art. 5). Not being a Party to either of those Conventions, Canada established its Arctic straight baselines in September 1985 (*see map*), shortly after the passage of the *USCGS Polar Sea,* and it did so under the customary law of the *Fisheries Case.* In that case, the Court held that straight baselines could be used "where a coast is deeply indented and cut into, as is that of Eastern Finmark, or where it is bordered by an Archipelago such as the 'skjaergaard' along the western sector of the coast" of Norway.

In addition to having the required geography to use the straight baseline system, Canada can invoke, as was done in the *Fisheries Case,* "certain economic interests peculiar to a region, the reality and importance of which are clearly evidenced by a long usage". The Court allowed Norway to rely on the traditional fishing rights, reserved to its local inhabitants in certain large basins, to support the validity of their enclosure by straight baselines. Similarly, Canada can invoke the vital needs and economic interests of its Inuit population. In particular, these interests may be relied upon to reinforce the validity of the baselines across Lancaster Sound, on the east side of the Archipelago, and Amundsen Gulf, on the west side. It is well established that the Inuit have been fishing, hunting and trapping in the waters and on the ice of most of the Archipelago for some 4,000 years. These vital historic rights and interests can surely be relied upon to consolidate Canada's title to the enclosed waters. It is important to note that the straight baselines having been established under the *Fisheries Case,* the enclosed waters are not subject to the right of innocent passage, as they would have been under the Conventions of 1958 and 1982. In 1985, Canada was not bound by either of these Conventions for two reasons: first, the right of innocent passage provision in the 1958 Convention had not become part of customary international law due to the absence of a sufficiently general and uniform State practice; and second, the equivalent provision of the 1982 Convention did not become binding on Canada until it became a Party to that Convention in 2003, nearly 20 years after drawing its baselines. Finally, it should be emphasized that neither the Court nor the Conventions have imposed limits on the length of the lines. It is this writer's firm opinion that Canada's straight baselines fully meet the legal criteria for their international validity.

5. CANADA'S SOVEREIGNTY OVER THE NORTHWEST PASSAGE

Canada and the United States maintain diametrically opposed views on the legal status of the Northwest Passage. Canada considers the Passage as a national sea route, in the same way as Russia views the Northeast Passage or Northern Sea Route, requiring its consent for foreign use. The United States considers the Passage as an international strait, in which the new right of "transit passage" applies. This right is one of freedom of navigation and overflight, virtually as on the high seas. It may be exercised by *all ships,* including warships in general and submarines in particular, *in their normal mode of navigation.*

Following the *Polar Sea* incident of 1985, when the United States refused to ask permission for its westerly crossing, the two countries concluded a Cooperation Agreement in January 1988. It provides for Canada's prior consent, but it has two important limitations: first, it applies to icebreakers only and, second, it does not change the respective legal positions of the Parties. The difference of opinion is caused by the complete absence in the 1982 Convention of any definition of a strait "used for international navigation". Consequently, one must look to the two criteria applied by the International Court in the *Corfu Channel Case* of 1949. The first or geographic criterion simply requires that there be an overlap of territorial waters. This was the case in Barrow Strait of the Northwest Passage before 1985 and, according to the United States, is still the case today. The second is a functional criterion, namely that the strait has been a "useful route for international maritime traffic". In that case, the Court found that the Corfu Channel had been a very useful route for seven States and had seen some 2,844 crossings over a 21-month period, counting only ships which had put in port and had been visited by customs. In other words, the actual use had been quite extensive.

Since its first crossing by the Norwegian herring boat *Gjoa* in 1903–06, the various routes of the Northwest Passage (*see map*) have seen only a total of 69 complete transits by foreign ships. The transits are comprised of the following: 20 by pleasure craft, 2 (a return trip) by the *S/T Manhattan* in 1969, 18 by icebreakers, and 29 by passenger ships[2]. Except for the *Polar Sea* in 1985, all icebreakers and passenger ships obtained prior clearance and authorization. As for the *Manhattan* voyage, it took place before Canada extended its territorial sea from 3 to 12 miles, and there was still a strip of high seas in the main straits (Parry Channel) of the Northwest Passage. Given the control exercised by Canada over the foreign transits and considering the small number of commercial ships involved, it is

2 These numbers are valid up to 2006, but they have not changed appreciably since.

evident that *the Northwest Passage has not had a history as a useful route for international maritime traffic and cannot be presently classified as an international strait.* The position of the United States is obviously based on a criterion of potential use rather than one of actual use. However, a sufficient degree of actual use might still develop.

6. POSSIBLE INTERNATIONALIZATION OF THE NORTHWEST PASSAGE AND PREVENTIVE MEASURES

Because of the remoteness of the region and the difficulties of navigation, comparatively little use for international navigation might be sufficient to make the Northwest Passage an international strait. It has already been recognized by the Permanent Court of International Justice in the *Eastern Greenland Case* of 1933 that the application of general principles of law in the Arctic regions must take into account special local conditions such as the difficult accessibility of the region. While it would probably be to Canada's advantage to eventually open the Passage for foreign navigation, such navigation must be under Canada's full control in order to adequately protect certain fundamental national interests. These are: the exceptionally fragile nature of the marine environment and ecosystem, the Inuit of the region and their traditional way of life, and the general security of the remote and immense region.

Numerous suggestions have been made to improve Canada's capability to exercise effective control of the Northwest Passage. What follows are ten suggestions, some of which are absolutely vital to ensuring the effectiveness of Canada's control.

1. The traffic system called NORDREG, encouraging foreign ships to request permission to proceed in Canada's Arctic waters, should be compulsory as soon as possible (*Note:* Prime Minister Harper's announcement on 27 August 2008 sets no date to make it compulsory).
2. At least one Polar class icebreaker should be acquired, enabling Canada to operate year-round in all its safety control zones, including M'Clure Strait.
3. A full range of sea- and land-based services should be developed to ensure safe navigation in the Northwest Passage.
4. Canada's RADARSAT-2 should be kept Canadian and under Canada's full control.
5. A submarine detection and control system should be installed at the main entrances of the Passage.
6. The number of Canadian Rangers should be increased and their training and equipment improved.
7. Inuit should be recruited for the Coast Guard to benefit from their unique knowledge of the Arctic region.
8. A year-round search and rescue capability should be developed, as air and sea traffic increases.
9. A deep-water seaport should be built at Iqaluit, as requested by the Inuit for a long time, adequate to accommodate large vessels.
10. Last, but not least, Canada should take steps to negotiate what could be called a transit agreement with the United States as soon as possible. Under such an agreement, the United States would recognize Canada's sovereignty over the waters of the Archipelago, including those of the Northwest Passage, in return for which Canada would recognize a right of transit for American merchant ships and icebreakers, under stipulated conditions to ensure the protection of Canada's marine environment and related interests. As for the exceptional passage of warships and submarines, they would need special authorization or would be provided for in Canada/US defence arrangements. Such a transit agreement might well prove possible, as the United States must realize that Canada's exclusive control of all the waters of its Archipelago could constitute an important contribution to the fight against international terrorism. Otherwise, *a virtually unrestricted freedom of navigation, which applies in an international strait (as the United States considers the Northwest Passage to be), could well bring dangerous visitors and catastrophic consequences for either or both countries.*

7. CANADA'S COOPERATION WITH OTHER ARCTIC STATES

Among the many challenges posed by foreign shipping in the Northwest Passage, two are of paramount importance: the protection of the marine environment and the safety of navigation. Measures to meet those challenges have already been the subject of circumpolar cooperation, particularly through the Arctic Council which Canada helped establish in 1996. The Council has recently adopted an Arctic Marine Strategic Plan to protect the marine environment, and is presently preparing an Arctic Marine Shipping Assessment. In addition, Arctic States have been working on comprehensive guidelines for ships operating in Arctic ice-covered waters. These could go a long way to help Canada enforce its Arctic shipping regulations under the Arctic Pollution Prevention Act adopted in 1970. Canada has played a leading role already in these two vital areas in cooperation with other Arctic States. It should continue to do so, while at the same time adopting and enforcing measures necessary to exercising full control over the Northwest Passage.

