

AN ICY LAYER OF ISOLATION

Prince Edward Island's Sea-Bound Particularity

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ABSTRACT: The types and degrees of insularity experienced in islands provide considerable material for academics. In the case of Prince Edward Island (PEI), being an Island combined with the isolation caused by sea ice covering the waters around PEI, has impacted Islanders' sense of relative insularity. Even after the construction of a fixed link to the mainland, Islanders continue to relish in a sense of distinctiveness linked to their Island condition. Since European settlement, PEI's sea ice barrier has periodically cut off channels of communication and transportation resulting in many societal effects. As ocean temperatures rise due to Climate Change, ice conditions are changing, bringing with them increased coastal erosion and other effects. This article investigates PEI's relationship with its frozen sea-bound particularity. Drawing upon the Island's history, culture, and climate data, as well as from the field of Island Studies, the article asks the question: how has this 'icy layer of isolation' affected Islanders' sense of place over time? And what are the potential implications of the effects of Climate Change for PEI?

KEYWORDS: sea ice, islandness, ice-boundedness, Prince Edward Island, climate change, insularity, isolation

Introduction

It is commonly understood that islands are, by their very essence, isolated or insular (Baldacchino, 2004, 2005; Péron, 2004; and others). The effects of insularity provide a great well of material for academics, as well as the types and degrees of the insularity experienced, depending on factors such as distance from the mainland, size of the island, topography, geography, warm- or cold-water status, connections between island peoples and mainland peoples, trade routes, military conflicts, economic links, and so on (Baldacchino, 2004, 2005, 2006a, 2006b; Hay, 2006, 2013; Péron, 2004; Royle, 2007, 2014; Royle and Brinklow, 2018; Stratford et al., 2011; and others). At the same time, an island is connected: the body of water separating an island from the mainland can be viewed as a road, a means of reaching the rest of the world (Brinklow, 2012; Gillis, 2016; Hau'ofa, 1999; Riquet, 2016), resulting in the truism that despite their isolation, some islands are the most

cosmopolitan places in the world (Gillis, 2004, 2007). This fact of seeming opposites – boundedness and connectedness – is inherent in the island condition.

In the case of Prince Edward Island (PEI), a small island province nestled in the Northumberland Strait on Canada's Atlantic coast, close physical proximity to the mainland – only 12 kilometres (8 miles) at its closest (Figure 1) – has not affected Islanders'¹ sense of isolation or insularity (MacDonald, 2000; Weale, 1999, 2007). Rather, it has resulted in a strong sense of identity that has influenced the Island's history as a province in Canada, and its culture and heritage. Even after the construction of the 12.9-kilometre-long Confederation Bridge in 1997 – which some would claim negates PEI's island status (Savill, 2003) – Islanders continue to extol their sense of distinctiveness, "to see it as a source of islander resilience and versatility, a state of existence to be cherished" (Hay, 2006: 22). This sense of 'specialness' in the world, or what has come to be called 'islandness' or 'the island way of life' created by the distilled nature of living in a bounded space, and the isolation experienced when being surrounded by water (Brinklow, 2016; Conkling, 2007; Royle and Brinklow, 2018; Weale, 1991), has contributed to a place attachment that not only survives but thrives.

