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CANADA'S ARCTIC WATERWAYS: FUTURE SHIPPING CROSSROADS?

Ron Macnab

In the foreseeable future, diminishing sea ice in the Canadian Arctic could inspire the world shipping community to seek expanded access to the nation's northern waterways for conveying international cargo. It could also enable the increased exploitation and exportation of northern resources by Canada's mineral and oil industries. Given the potential economic imperatives, it might prove difficult for Canada to deny such use of these waterways, however it should be possible to apply effective measures for regulating the increased vessel traffic while ensuring the safety of navigation and the protection of the environment.

INTRODUCTION: SHRINKING SEA ICE AND GROWING SHIP TRAFFIC

Observations indicate that the thickness and extent of the Arctic Ocean's permanent ice cover are diminishing on a yearly basis. Within a few decades, this trend could cause significant portions of the region to remain navigable for longer periods than is presently the case. If this were to happen, the prospect of shortening the transit route for large vessels that shuttle between ports in the Atlantic and Pacific Oceans could motivate the world shipping fleet to consider using Canada's northern waterways with a view to improving the economics of intercontinental trade. For example, the length of the route between Western Europe and Southeast Asia is 12,600 nautical miles via the

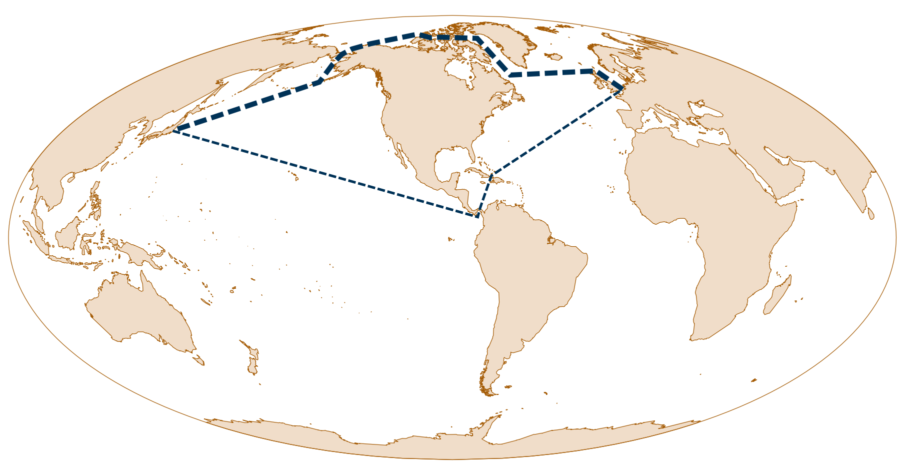

Figure 1
A comparison of shipping routes between Western Europe and Southeast Asia, via the Panama Canal (12,600 nautical miles, thin dashed line), and the Northwest Passage (7,900 nautical miles, thick dashed line).

Panama Canal, but only 7,900 miles via the Canadian Arctic (Figure 1). This shorter distance translates into a greater than one-third reduction in the time and cost of moving cargo between these two regions.

A reduction of the perennial ice cover might also make it practicable to initiate significant new operations for extracting hydrocarbons and minerals from the Canadian Arctic, and for loading those resources into the holds of bulk carriers for transport to southern markets. Therefore it is conceivable that shipping operations at the international and domestic levels could someday increase significantly in a region that has so far been largely immune to such activity on account of the need for reinforced vessels and specialized navigational skills.

Given these potential developments, there appears to be an argument for anticipating increased waterborne traffic in the Arctic Archipelago. While increased shipping activity would no doubt bring its share of new challenges, it should be possible for Canada to undertake preparatory action in the regulatory and technical fields, with a view to facilitating the efficient exercise of national rights and responsibilities in the region. This article enumerates a few of those problems, and suggests pre-emptive action (some of which is already in hand) for dealing with them.

PROSPECTIVE WATERWAYS THROUGH THE CANADIAN ARCTIC

The Canadian Arctic Archipelago (Figure 2) is threaded with numerous channels, bays, and inlets that in principle could accommodate large vessels. Of these, Parry Channel is the pre-eminent waterway and it is the one most likely to attract the attention of the international shipping community on account of its east-west orientation and its broad passages. From west to east, it consists of four smaller bodies of water: M'Clure Strait, Viscount Melville Sound, Barrow Strait, and Lancaster Sound.

To all present intents and purposes, Parry Channel remains impassable in its entirety at any time of year, on account of the persistent ice plug that blocks the western end of M'Clure Strait. However this could change as warming conditions induced erosion of the plug, and in so doing created an opening