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THE STRUGGLE FOR EXISTENCE IN A WORLD OF CLIMATE CHANGE: A DARWINIAN PERSPECTIVE ON THE TUNDRA OF NORTHERN CANADA

Charles J. Krebs

Figure 1
Slumping of coastal tundra on Herschel Island, north Yukon, due to permafrost melting. The slump is about 200 m across and is underlain by an ice wedge. Photo: Chris Burn.

The 150th anniversary of the publication of Charles Darwin's *Origin of Species* provides an opportunity to reflect on one of his famous quotations:

> ... as more individuals are produced than can possibly survive, there must in every case be a struggle for existence, either one individual with another of the same species, or with individuals of distinct species, or with the physical conditions of life. (p. 78)

I address here how the struggle for existence might play out in the tundra ecosystems of northern Canada in an era of rapid climate change. Darwin of course said nothing in his books about climate change and he was never privileged to visit arctic areas. But his ideas do help point the way to understanding what might happen and what we need to know as these events unfold.

Ecology is the science of the struggle for existence, and although the term was not yet invented at the time the *Origin* was published, much of Darwin's writing was ecological. Ecology works in two time dimensions, ecological time and evolutionary time. The ecological time scale is months and years, while the evolutionary time scale typically operates in thousands of years. Climate change in the past has for the most part moved slowly over evolutionary time, but now we face rapid climate change in ecological time, and we need to explore its consequences for Canada's Arctic.

I will not review the evidence that already exists for rapid climate change in northern Canada. The northern Yukon and Alaska have been the global "hot spot" for increases in average temperatures of 3°C or more during the last 35 years. The result is highly visible in melting permafrost along the Yukon north coast (Figure 1). But moving from these temperature rises to assessing biological consequences is far from easy. Partly this is due to the simple fact of adaptation in arctic animals, a consequence of natural selection over long time periods in the past. None of the terrestrial vertebrates of northern Canada will be directly incapacitated by rising temperatures or by changes in rainfall. What will affect them are the changes in their habitats, including their food organisms, their competitors and predators, and their diseases. The key question we have to ask is what are the habitat requirements of northern animals, and how will these habitats change as the climate shifts. The time frame for answering these questions is currently restricted to the 50–100 year range, since further climatic change beyond 2100 depends much on human decisions about greenhouse gases.

The polar bear is the iconic animal of the North and much has already been written about its predicament in an era of global warming. It is also a simple case because it is a predator largely dependent on seals for food, and the seals in turn depend on sea ice for their habitat. So polar bears are sea ice dependent, and if you can predict the extent of sea ice in summer and winter, you can make a strong case for how polar bear numbers will change with climate change. The prognosis is not good, and southern populations in Hudson Bay will be lost. Northern populations will be much reduced in numbers but will not go extinct in this time frame.

The principle illustrated for polar bears can be applied to all of the animals and plants of the tundra. First, get a good description of the species ecological requirements, its habitat. Second, estimate how these habitats will change as the climate shifts. And finally, be on the lookout for changes that look to be of minor significance at present but might grow in importance in a warmer world.

To follow this outline we can next consider the grizzly bear. Grizzly bears differ dramatically from polar bears because they are omnivores and will eat almost anything (Figure 2). On the Pacific Coast grizzlies obtain much of their food from salmon. In the interior of the continent berries and other plants become much more important in the diet. The grizzly is adaptable, and has relatively little to fear from climate change. Threatening processes for grizzlies are more to do with human hunting and other human conflicts than with climate change.

Caribou are a dominant herbivore of tundra areas, and occur as two major groups – Peary caribou in the High Arctic and barren ground caribou of mainland tundra areas. The barren ground caribou population is broken up into herds that occupy relatively distinct parts of the Arctic, and they occur in large numbers across much of the tundra[1]. Caribou are strictly herbivores, and their numbers appear to rise and fall in what might be 50–70 year cycles. At the present time caribou numbers across northern Canada are declining. For example, the Bathurst herd in the central Canadian Arctic has been declining about 6% per year for the past 20 years (Figure 3). Many of the other caribou herds have little or no census data available. The reasons for population decline in barren ground caribou are still not clear, but the main threatening processes are wolf predation, overhunting, food shortage, and industrial development. Climatic factors affect access to winter and spring food supplies because of deep snow and ground icing, but it is not known quantitatively how important any of these factors are. One concern is that lichens in the Canadian North are being replaced by vascular plants as the climate warms, and caribou may be losing an important winter food. At present we do not know the scale or the rate of these plant community changes, which limits our ability to understand and predict possible trends. Until the

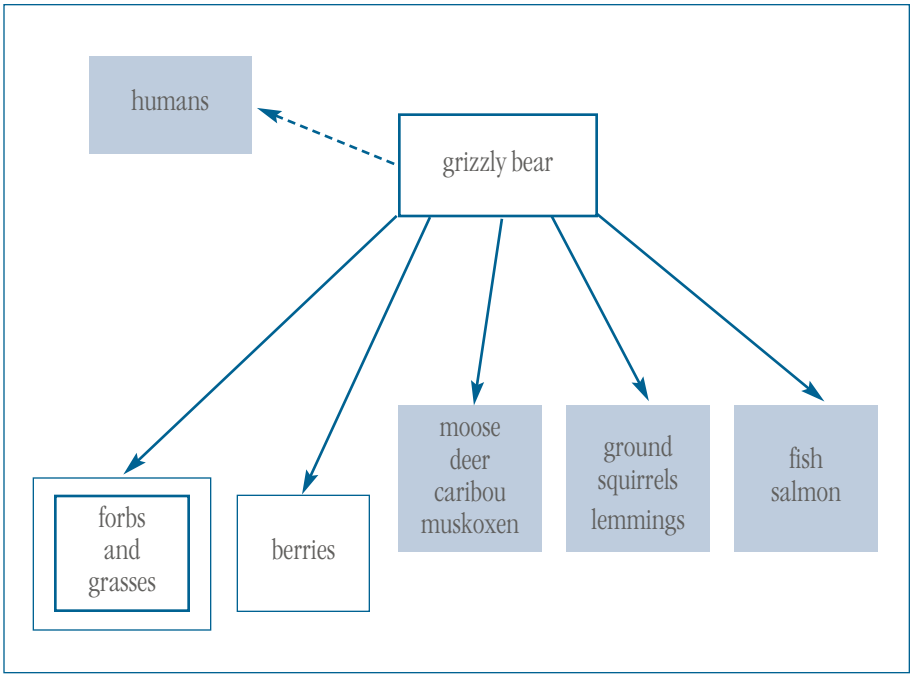
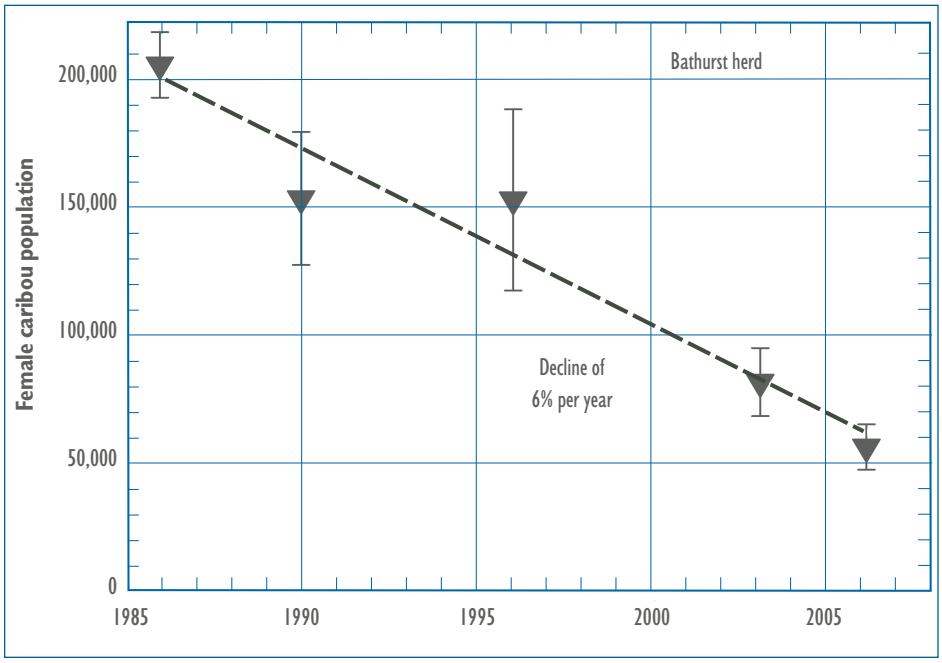