But what happens when the water surrounding an island turns to ice, when what was considered a medium for transportation becomes a seemingly impenetrable barrier? Or becomes a medium for a different kind of travel? PEI's status as a cold-water island located in a northerly latitude and within close proximity to the Atlantic Ocean provides extreme winter conditions that, besides the snow and cold in the fields and towns that bring human activity such as farming and commerce to a near standstill, also bind the waters that surround the Island in a layer of sea ice. Since European settlement in the 1700s, this 'icy layer of isolation' has had the effect of cutting off channels of communication and transportation for days, if not weeks and months at a time. Over generations, this added significantly to Islanders' sense of isolation and insularity, deeply affecting the Island's culture and way of life. With stories of treacherous crossings over a frozen Northumberland Strait by 'ice boats' (vehicles that were alternately rowed and dragged), to ferries getting stuck in the ice for days, travelling to and from the Island in winter has been a dangerous endeavour. The opening of the Confederation Bridge in 1997 was intended to overcome the transportation challenges PEI experienced and went a long way to reducing Islanders' sense of isolation in all seasons. Just how the Confederation Bridge has affected 'the Island way of life', its isolation and insularity, has been the subject of some study and debate (Baldacchino and Spears, 2007; MacDonald, 2007; Pettit, 2018). The construction of a bridge also led to a closer examination of ice conditions in the Strait, resulting in studies that had not been carried out before. But now, in 2019, climate change may be contributing to a new chapter in the story. As ocean temperatures rise, ice conditions are changing, bringing with them increased coastal erosion and other effects – and, consequently, Islanders' interactions with the Strait in winter. This article, then, investigates PEI's relationship with the frozen Northumberland Strait, past and present, and with speculation about the future. Drawing upon the Island's history, culture, and climate data, as well as from the interdisciplinary field of Island Studies, the paper asks the question: how has this 'icy layer of isolation' affected Islanders' sense of place over time? And in this current era of climate change and global warming, what are the implications for Prince Edward Island?

¹ Traditionally, Prince Edward Island's inhabitants refer to their island as 'the Island', and themselves as 'Islanders', both with a capital 'I'.

Prehistoric Prince Edward Island

Located in the Gulf of St. Lawrence. PEI was affected by the Ice Age from 75,000 to 13,000 Before Present (BP), becoming ice-free around 13,000-1200 BP (Environment Canada, 2001). Until the glaciers retreated, neither the Northumberland Strait nor what was to be called Prince Edward Island existed; at that point, they were part of the mainland. When the glaciers retreated, the Island was joined to the mainland by a land bridge. Between 5,000 and 10,000 years ago, the ice melted and the sea level rose. At the same time, the land rebounded, creating the Island and the Northumberland Strait (Calder, 2018; DeGrece, 1999).

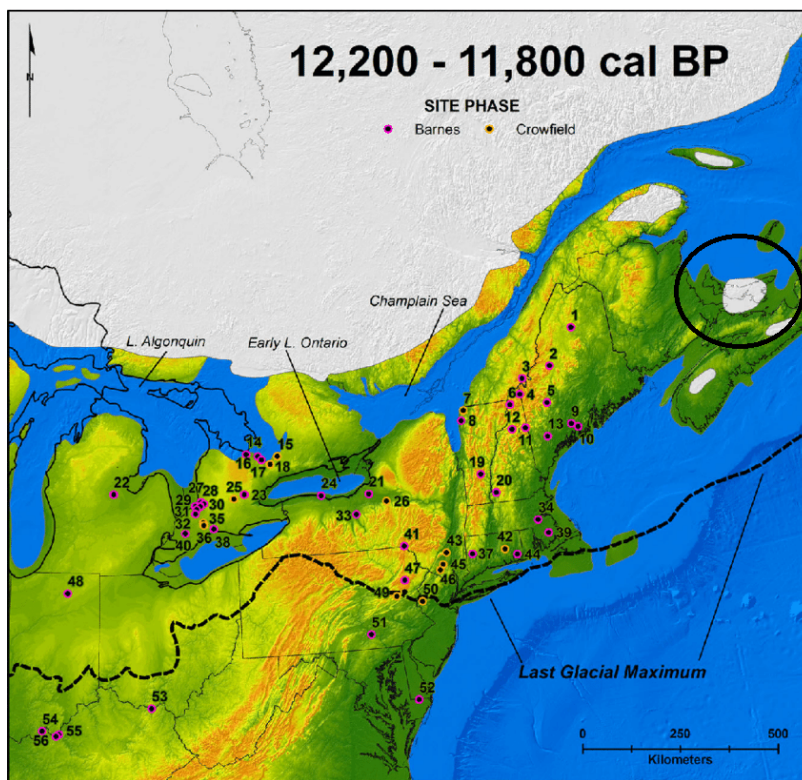


Figure 1 - PEI as part of the continental landmass during the Ice Age (Lothrop et al, 2019).