Figure 2
A simplified food web for grizzlies in northern Canada. Except for humans, grizzlies are top predators in the food chain with no enemies.

Figure 3
The decline of the female portion of the Bathurst barren ground caribou herd since 1985, as estimated from aerial surveys. (Data from Nishi *et al.*, 2007.)



1 See *Northern Perspectives*, 31(1) Spring 2007 for a detailed discussion of caribou (www.carc.org).

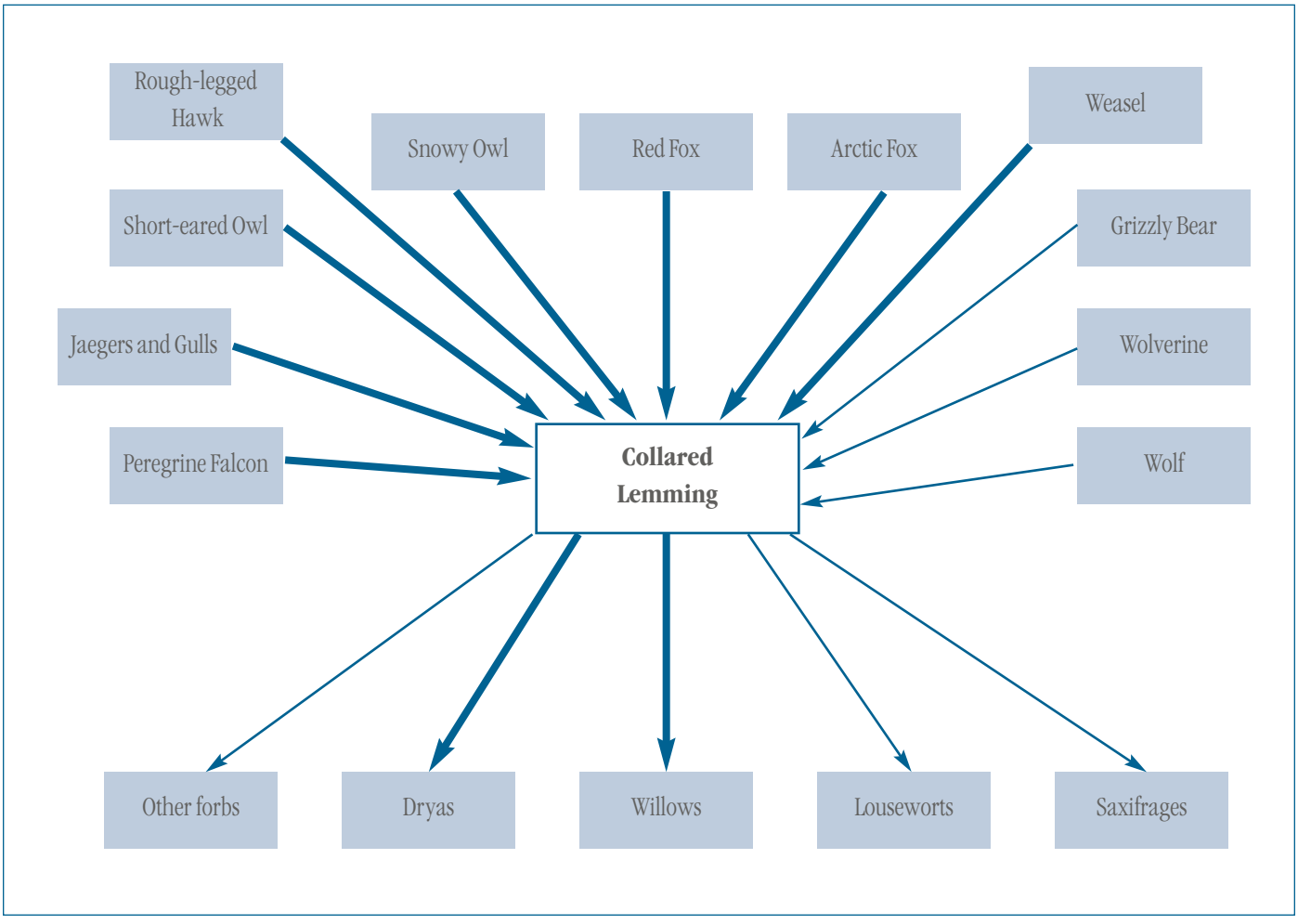
mechanisms behind the population changes are clear, management actions can only operate under the precautionary principle, and thus recommendations to reduce the harvesting of caribou by hunters have been nearly universal.

Peary caribou are a special subspecies of small-bodied caribou that inhabit the arctic islands. They have been declared an endangered species in Canada. Census data for many of the subpopulations of Peary caribou are non-existent. Their numbers on the Queen Elizabeth Islands declined from about 26,000 in the 1960s to about 3000 recently due to a combination of climatic events and overharvesting by hunters (Miller, 2007). Peary caribou are particularly susceptible to ground icing in autumn when freezing rain prevents access to the lichens which are their main winter food. Low populations are also easy to overharvest, and to protect any endangered species hunting must be restricted. It is somewhat ironic that Peary caribou are the most threatened species in northern Canada yet most Canadians would not know this and are more concerned about polar bears. Climate change will have a severe impact on Peary caribou if ground icing becomes more frequent in warm autumn weather.

Muskox populations in northern Canada were severely reduced in the 1800s because of overharvesting for hides and meat, and they were protected in 1917 by the Canadian government. But the decline from harvesting continued until the 1950s when only about 1000 animals remained, and more complete protection was achieved. Since that time muskox have been increasing and spreading throughout the central Arctic, so that they are no longer under threat. At the present time there appear to be no serious threatening processes for muskox, but increased harvesting could become a repeated threat if not controlled.

While most Canadians would nominate the polar bear or caribou as the icon of the tundra regions of the North, many biologists would nominate lemmings as one of the key players in these northern ecosystems. Two lemmings occupy the North, the collared lemming, which turns white in winter, and the brown lemming. Both of them are herbivores, and are active all year round. Major population growth can result from winter breeding under the snow. They are key players in northern ecosystems because virtually

Figure 4
A simplified food web for collared lemmings in northern Canada. Nearly every predator in the arctic eats lemmings for all or part of its diet. Colllared lemmings in turn rely on a variety of green plants for summer and winter forage. The larger the arrow, the more important the food link.



all the predators of the North live on lemmings (Figure 4). (The polar bear is the single exception.) Grizzly bears regularly dig out lemmings in summer, an almost comic event. The numbers of lemmings tend to rise and fall in 3–4 year cycles, and this boom-bust system causes the numbers of their predators – arctic foxes, weasels, snowy owls, jaegers, other raptors – to also rise and fall in synchrony. So in some sense as the lemming goes, so goes a large part of arctic vertebrate predator populations.

Snow is an important habitat component for lemmings because it insulates them from extreme temperatures and partly protects them from some predators. Lemmings are under a single threat in the Canadian North – ground icing in autumn and spring, and in this way are similar to the Peary caribou. Freezing rain can cut off all access to the basal parts of forbs, grasses and sedges that lemmings eat in winter, and cause starvation. There is no sign yet that this is happening on a large enough scale to affect the overall abundance of lemmings but this kind of effect needs careful monitoring. Shorter, warmer winters increase the possible frequency of freezing rain in the Arctic. At present we have no good methods of mapping ground icing in lemming or caribou habitat except by the laborious process of digging snow pits. If we could map these events from satellite information this would give a gigantic boost to investigate the impact on populations.

Lemmings, caribou and muskoxen are dependent on their food plants, and as the Arctic warms, its vegetation zonation will progressively march north. The boreal forest will expand to occupy the southern areas of the tundra, and the low arctic tundra will encroach on the mid- and high-arctic vegetation zones. Southern species will have more habitat available and northern species like lemmings will have less habitat, so that overall their global populations must decline. No one thinks that lemmings will become threatened by these changes, and smaller species will typically be easier to conserve than wide ranging species.

Shrub growth has been increasing across the southern parts of the tundra over the past 50 years. Photographic evidence of an increase in the growth of willows and dwarf birch in Alaska has shown a slow increase in willow cover over about 50–60 years (Tape *et al.,* 2006). These changes in shrub growth have been relatively slow, and there is much speculation about the impact that shrub growth will have on arctic ecosystems. Post and Petersen (2008) for example reported an experiment showing that enhanced warming would increase willow and birch shrub growth as predicted, but if herbivores such as caribou and muskoxen were allowed to be present, this enhanced growth was eaten so that the plant community did not change as expected. The key point is that changes in tundra ecosystems will not be simple, and plant-herbivore and predator-prey interactions may negate or even reverse simple predictions made from temperature and rainfall measurements.

What would Darwin say to all of this? Clearly natural selection acting over thousands of generations has produced a fauna and flora in Canada's North that is highly adapted to a changeable climate. If the current climate change were operating slowly, further adaptation could occur. But change now is moving very rapidly, and there is genuine concern that evolution cannot keep up. It is clear from our discussions that arctic animals and plants are not just reacting to changes in climatic variables but also to changes in plant-herbivore dynamics and predator-prey dynamics. Adaptation is constrained by generation time and by the availability of genetic variation for any particular trait. We have virtually no information for arctic vertebrates about levels of genetic variation for any trait whatever. For many of the threatening processes in the Canadian Arctic no adaptation is possible. We cannot select polar bears for resistance to overharvesting, or ringed seals that do not require sea ice for birthing, or caribou that can somehow obtain food through ground ice. There is a limit to adaptation, and the current array of threatening processes in tundra is not a simple issue of animals and plants becoming adapted to warmer temperatures. I have not discussed other threats of newly emergent diseases, increased insect harassment, added pollutants, and industrial development in the North.

The simple idea that we can understand the ecological impacts of climate change in the North by measuring temperature and rainfall must be abandoned. Virtually all our northern animals are well adapted to changes in temperature and rainfall, and these direct effects are not the important ones. The key must be to understand how changes in climate change plant communities, feeding opportunities, and predator-prey interactions. Tracing the chain of biological interactions that flow from climate change is the challenge for the North. We can start this process by constructing the details of food chains, as illustrated in Figures 2 and 4. We then need precise experiments to understand linkages in food chains. If one plant species is removed from a community, how do the other species respond? Do new species invade, or do the remaining species expand their dominance? If red foxes replace arctic foxes on the tundra, what are the consequences for the prey species? These and many other studies are an illustration of the details we need to understand to put arctic climate change into a biological framework.

Three recommendations flow from these analyses. First, we cannot predict the effects of climate change for tundra plants and

animals at present, and consequently we need careful year-by-year monitoring of the abundance of key species in the Arctic so that we have a maximum amount of time to detect detrimental trends in populations. Second, we should not assume that rapid Darwinian evolution will overcome our insults to northern ecosystems so that nothing will be affected by human actions involving industrial development or harvesting. An assumption of ecosystem resilience via Darwinian selection should not be used as an excuse for causing ecological harm. Third, we need much more detailed study of the biological interactions that structure northern ecosystems so we can understand what is happening now and how it will play out in the future. There is much to do.

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THE INUIT LANGUAGE IN CANADA: PERSPECTIVES FOR THE TWENTY-FIRST CENTURY

Louis-Jacques Dorais

It is often said that only three Canadian aboriginal languages have a good chance of surviving the next few decades: Cree, Ojibway, and Inuktitut. In the foreseeable future, the reasoning goes, the relatively high number of speakers of these languages will prevent their suffering the fate of most other Canadian indigenous languages – a more or less rapid decline, followed by complete disappearance for some. How true is this for the third language in the list, the Inuit language?

Canada Census data for 2006 are encouraging at first glance. Nearly two thirds (65%, or 32,965 individuals) of 50,480 people surveyed who identified themselves as Inuit, claimed as their mother tongue one of the major Inuit-language dialects: Inuvialuktun (in the Inuvialuit Region, Northwest Territories), Inuinnaqtun (in western Nunavut) or Inuktitut (central and eastern Nunavut; Nunavik [Arctic Québec]; Nunatsiavut [Labrador]). A closer look, though, reveals that the percentage of speakers varies significantly from one region to another. It is also much weaker among Inuit migrants to southern Canada – about 19% of the total – than among those still occupying *Inuit Nunaat* (the Inuit homeland).

Table 1, which displays the number and percentage of people of Inuit-language mother tongue in each province and territory, shows this clearly. In those provinces where the Inuit population consists only of migrants, as well as in the Yukon, less than one-quarter declaring Inuit origin in 2006 claimed their ancestral language as mother tongue. Prince Edward Island is the exception, but too few Inuit live there to give the data any statistical value.

Two provinces and two territories lie partly or entirely within Inuit Nunaat: Québec, Newfoundland and Labrador, the Northwest Territories, and Nunavut. In Quebec and

Nunavut, the proportions of those with Inuit-language mother tongue – 89% and 84% respectively – are very high, suggesting the language is doing well on its home turf. In contrast Newfoundland and Labrador (14%) and the Northwest Territories (19%) appear to be heading in the opposite direction. Why is this so?

In Nunatsiavut (Labrador), mission schools began teaching in Inuktitut at the end of the 18th century. The arrival of hundreds of European colonists, followed by forced anglicization in 1949 when the Newfoundland government took over the schools, brought the early appearance of Inuktitut-English bilingualism. Since the 1960s Inuktitut has been deteriorating rapidly there. Among the Inuvialuit of the Northwest Territories similar factors – the presence of Euro-Canadian trappers and the establishment of residential schools in the first quarter of the 20th century – produced similar results: generalized bilingualism followed by near-total disappearance of the ancestral language. Does a similar fate threaten the Inuit dialects that were still strong in 2006?