It has been asserted that people first came to the Maritimes about 10,000 BP, chasing large herds of caribou (Tuck, 1984) and took to fishing. Around 3500 BP, the rising sea levels caused these people to shift from exploiting deep sea fish to using predominantly shellfish. It is believed that these 'shellfish people' were the predecessors of the Mi'kmaq First Nation. Much of the evidence of the people in the Maritimes prior to the 'shellfish people' is underwater, due to the rise in sea level that also created PEI. Therefore, it is difficult to say what effect seasonal ice in the Northumberland Strait had on their society. The evidence for the Mi'kmaq society is somewhat clearer. Their culture was cyclical, dependent on what each season of the year offered. Wintertime meant big-game hunting whereas summer brought coastal fishing and shellfish harvesting. PEI, like all coastal areas

for the Mi'kmaq, was initially a summer camping area (Keenlyside and Kristmanson, 2016; Maloney et al, 1973). There was no big game on PEI, such as deer or caribou, and therefore PEI was, even then, largely a seasonal economy with summertime being the boon period. Whereas the prehistoric period of PEI portrays a picture of broad and long-standing nature-society interaction related to seasonal ice in the Northumberland Strait, the colonial period provides a more specific and more varied picture of the ice's effects on PEI's human occupants.

19th Century Ice-capades

During the period of the first European colonists on the island – the French from 1534 to 1765 – there is very little information about PEI's natural and meteorological conditions. Indeed, it is in the 18th Century that first-hand evidence about climate and ice conditions around PEI is introduced when the British assumed authority over PEI from the French and began its development into a colony. One of the key aspects of PEI's transition to a British colony was its survey by Samuel Holland in 1765 (Lockerby and Sobey, 2015). From his contemporaneous notes, transcribed in A.B. Warburton's volume of 1923, a general glimpse of the ice conditions around PEI is seen:

In general, it is observed that about October there usually begins to be frosts morning and evening which gradually increase in severity till about the middle of December when it becomes extremely sharp. At this time, a northwest wind with small sleet seldom fails. In a little time, the rivers on the island are frozen up and even some distance from the land upon the sea coast, the ice soon becomes safe to travel upon and is at least 22 or 24 to 30 inches thick.... In the spring, the rivers seldom break up till April... (Warburton, 1923: 129)

A more specific account of the effect of the presence of ice in the Northumberland Strait on human activity on Prince Edward Island is also provided through Warburton in his description of Walter Patterson, the first English governor of the colony, and his response to the freezing waterways described by Holland:

In February 1775, owing to the vessels in which his despatches were to have gone to England having been frozen into the harbour on the 21st of December when there happened severe frosts (remarkable as being uncommon so early in the season), Patterson determined to attempt a winter mail service. He endeavoured to persuade some men to attempt a passage in a small canoe to Nova Scotia. If successful without great difficulty, it would remove an objection made by many people against being in PEI namely being shut out from intercourse with the rest of the world for so long in winter.... The attempt was made and succeeded. Thus, Patterson is entitled to the credit of inaugurating the winter mail service. (ibid: 178)

What is most significant about this account is not only that it records the date of the first freezing of the Strait but also that it makes note of this date as being uncommonly early. This fact correlates with the cool global temperatures of the period, known as the Little Ice Age, showing how PEI was also affected by global climate trends (Cronin, 2003). Also of significance is the technological response of Patterson which was to have continued social, economic, and political consequences on the Island.