Table 2 lists in detail the number and percentage of persons with Inuit-language mother tongue living in Inuit Nunaat in 2006, for each of the ten main dialects of the Canadian Arctic. It shows that the proportion of speakers varies from one dialect to another: from 18% among those of Inuvialuktun mother tongue to 99% for those who speak the Inuktitut of North Baffin or Nunavik (Arctic Quebec). Generally, the percentage of speakers rises as you move from west to east. The Nunatsiavut dialect of Labrador, at the southeast end of the Canadian north, is the exception, for here the proportion of mother-tongue Inuktitut speakers attains only 20%. Note, however, that this is clearly higher than the percentage of Inuit-language speakers across the province of Newfoundland and Labrador (14%). The percentage of speakers is also higher in Nunavik (99%) than in the province of Quebec as a whole (89%), which is correspondingly true for all of Inuit Nunaat (79%) versus Canada as a whole (65%). This confirms the superior strength of language in its original territory as compared with the rest of the country.

While dialects such as Uummarmiut, Siglit, Inuinnaqtun, and Nunatsiavut are declining, the status of Inuktitut seems good. Spoken by 87% of the population of eastern Inuit Nunaat (92% if Nunatsiavut Inuktitut is ignored), the language seems to have a secure future. The absolute number of maternal-language individuals has increased according to the most recent censuses, indicating that this dialect is still transmitted to children as a first language. For all Inuit dialects, the proportion of speakers went from 69% to 65% between 1991 and 2006, a minimal decline.

So is all going well for Inuktitut? Perhaps not. The 2006 census contains some other figures worth considering. While it is fine to have Inuktitut as a mother tongue, you still have to use it from time to time. This is understandably not always easy at work, where the language of managers, some employees, and communication with the outside world is often English (and occasionally French in Nunavik). In the confines of one's home, however, nothing should prevent using the native language, except in a few cases where one spouse happens to be Euro-Canadian. But, as Table 3 shows, the language usually spoken at home is not always Inuktitut. While in Québec 95% of Inuit mother-tongue individuals normally speak it at home, this is true for only 77% of Inuit speakers in living in Nunavut. Elsewhere the percentages are much lower. For all of Canada they are under 80%.

Table 1
Persons of Inuit origin and mother tongue[1]

Political division	*Inuit (number)*	*Inuit mother-tongue speakers*	
		Number	*Percentage of speakers*
Newfoundland and Labrador	4,715	655	14%
Prince Edward Island	30	15	50%
Nova Scotia	325	15	5%
New Brunswick	185	10	5%
Quebec	10,950	9,740	89%
Ontario	2,035	425	21%
Manitoba	565	140	25%
Saskatchewan	215	50	23%
Alberta	1,610	180	11%
British Colombia	795	115	14%
Yukon	255	60	24%
Northwest Territories	4,160	800	19%
Nunavut	24,640	20,760	84%
Canada	**50,480**	**32,965**	**65%**

Data from the Census of Canada, 2006.

1 This table and the following ones are adapted from a book to be published in 2009: Dorais, Louis-Jacques, *The Language of the Inuit: Syntax, Semantics and Society in the Arctic*. McGill-Queen's University Press, Montreal.

Table 2

Persons of Inuit origin and mother tongue (by dialect) living in *Inuit Nunaat* in 2006

Dialect	*Number of persons with dialect as their ancestral language*	*Actual number of speakers*	*Percentage of speakers*
Uummarmiut	690	122	18%
Siglit	1,690	310	18%
Total, Inuvialuktun	**2,380**	**432**	**18%**
Inuinnaqtun	2,775	1,010	36%
Total, Inuinnaqtun	**2,775**	**1,010**	**36%**
Natsilingmiutut	2,730	1,815	66%
Kivalliq	4,170	3,735	90%
Aivilik	2,990	2,655	89%
North Baffin	5,215	5,170	99%
South Baffin	6,600	5,975	91%
Nunavik	10,350	10,215	99%
Nunatsiavut	2,535	505	20%
Total, Inuktitut	**34,590**	**30,070**	87%
Total, Inuit language (in *Inuit Nunaat*)	**39,745**	**31,512**	79%

Data from the Census of Canada, 2006.

The situation has deteriorated over the last few decades. According to census data, in 1986 46% of Inuinnaqtun and Natsilingmiutut speakers of the Kitikmeot region of Nunavut spoke their language at home; in 2006, this figure was only 31%. In Nunavut's Kivalliq region the percentage declined from 81 to 73 over the same period, and the two largest communities in this region saw an even steeper drop – from 73% to 59% in Rankin Inlet and from 92% to 36% in Baker Lake. The reduction was generally less in eastern Nunavut and Nunavik (where the proportion of regular Inuktitut speakers has remained constant at 90%), although it was evident in certain areas. In Iqaluit, the capital of Nunavut, the percentage of Inuit-language mother tongue individuals regularly using the language fell from 88% (1986) to 59% (2006). In Kuujjuaq and Kuujjuaraapik, in Nunavik, it went down to 80% (from 90% in 1986), a less marked decline but still significant in a region where all other communities maintained a proportion near to 100%.

It appears that Inuktitut is tending to lose importance as a language of everyday communication where speakers interact daily with a relatively high number of non-Inuit – places where they have better access to jobs in administration, education, or commerce. This is true in regional service centres like Iqaluit, Rankin Inlet or Kuujjuaq, but also in some small communities like Resolute in the High Arctic where in 2006 only 43% of mother-tongue Inuit-language speakers used it regularly at home. The regions where Inuktitut is spoken are facing increased presence of non-natives, schooling in English, and generalization of bilingualism – a language situation experienced in the past by Labrador, the Inuvialuit region, and more recently Nunavut's Kitikmeot region. This is what led to the rapid and perhaps irreversible shrinking of Inuvialuktun, Inuinnaqtun, and Nunatsiavut Inuktitut.

Times, however, have changed. Barely 40 years ago Canadian government authorities considered it best if the Inuit language disappear, hence the establishment in the North of unilingual English schools at a time when Inuit had not yet begun to demand their territorial, political, cultural, and linguistic rights. Now all recognize the value of the language, and since the early 1970s it has been taught in all schools in Inuit Nunaat. Where children still speak it, it is the only language of instruction from kindergarten to grade two or three, when English becomes the main language (or French in Nunavik) until the end of high school. In communities where children no longer speak the language it is often taught as a second language for one or two hours per week. Inuktitut and Inuinnaqtun are official languages in Nunavut, where it is hoped that they will become the working languages of the territorial government by 2020. Inuktitut is also an official language in Nunavik and Nunatsiavut, as is Inuvialuktun in the Inuvialuit region. Clearly the Inuit language is now respected and recognized by all as an integral part of the indigenous culture of the Canadian Arctic.

Nevertheless, English is used frequently in daily life by bilingual Inuit, including those who live where the language is strong – even when talking among themselves. From 1994 to 2002, a research program run by Université Laval and Nunavut Arctic College[2] focussed on describing and analyzing the language behaviour of adults and children in three Nunavut (Baffin) communities where all generations are familiar with Inuktitut:

2 Program supported by the Social Sciences and Humanities Research Council of Canada (SSRHC).

Iqaluit, Igloolik, and Kimmirut. The research led to the following conclusions[3]:

1. Despite the importance which Inuktitut has retained there, the Baffin region must be considered a bilingual linguistic community because most Inuit use both Inuktitut and English to communicate with each other. Despite this encroaching bilingualism, Inuktitut generally remains the first language spoken to children and to elders (who are most often unilingual).
2. There is nevertheless a tendency to address children in English as soon as they begin to become bilingual (starting in grade three or four). This is more common in Iqaluit than in Igloolik or Kimmirut.
3. There is no difference in how men and women use Inuktitut and English.
4. Young people (excluding small children) tend to use English more often than adults and elders.
5. More generally, English is used to speak about what several speakers called *qallunaujaniit,* the "things not of Inuit origin", that is, most of the common activities, and objects used, in today's Arctic communities. English is therefore seen as the language of modernity and practicality – hence its preeminent position in the workplace.
6. Inuktitut is however seen as very important, indeed essential, for preserving Inuit identity. This is why nearly all those interviewed for the research consider it their duty to pass it on to the younger generations.

Further work in Iqaluit from 2003 to 2006 showed that while the creation of Nunavut had increased the legitimacy and visibility of Inuktitut, it did not change the language use of young Inuit, who are speaking more and more English among themselves. Like the adults, these young people consider it important to preserve Inuktitut, which they believe constitutes an essential element of Inuit identity; but this is not always reflected in their behaviour[4]. How can we explain this?

The bilingual Inuit encountered in the research consider that when speaking to someone it is important to be understood. Understanding is more often achieved when speaking English, because when speaking of modern life the available Inuit words are not always known, or else are considered too cumbersome. It is easier, for example to say "next week" than to use the corresponding Inuit expression *pinasuarusiulaartumi.*

In a context where for most people under 50 schooling was in English – except perhaps in kindergarten and during the first two or three years of primary school – it is understandable that it might sometimes be difficult to use Inuktitut to speak of things beyond basic actions and sensations (walking, sleeping, hunger, happiness, etc.) or traditional life. Words used for discussing modern material culture, technology, social organization, administrative institutions, work, or political and ideological concepts have generally been learned in English. Beyond the third or fourth grade it is this language – most often taught by Euro-Canadians – that has served almost exclusively as the instrument for learning about contemporary life. Most Inuit do not therefore have the lexical and conceptual instruments for expressing all they have to say in their own language. Caught between their desire to preserve Inuktitut and the need to be understood, they very often opt for the latter, moving frequently into English or mixing it with their maternal language.

It seems to me that the key to survival of the Inuit language where it is still strong (eastern Nunavut and Nunavik) lies in establishing an education system where it serves as the principal teaching medium, from kindergarten to the end of secondary school. Accompanied by solid instruction of English (or French in Nunavik) as a second language, not as the main teaching medium, this should bring about stable bilingualism, where speakers can easily express themselves completely in either language. It is only in this way that the future of the Inuit language throughout the 21st century can be assured.

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Table 3

Mother-tongue Inuit speakers using the language at home

Political unit	*Inuit mother tongue (number)*	*Inuit spoken at home*	
		Number	*Percentage*
Newfoundland and Labrador	655	185	28%
Quebec	9,740	9,230	95%
Northwest Territories	800	160	20%
Nunavut	20 ,760	16,020	77%
Other provinces and Yukon	1,010	385	38%
Canada	32,965	25,980	79%

Data from the Census of Canada, 2006.

3 Conclusions taken from Dorais, Louis-Jacques and Sammons, Susan : *Language in Nunavut. Discourse and Identity in the Baffin Region*. Nunavut Arctic College & Québec, Iqaluit. *GÉTIC*, 2002, p. 121–122.

4 *Cf.* Shelley Tulloch: *Inuktitut and Inuit Youth: Language Attitudes as a Basis for Language Planning*. Doctoral thesis, Université Laval, Québec, 2004 (research undertaken in Iqaluit, Pangnirtung and Pond Inlet); Louis-Jacques Dorais: "Discours et identité à Iqaluit après l'avènement du Nunavut". *Études/Inuit/Studies*, 30(2): 163–189, 2006.

COMMUNITY-BASED RESEARCH, YOUTH OUTDOOR EDUCATION AND OTHER HIGHLIGHTS OF A NORTHERN RESEARCH INTERNSHIP EXPERIENCE IN OLD CROW, YUKON TERRITORY

Ann Balasubramaniam

As an early career northern researcher, I have come to realize that northern research is more than just the science and adventure associated with field research. It is also an opportunity to interact with people in Canada's most remote communities and build relationships through sharing knowledge. Meaningful interaction with a community is best accomplished by spending long periods there, to show good will, build trust, and become familiar with how the community operates. This can be a tall order for most graduate students, who are limited by time and finances at northern field sites.

The Natural Sciences and Engineering Research Council (NSERC) Northern Internship (NRINT) program recognizes this, offering subsidies to offset the cost of an extended stay and encouraging partnerships between early career researchers and northern organizations. The internship aims to foster the development of qualified researchers in a way that is useful to northerners, and to bridge the communication gap between researchers and interested community members. It encourages students to get involved in communities and to perform educational outreach by sharing their findings with local people. The program can provide a perfect opportunity for young researchers to expand their portfolios and acquire a variety of skills while developing important connections within northern communities.

As an International Polar Year (IPY) researcher involved in a community-driven research project based in Old Crow, Yukon, I could see how a Northern Internship would allow me to expand my own research project

Figure 1
Frying up fish eggs at the girls' science camp, August 2008. Left to right: Shae Garrett, Melayna Kyikavichik, Chyanne Kapuschuck. Photo: Ann Balasubramaniam.

while working within the community to leave a legacy, which is a central focus of the IPY. In the summer of 2008, during my second year of field research, I undertook a Northern Internship and stayed in Old Crow from June to September.

My host organization was the Vuntut Gwitchin First Nation Government's Natural Resource Department (NRD). We worked together to create three broad, mutually beneficial goals. The first, and the fundamental reason for the internship, pertained to community engagement, knowledge transfer and capacity building: to foster environmental stewardship and community-based scientific monitoring activities. The second involved furthering my research objectives by expanding my data set while exploring new areas of research. The third goal was to assist, on behalf of the NRD, in facilitating the fieldwork of other researchers studying in the Old Crow area. In this article I will briefly describe the highlights of my summer internship and outline some lessons I learned.

FOSTERING THE DEVELOPMENT OF ENVIRONMENTAL STEWARDSHIP AND COMMUNITY-BASED SCIENTIFIC MONITORING

The people of Old Crow are in a state of transition. Their harvesting opportunities are decreasing because of what they consider to be unprecedented environmental changes occurring in their traditional territory. This community, historically one of hunters and gatherers, now faces complex natural resource management issues that go beyond basic sustainable harvesting. Over recent years their access to wildlife has been hindered by hydrological changes (low river water levels and lakes draining), diminished wildlife populations (low counts of caribou and fish stocks) and other environmental phenomena. The need for environmental stewardship and long-term data sets is becoming more apparent both to the community and the IPY researchers. The Natural Resources Department faces the challenge of equipping local residents with the skills they need to undertake environmental stewardship programs based on scientific monitoring practices. Some programs are successfully focusing on wildlife population counts. However, there is a growing need for monitoring key ecosystem parameters that can indicate ecosystem-wide change, such as hydro-ecological change in lakes. During my internship in Old Crow, I worked with the NRD to overcome some of the obstacles associated with science-based research by engaging community members in my science activities as often as possible using public education and cooperative research.

Public education within a community can take many forms and I found that the combination of formal presentations to groups and informal discussions with individuals worked best in Old Crow. Working with the NRD gave me many opportunities to chat informally over tea with local people about some of the research on environmental changes in their traditional territory, the Old Crow Flats, which is the focus of IPY project in which I am participating. Each working day I would normally spend two or three hours chatting with visitors who came by the NRD office and asked questions. This was an excellent opportunity to discuss my research with interested community members and get their input. Conversations that started off with my work in the Flats often moved on to local stories of personal experiences. These increased my understanding and gave me new avenues to research.