Patterson's innovation was to adapt the techniques of the local aboriginals. He combined the agile canoes used by the Mi'kmaq to ply the Strait with winter sledding technology of European horse-carriage-makers in order to overcome the variety of hazards presented by the Strait's ice floes. A precursor to the ice boats of more familiar lore, such as early ice-friendly watercraft were suitable equipment for travel on water, ice, and shore in good and bad weather as winter conditions around PEI were always a mixture, with the extent and severity of the mixture varying yearly. As C.N. Forward points out: "[t]here is great variability in ice conditions from year to year as the Gulf of St. Lawrence lies on the border line between the Northern Hemisphere's ice-covered waters and ice-free waters. Changes in water temperature a few degrees higher or lower than normal may result in the virtual absence of ice or its formation on a large scale" (Forward, 1959: 2). This corroborates John Stewart's 19th Century account of ice conditions as being highly variable:

The commencement and duration of the winter varies much in one year from another. The Hillsborough river opposite Charlottetown has been crossed on the ice as early as the first week in December and on other years has been open as late as the 20th of January and on several years successively as late as the 8th or 10th of that month and in Spring we have the same harbour sometimes not clear of ice before the 20th of April and on other years open at the same time in March. (Stewart, 1806: 98)

This variability is further confirmed throughout the colonial period through shipping data gathered from early newspapers which record, in some years, the dates that ships began their transport to and from the Island. For example, in 1830, we learn that the *Richard Smith* began traveling between Pictou, Nova Scotia, and Charlottetown in the last week of April. In 1864, the steamer *St. Lawrence* made its first crossing of the Northumberland Strait for the season on April 6 (*Island Register*). Dates of the commencement of shipping appear to be only sporadically recorded other than discussed above. Even considering the variability of the ice conditions recorded during the English period, the Strait's iciness possessed a consistency as a barrier to navigation by the technology of the period, from sail to steam, with the notable exception of the nimble ice boats.

The ice boats were used on the Strait sporadically and then fortnightly from 1827 until April 1917 (Cape Traverse Ice Boat Committee, nd; *Island Register*, nd) when weekly service carrying mail and passengers was established between Cape Traverse, PEI and Cape Tormentine, New Brunswick. The service and the rugged individuals who manned the service have been rightly celebrated in PEI history as a valuable conduit to the rest of the world in an arduous and sometimes dangerous setting. Indeed, early photos of men hauling the boats across the ice with a safety harness are iconic; a ticket from 1886 shows a passenger fare of \$2 for men and boys who assisted and \$5.00 if you did not. The fare for women and the elderly was \$4.00 as they were not allowed to help (Government of PEI, 2013). Stories of being stranded in the Strait have become part of the Island's mythology, with only two deaths reported: the first was a young man named Henry Hazard, who died in 1855 after spending two nights on the ice with several others when a storm blew up; and the second, a crewman who drowned in 1917, just two months before the service ended (Beck, 1997: 135-8). However, in spite of the efforts of those performing the service, the ice-boat system became increasingly inadequate for the year-round transportation needs of the Island. Whereas in the earlier part of the English period, the Island's population was small and its export capacity was met through the local construction of sailing vessels to be sailed away at the end of the summer growing and boat-building season, the 19th

Century saw a larger and more productive Island population interacting more extensively with the outside world as means to prosperity (Black, 1973).



Figure 2 - Ice boat service from P.E.I. to Mainland; HF.79.79.1.5 A. (from the collection of the Prince Edward Island Museum and Heritage Foundation)