Figure 2
The final goodbye at the girls' camp, August 2008. Left to right: Sheila Kyikavichik, Brianna Tetlichi, Ann Balasubramaniam, Shae Garrett, Chyanne Kapuschuck, Melayna Kyikavichik and Brian Bell. Photo: Ann Balasubramaniam.

During the Biennial Gwitchin Gathering, the Vuntut Gwitchin First Nation's international conference and celebration, I was asked to make a formal presentation as part of the climate change speakers' panel. This was one of the most important presentations I have given, as the over thirty people who attended were looking to the research for

Figure 3
Fieldwork at Mary Netro Lake. Ryan Kyikavichik learns about light meters from the author. Photo: Ann Balasubramaniam.

information to help them sustain their traditional hunting, fishing, and trapping activities in the context of rapid climate warming. The comments and questions from the audience and the discussions my talk generated really helped me gain a broader perspective on my project. The lakes I had sampled and discussed were no longer simply data points on a graph but rather living systems, part of the livelihood and cultural identity of the Vuntut Gwitchin First Nation.

As another, more formal way of engaging Old Crow residents in science, I launched a community-based lake biomonitoring project. A collaborative research effort supported financially by the NRD and the Yukon Government, it took place at nearby Mary Netro Lake, which is similar in size, depth and plant life to a lake in the Flats. The lake also has a campsite and canoe launch that had been used by the late Mary Netro, a respected elder, which made it an ideal site. One of the goals of the project was to test algal samplers (collecting periphyton) that I am developing as part of my PhD research. The NRD hired a local youth, Ryan Kyikavichik, and assigned their game guardian, Robert Kyikavichik, to the project. Both worked as field assistants and participated in biweekly monitoring activites to test the ease of use of the samplers by assembling, deploying and retrieving them.

The first trips went well. My field assistants were engaged and easy to work with when given proper explanations of methodology and research objectives and learned quickly how to use modern limnological tools – a YSI multi-meter (which measures water quality), a light meter, and plankton net tows. In fact as a team we quickly found a rhythm and carried out our tasks efficiently. Robert raced through his tasks proficiently and excelled at using limnological meter-based testing. Ryan had a steeper learning curve, but with guidance from Robert and I he quickly picked up tasks; he was very good at plankton tows and discovered everything from leeches to rare Gordian horse-hair worms. At times, however, even with the best of intentions and prior planning, trips had to be cancelled because of circumstances in the personal lives of the field assistants. I quickly learned that they had many priorities that took precedence over their roles on my research team. A flexible schedule proved more workable in the long run and best for maintaining interpersonal relationships.

Despite the occasional interruptions the project achieved its goals, and there are now a few trained individuals in the community who understand the rationale behind the biomonitoring tools I am developing. The insights I gained regarding the usability and effectiveness of the periphyton sampler are proving very useful as I develop protocols for its use.

One of my most memorable public education experiences in Old Crow was organizing and leading a boys' and girls' science camp as a way to engage youth in science. Circumstances, including deaths in the close-knit community, meant that this was the only camp offered all summer and it provided the young people their only chance to get out on the land, a central element in their culture. The camp also offered an excellent opportunity to teach the children – the future community leaders – about environmental stewardship and the scientific method through first-hand experience. Planning all aspects of the camp was for me an enormous undertaking, but an enjoyable one. Earning the trust of the community and discovering the details of childcare in a First Nation community was a fascinating experience that I will not soon forget.

The science camp ran for seven days, the time divided equally between girls and boys aged eight to fifteen years old – in separate time slots, as girls from previous camps had requested. The workshops were interactive and focused on basic scientific methodology. I encouraged the children to think of

questions, make predictions, conduct experiments, and gather observations until they formulated their answer. These methods were new to them as most had not had the opportunity to take science at primary school. At the request of an elder the camp also taught traditional skills and the sessions incorporated traditional medicine and plant diversity hikes conducted by Vuntut Gwitchin staff. Less formal sessions such as cooking the fish specimens evolved unplanned, as the staff did not want to let good food go to waste. The children learned the techniques for skinning, gutting and smoking fish from the camp steward, a respected elder.

Overall, the camp resembled camps of my own childhood except for little details that highlighted the importance of culture and tradition to the children. For instance in the girls camp, following fish dissection lessons some of the youngest female campers were more interested in gathering fish eggs and cooking them on the fire than in eating the prepared cheese sandwiches they were being offered. On the other hand the boys, who were often rambunctious, sat quietly during the 10 minutes of down-time between activities, constructing bows and arrows out of willow branches. These small differences really highlighted the need for an integrated camp that embraced their cultural heritage while teaching them modern scientific theory. Retrospectively, the fact that the youth enjoyed the camp and its combination of traditional knowledge and science is a positive sign for this community where schoolchildren typically feel overwhelmed by science subjects.

EXPANDING RESEARCH OBJECTIVES AND ASSESSING BIOMONITORING TOOL USABILITY

Research schedules in the North rarely have room for add-on projects to determine whether established research methods effectively capture the information sought; but an extended stay at a field site may enable a researcher to study a system over a longer period and run quality-control tests. My primary field research schedule included three short trips into the field for helicopter surveys to retrieve one water sample per lake, and time and budget restraints left little room for more detailed studies. During my internship, however, I not only completed all three helicopter surveys but also collected multiple replicate data sets of water chemistry, periphyton, and light measurements from Mary Netro Lake through the community-based biomonitoring project. These data will strengthen my knowledge of the spatial and seasonal dynamics of regional shallow lakes and will aid in deciphering the length of time and release location of samplers within a lake. I will be able to add a quality-control analysis section to my thesis, enabling me to refine my biomonitoring tool design and develop a comprehensive list of protocols for use by the community of Old Crow and our other northern agency partners.

Figure 4
Researchers have tea at Pascale Roy-Léveillée's field camp on Old Crow Flats. Photo: Ann Balasubramaniam.

IMPROVING RESEARCHER COLLABORATION AND FIELD COORDINATION

One of the most problematic aspects of northern research is the lack of field bases and local staff to help with logistical tasks, which makes it difficult for the many researchers studying the Old Crow Flats to collaborate and share logistics. I have often experienced logistical setbacks that an effective "go-to" person could easily have avoided. During my internship I assisted the NRD in this area, working with their staff IPY coordinator to facilitate researchers' arrivals to town and departures to field sites and their access to logistics. I also coordinated and hosted meetings and dinners where researchers could discuss their field seasons, equipment needs, and future research directions. This kind of exchange among researchers – which usually occurs only during conferences and formal meetings – was

always energizing, enjoyable, and generally informative. At one point, at the request of a researcher who needed assistance, I was even able to visit a field camp out on the Flats, and we sat down to have tea and discuss her progress as well as her needs. This type of collaboration really did enhance my summer experience and it allowed me to see another more administrative side of research. I now fully appreciate the cumulative weight of the tasks we ask of our northern research partners. Most importantly, it granted me the opportunity to get to know many of the scientists and learn more about their research.

My internship was an extremely positive experience. I would recommend it to early career researchers interested in adding a different layer of context to their thesis projects. The experience has been of lasting benefit to my research by broadening my understanding of the ecosystem in which I work. It has also considerably strengthened my portfolio of skills for collaborating effectively in an integrative community-centered scientific research project and has given me a good perspective on the work needed to facilitate large research initiatives.

Furthermore, the internship provided me with a unique opportunity to connect with the community of Old Crow in a meaningful way by assisting them with tasks they considered important. I have made many connections with people in the town and continue to work with them on other research and education projects. In the North, where interpersonal relationships are part of the cultural fabric, it is very rewarding to have been able to develop some strong friendships. These relationships would not have been possible had I not lived there for an extended period of time. This internship has been a success on many levels and significantly increased my connection to northerners. It likely has set the stage for me to develop a strong career as a northern researcher.

Ann Balasubramaniam is a PhD student in the Department of Biology, University of Waterloo. She is supervised by Roland Hall, Department of Biology, University of Waterloo and Brent Wolfe, Department of Geography and Environmental Studies, Wilfrid Laurier University.

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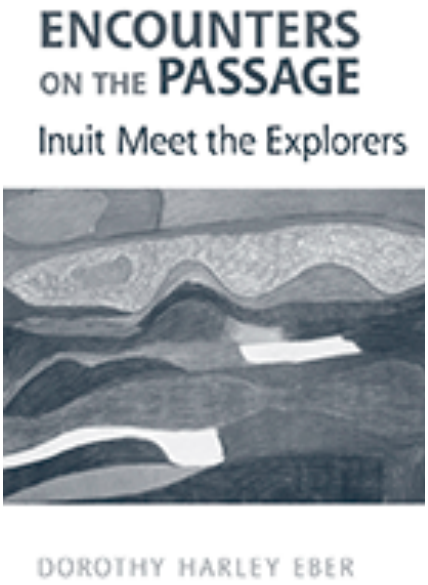
BOOK REVIEW

Susan Rowley

Encounters on the Passage: Inuit meet the Explorers, by Dorothy Harley Eber. University of Toronto Press, 2008. 240 pp., 48 images. $45.00 CDN. ISBN 978080209-2755.

Encounters on the Passage is Dorothy Eber's fifth volume on history told from an Inuit perspective. Her work with Peter Pitseolak and Pitseolak, both from Cape Dorset, focussed on their lives; however, in her interviews she heard stories of the encounters between the strange newcomers and the people. In some ways, this latest volume can be seen as a follow-on to her last book, *When Whalers Were Up North* (1996) chronicling Inuit interactions with and reactions to European and American whalers. The lure of the Northwest Passage, with its tragedies, comedies of errors and the enduring mystery of the "lost" Franklin expedition sends a siren call to Arctic historians. "Not another Franklin volume," some might comment and yet the public's appetite appears insatiable. Eber's contribution to this vast and ever-burgeoning literature is refreshing. It is a slim, well-written volume with no pretensions. Eber wants the reader to hear and understand Inuit voices and the very real knowledge they have of the early explorers and the crucial contributions this knowledge makes to a better understanding of these encounters – and perhaps also to discovering more about the last months of Franklin's men before they perished.

Encounters is a series of vignettes detailing and discovering the voyages, by ship, of five explorers over more than three hundred years. The first three, Frobisher, Parry, and John Ross, mostly set the stage for Franklin. Eber uses them to demonstrate Inuit knowledge of these strangers and to explore the complexities of the relationships detailed in



the oral histories. The last, Amundsen, is included to complete the story with commentary from an Inuit perspective about the leader on the first ship to transit the Northwest Passage.

Historians and archaeologists may find the lack of references frustrating. Eber has kept primarily to Inuit testimony she has gathered, and to the accounts written by the British voyagers. This has led to some curious gaps in information: for instance Ohokto's account of the explorer John Ross, published in *The Beaver* in 1948 and presented immediately before Ross's version of the encounter, is eerily similar to Eber's presentation of the same topic. Eber has also commented on some work without citing it. Her discussion of cannibalism among the Franklin crew, for example, does not refer to the research of Keenleyside, Bertulli and Fricke (1997) that supports Inuit oral history through an analysis of the cut marks found on crew members' skeletons. Likewise, no reference is made to numerous unsuccessful searches for Franklin's ships employing divers and side-scanning sonar or to Gill Ross's work on the numbers and types of Franklin search expeditions (Ross, 2002). In many ways, this is both understandable and unfortunate. It is understandable, because the author is focussing on Inuit encounters and giving primacy to their voices. It is unfortunate, because this is a very readable book with a wide public appeal and may lead readers to conclude little research has been undertaken on Franklin.

There are several minor factual errors, typos and places where additional footnotes would have proved useful. These do not, however, detract from the volume as a whole.

I found the most serious omission was a detailed map of the King William Island region. A large-scale map showing, in Inuktitut and English, the places that appear in the text should have been included. I wanted to be able to trace the locations Inuit were describing on the land. This is crucial because of the Inuit accounts stating that: a) some of the Franklin crew may have backtracked to one of the ships, b) one of the ships tried to sail away, c) there are Franklin era graves and skeletal remains in unexpected regions, and d) there are seal oil stains, indicating human occupation, in locations not used by Inuit. This body of information provides strong justification for seeking Franklin's ships and men in different areas.

Eber is to be commended for her work in once again bringing Inuit voices to the forefront of the discussion on Franklin and other explorers. In so doing, she has created an entry point for a new generation of readers interested in multivocality and the complexity of a history presented from multiple viewpoints.

Louis Kamookak, a historian from Gjoa Haven, is currently working with Robert Grenier from Parks Canada on a federally funded project to explore the waters identified through Inuit oral testimony for Franklin's ships. Through their work some of the mysteries still remaining may be solved. Perhaps, somewhere, rest the remains of John Franklin waiting to be discovered "with his hand reaching for the Beaufort Sea."

Susan Rowley is Associate Professor of Anthropology and Curator of Public Archaeology at the Museum of Anthropology, University of British Columbia.

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NEW BOOKS

Doctor to the North: Thirty Years Treating Heart Disease among the Inuit, John H. Burgess. McGill-Queens University Press. 178 pp., 12 pages of colour illustrations, 50 black & white illustrations. ISBN 97807-73534315.

For several weeks a year, over three decades, Dr. John Burgess worked as a consulting cardiologist in the Canadian North, a first-hand witness to rapidly changing disease patterns among the Inuit as a Western lifestyle became more prevalent. Through the stories of some of his Inuit patients, Burgess presents a broad spectrum of heart diseases and discusses how they can be prevented.

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John Burgess is an emeritus cardiologist at the McGill Health Centre and professor of medicine, McGill University.

As affecting the fate of my absent husband: Selected Letters of Lady Franklin Concerning the Search for the Lost Franklin Expedition, 1848–1860, by Lady Jane Franklin, edited by Erika Behrisch Elce. McGill-Queens University Press. 222 pp., 7 black & white images. ISBN 9780773534797.

Erika Behrisch Elce, assistant professor in the English Department at the Royal Military College of Canada, has collected the poignant letters of Sir John Franklin's wife, Jane, which provide a new perspective on the Franklin tragedy.

From her optimistic requests to whaling ships to her persistent demands for Admiralty aid, Lady Franklin played a crucial role in the search for her husband. Her correspondence with British prime ministers, members of Parliament, lords of the Admiralty, and a US president presents a private, domestic side to a national tragedy and sheds new light on what Sir John Franklin's disappearance meant to England, its public, and its sense of itself as an imperial power.

Lands that Hold One Spellbound: A Story of East Greenland, by Spencer Apollonio. University of Calgary Press. 300 pp., 20 black & white photos, 9 maps, 2 tables. ISBN 978-1-55238-240-0.

Lands that Hold One Spellbound is an informal history of East Greenland, summarizing indigenous settlements over four millennia and describing European explorations from the Norse period to recent years.

Spencer Apollonio is a retired marine biologist and a research fellow of the Arctic Institute of North America (AINA).

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