The Charlottetown Conference in 1864, held on the Island when Islanders, demonstrating their “profound attachment to their independence” (Bolger, 1964: 16), refused to attend a meeting on the mainland, marked a turning point in the history of PEI’s relationship with the Strait and the desire to overcome its frigid impenetrability – along with the advent of steamships and railways in the rest of British North America which highlighted PEI’s isolation. Although the Island only toyed with the idea of uniting with the British colonies of Nova Scotia, New Brunswick, Upper Canada (what became the province of Ontario), and Lower Canada (later Quebec) in 1867, it was the seasonal isolation of the ice-covered Strait that was thought to prevent the Island from benefiting from the advantages of conveyances such as public railways and highways if they were to join the fledgling Dominion of Canada (Black, 1973; Cullen, 1973). As well, the practical difficulties of maintaining democratic representatives in a mainland capital cut off from the Island during winter was a deterrent to PEI joining the Dominion. In other words, the Island’s icy insularity led to a consensus among the political decision-makers of PEI that joining the Canadian Confederation was neither practical nor economically advantageous. In order to sell Islanders on the idea of Confederation, the Canadian government had to improve its pitch to include measures overcoming the hurdle of the sea-ice barrier. The Canadian government continued to refine its courtship of PEI ultimately offering, in 1873, “efficient steam service for the conveyance of mail and passengers, to be established and maintained between the Island and the mainland of the Dominion, Winter and Summer, thus placing the Island in continuous communication with the Intercolonial Railway and the Railway System of the Dominion” (Belliveau et al, 1992: 65). By this time, PEI had a greater economic need to export its agricultural products at points throughout the year to meet the North American market’s demands rather than merely at harvest. Combined with local governmental mismanagement, the Canadian offer was too good to pass up again. The

notion should not be discounted that the offer of an efficient and continuous connection to the mainland was also seen as the best avenue yet to end the stark feeling of isolation in the winter psyche of Islanders.

The Canadian government initially assumed responsibility of the ice-boat service in 1873 and operated it until 1917 despite repeated attempts at improved winter ferry service, usually at the behest of PEI governments. It was the generally held Island view that a continuous and efficient connection to the mainland was one of the fundamental terms of the Island's union with Canada. Indeed, the special terms of PEI's admission to the federation is seen as an important landmark in federal-provincial affairs in this country (Cullen, 1973). Furthermore, the discrepancy between the PEI position and the federal position was to colour the Island's relationship with the federal government for the next 120 years, culminating in the construction of the Confederation Bridge in 1997. More precisely, it was the failure of the federal government to live up to its original promise that affected its relations with PEI. A series of newer and larger icebreaking ferries (such as the *Stanley* and the *Minto*) were auditioned in the Strait with varying degrees of success, and the weather during the years after PEI joined Canada appears to have been particularly harsh. Mary K. Cullen notes that "in 1882, a House of Commons Committee looking into the transportation link to PEI concluded that ice conditions in the Northumberland Strait would interrupt steamship service for the foreseeable future" (1973: 238), and that:

the winter of 1890-91 was exceptionally severe and the continuity of the Stanley's trips was broken at various times by heavy drift ice and gales in the Strait. Early ice caught the Stanley unprepared for service and for 10 days the Island had no steam service at a time when fall produce was piling up. Even when the Stanley resumed its operations, it was unable to make crossings on 43 different days. (ibid: 244)

These prolonged periods of isolation exacerbated Islanders' sense of insularity, and contributed to their longstanding sense of grievance against the federal government (MacDonald, 2000).

Ice politics in the 20th Century

It is unclear whether the climate conditions improved after the early 1890s or whether this was simply part of the variability of the area noted by Forward and Stewart above. The ferry service, on the other hand, did improve after 1917 with increased financial commitment from Canada. As well, the efficiency of ice-breaking technology finally surpassed that of the ice boat. However, as PEI modernised along with the rest of the world, the desire for greater economic integration, combined with the historic federal promise of regular connection, kept the issue of a better link to the mainland in the foreground. The pressure to maintain and improve the promised "continuous and efficient service" continued to increase throughout the 20th Century and was often debated during elections. Political talk of even better service in the form of a causeway or fixed link across the Strait then prompted scientific research into meteorological conditions including seasonal sea ice.

With reliable ice-breakers such as the *Abegweit* plying the Northumberland Strait, the federal government chose to engage in long-term thinking about incorporating PEI into its national transportation infrastructure. Advances in financial and economic planning

allowed better, more efficient modes of transportation. As well, scientific advances allowed better examination of natural conditions including sea ice. While previous eras rely on inference and observation about ice conditions in the Northumberland Strait, we now can refer to more scientific research. In the first place, we know that the Northumberland Strait is part of the Gulf of St. Lawrence and is literally cradled on the waves by the part of the Gulf known as the Magdalene Shallows. Where cooler temperatures prevail, as in the North Atlantic, ice will tend to accumulate in shallower areas. As well, the currents in the Gulf are weakest around PEI, allowing greater ice accumulation. Finally, the climate in the area is greatly influenced in winter by the general flow of arctic air and water (mentioned above), caused by the overriding climatic influence of the North American Oscillation (Forward, 1959; Hurrell et al 2003).



Figure 3 - The Confederation Bridge, under construction (Baird.com)

Sea ice in winter has been a prominent part of the natural conditions around Prince Edward Island and, with better research, as mentioned, we are now able to more fully understand exactly how much of a role sea ice has played in PEI's environment. Ice conditions in the Strait originate from the formation of ice in the Strait itself (or freezing of the local water), as well as ice movement into the Strait from the Gulf due to currents and winds. Significantly, it has been noted that the ice does not develop beyond one season, moving and melting in spring (Canadian Ice Service, 2001), and the tidal nature of the Strait prevents the formation of stationary ice. In the late 1900s, the issue of ice conditions was particularly crucial as the federal government gave more serious consideration to some kind of fixed road link connecting the Island to the mainland. The effects of sea ice on such a structure in the Northumberland Strait and its effects on the sea ice and, more particularly, on the seasonal clearance of the sea ice allowing seasonal fishery, was of particular concern (Clancy and Levesque, 2017; Fisheries and Oceans Canada, 2005). The debate about the Fixed Link pitted the 'Friends of the Island' against 'Islanders for a Better Tomorrow', and the effect of prolonged sea ice on the lucrative

fisheries was one of the issues up for debate (Pettit, 2018). However, after extensive study by the government and Strait Crossing International, the company that would go on to construct the Confederation Bridge, it was believed that the construction of a fixed link would have little impact on the fishery. With cone-shaped pier bases capped with concrete ice shields “designed to act like the bow of an icebreaker” (Bergman, 2003: online), the pack ice would break apart when it hit the piers, resulting in little to no delay in the fishery. After an Environmental Assessment Review Panel completed its work and gave the go-ahead, construction on a bridge between PEI and New Brunswick began in 1994, and the Confederation Bridge was opened in 1997.



Figure 4 - Piers of the Confederation Bridge cutting the ice sheets into rectangles (Adam Fenech)

Climate, namely, temperature, has a direct bearing on the extent and thickness of ice that forms around Prince Edward Island. The surface winds modify the sea-ice location, form, and distribution. Winds also play a major role in the extent of the ice cover especially at the beginning of the season when strong winds can destroy relatively thin ice and temporarily suppress the development of new ice (Canadian Ice Atlas, 2011). Regional weather patterns affecting sea-ice development around Prince Edward Island are competing systems during the winter months. It can include cold air from the Canadian Arctic carried seaward across Eastern Canada resulting in temperatures far below the freezing point, rapidly increasing the volume and extent of the sea ice. Or it can include migratory low pressure centres from the southeastern United States resulting in mild air sweeping northward and creating ice melting conditions that last anywhere from a few hours to several weeks. The winter seasons in and around Prince Edward Island vary considerably in severity depending upon the relative frequency and the paths of these migratory storm systems. Human-induced climate change is influencing these regional weather systems, changing the sea ice extent and thickness, as well as the seasonality of sea ice conditions.

In recent years, as concerns about climate change have increased, there is an increasing amount of data about weather patterns of the region and beyond. Aside from anecdotal and historical writing, we reviewed data from about 40 years in the 20th Century. The data appear to show that historic trends in ice conditions are not statistically significant. In other words, while, as Forward and others have noted, there is great variability in ice conditions from year to year in the Strait, there is no particular pattern or trend that is discernible. One of the features of global warming is increased weather volatility and although it would seem to be a difficult task to detect volatility in a highly variable meteorological setting such as the Gulf of St. Lawrence, the data does hint at some volatility in recent years. For example, the earliest 'ice out' date is in 1981 while the latest 'ice out' date is only three years later in 1984. Also, the earlier period dates are closer to the 40- year average 'ice out' date of April 22. Expanding our scope in relation to sea ice to include not just the sub-arctic but also arctic regions, there are reports of significant melting. As noted in *The Economist*:

There is no need to pore over records of temperatures and atmospheric carbon-dioxide concentrations. The process is starkly visible in the shrinkage of the ice that covers the Arctic ocean. In the past 30 years, the minimum coverage of summer ice has fallen by half; its volume has fallen by three-quarters. On current trends, the Arctic ocean will be largely ice-free in summer by 2040. (Unattributed, 2017: online)

The accounts of Smith and Warburton aside, there is ample current anecdotal information of the diminishment of sea ice surrounding Prince Edward Island. For example, a long-time Charlottetown resident remembered skating from Victoria Park to Governor's Island, suggesting a winter-length deep-freeze of rink-like character in Charlottetown Harbour (which is open to the Northumberland Strait) that one would now associate with Canada's northernmost latitudes (Jenkins, pc 1990). Along with personal memories, there exists current newspaper photography that demonstrates the stark contrast between ice conditions around PEI in recent years (2015 notwithstanding) versus those described by Patterson from 200 years ago or even Cullen from 100 years ago (*The Guardian*).

Still ice?

Where the body of the vessel meets the solid ice, a frigid smoky green water pushes and bubbles to the surface. The ice breaks away from itself. Massive dinosaur-size palettes push out to the solid ice. It's violent. The boat leaves a path of water in its wake. But not for long. The ice opens only for moments allowing the ferry to pass through. The ocean ice self-mends. The palettes of ice run back to each other. There is evidence this Arctic white surface has been disturbed. As the sun begins to set, the shadows make marks like pencil on paper. A long winding path behind us. An indication of passage. (Keefe, pc 2012)

Despite the beauty of the crossing as described by Fogo Island (Newfoundland) painter M'Liz Keefe above and despite the urge to inscribe metaphysical meaning on the scars a boat has left in the ice, experiencing a ferry crossing in winter is something that most Prince Edward Islanders do not miss. Being stuck on a ferry in the ice for several hours past one's docking time is an experience most do not wish to repeat. But, 21 years after the Confederation Bridge opened, eliminating the ferries from PEI to New Brunswick and thus the wintertime crossings by boat, Islanders still tell the stories – with pride and a certain nostalgia – of being stuck in the ice, and the camaraderie that came with sharing a particularly harrowing experience.

But just how Prince Edward Islanders feel about themselves as Islanders is an ongoing question – especially since the construction of the Confederation Bridge. Some say the Bridge has rendered PEI a non-island, calling it – half in jest – 'Prince Edward used-to-be-an Island' or 'Prince Edward Peninsula'. But, to most, the question of whether the inhabitants are still islanders is answered with a resounding 'yes', especially in the wintertime, when the ice in the Strait holds the Island firmly in its grasp, giving Pete Hay's phrase, "shore-bound particularity" (Hay, 2003: 555) new meaning. The Bridge routinely posts restrictions on high-sided vehicles during severe weather and wind events, resulting in reduced or no mail service and empty grocery-store shelves for days at a time. And that forced separation, when the Island shuts down and 'the mainland is cut off again', reminds Islanders of a less busy time when time is one's own, to imagine, to create, to enjoy the winter quiet when the sea ceases to lap up against the shore.

Islanders continue to rely on themselves, on their neighbours and communities, to survive when harsh and unrelenting weather becomes the common enemy. The winter of 2015, with blizzard after blizzard dropping a record 5.39 metres (18 feet) of snow in three months, is particularly memorable. That shared sense that they made it through another winter yet again manifests in stories that people tell and retell with pride, serving to bind them together and to their place, demonstrating cultural confidence and strengthening Island identity. A particularly poignant image from the International Space Station showing the bare outline of Prince Edward Island buried under snow and ice brought some people up short. Perhaps the image was a reminder of when PEI was part of the mainland 10,000 years ago; and perhaps this was an affront to Islandness, or that sense of separation that defines Islanders. Or perhaps it was yet another example of PEI being left off the map. Despite that, Islanders were quick to collect a certificate issued by the Charlottetown *Guardian*: "I survived the winter of 2014-15": "something to tell the grandkids" (Fenech, 2015).



Figure 5 - Image of Prince Edward Island taken on 17th February 2015 from the International Space Station (NASA.gov)

The Future

Common sense tells us that there is a strong correlation between temperature and the presence of sea ice. Scientific research confirms this. As global warming continues, we may see more volatility in the ice conditions of Northumberland Strait. For example, after five previous years of harsh winters, the winter of 2006 provided conditions where ice did not significantly form in the Strait. Aside from weather volatility, it is therefore likely that we will see less ice in the Northumberland Strait as global temperatures rise.

Global climate models confirm this likelihood. Climate models are strings of mathematical (differential) equations based on the basic atmospheric laws of physics, fluid motion, and chemistry that, taken together with interactions with ocean, sea-ice and land components, describe the Earth's climate system. The largest supercomputers in the world are used to 'run' the models by dividing the planet into a 3-dimensional grid (both horizontal and vertical), applying the mathematical equations, and evaluating the results. Global climate models are capable of reproducing the general features of the observed global temperature and other climate variables over the past century (IPCC, 2001), including sea ice. Observations in the Northumberland Strait have shown below normal sea-ice conditions since 1995/96 (Canadian Ice Service, 2011). These are projected to continue over the next century as future projections of sea surface temperature for the 2020s (2011-2040), 2050s (2041-2070), and 2080s (2071-2100) using the output from the Hadley Centre Global Environment Model version 2 (HadGEM2) from the Fifth Assessment of the Intergovernmental Panel on Climate Change (IPCC AR5) conducted for this paper show a "most likely" increase of 2 to 4 degrees Celsius.

The question of ice in the Northumberland Strait and its effects on PEI society has largely been answered with the construction of the Confederation Bridge. It is therefore difficult to say what the effect of variable or less ice in the Strait will have on the inhabitants of Prince Edward Island in the future. However, we will see environmental effects. For example, less ice in the winter will mean more wave action and, consequently, more erosion. With less ice, the Island will be more prone to storm surges and high tides and the piling up of land-fastened ice. Thus, human habitation and activity very close to the shore will become more precarious even before we see the effects of sea-level rise in PEI. By continuing to study the ice around us and, indeed, all the conditions around us, we may be better able to adapt to our surroundings as they change.

These conclusions are not exclusive to PEI: with islands on the front line of climate change, they will continue to feel the effects, just as Prince Edward Island does. With the impact of sea-level rise and extreme weather events, cold-water islands will experience coastal erosion, flooding, and salt-water intrusion into water supplies just as warm-water islands do. Changing seasons will affect growing seasons, food production, and fisheries and aquaculture. Extreme weather events affect transportation linkages between islands and their mainlands, increasing the risk to food security. Means of energy production may shift as islands attempt to become less dependent on burning fossil fuels that contribute to global warming. And, undoubtedly, human and animal health will be affected as temperatures rise. These are just some of the ways that islanders will experience changes in their climate. And what will be different among the islands are the individual experiences and stories, and how they react. Islanders have much to learn from one another as they move through the 21st Century. For islands in the extreme northern and southern latitudes, the effects of changing sea-ice conditions on islandness have not been explored as thoroughly as they might.

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