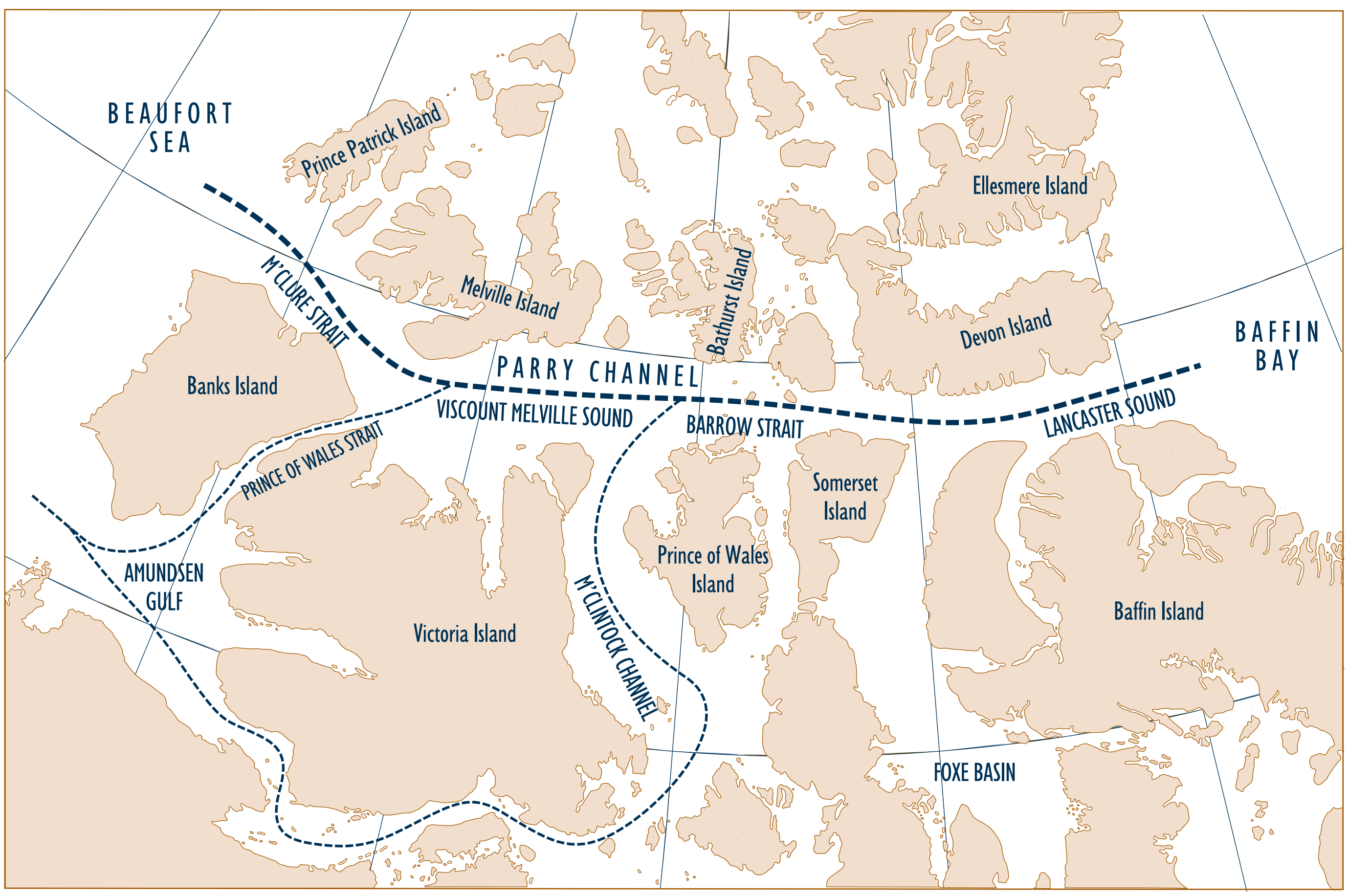

Figure 2
Map of the Canadian Arctic Archipelago displaying Parry Channel, along with its constituent bodies and tributary channels. The thick dashed line represents a potential route for international shipping if permitted by ice conditions in the western end of M'Clure Strait. The thin dashed lines illustrate alternative routes for bypassing M'Clure Strait, but these would likely be less attractive to international shipping interests.

that remained navigable by large vessels on a seasonal basis. In the meantime, there are two alternate routes for bypassing M'Clure Strait. Both require vessels to steer circuitous courses past Banks Island or Victoria Island to the south of Parry Channel, in order to reach Amundsen Gulf. These routes feature narrow and potentially hazardous waterways that could add significantly to transit times and distances. Moreover, their status as internal waters could impose additional juridical impediments upon foreign vessels. Therefore they are unlikely to be considered suitable for international transits.

Historically, the straits and channels that comprise the east-west route through the Canadian Arctic Archipelago have been designated as the Northwest Passage. With a length of 720 nautical miles, the section of the Passage defined by Parry Channel is considered to be the longest deep-water strait in the world, surpassing even the Strait of Malacca, which spans a distance of about 540 nautical miles between Indonesia and Malaysia.

While they have yet to designate specific routes, certain interest groups in Russia and Canada are proposing the "Arctic Bridge" concept, which would establish the high-latitude ports of Murmansk and Churchill as primary nodes for the exchange of manufactured goods and natural resources between the northern regions of Europe and North America. Conceivably, this could involve a trans-Arctic shipping link utilizing a north-south path through the Canadian Arctic Archipelago. The technical and economic feasibility of such a proposition has yet to be determined, however it is worth noting that Russian shipping expertise includes a substantial history of icebreaking operations in support of commercial shipping along the Northern Sea Route off the coast of Siberia, and in mobilizing regular tourist excursions across the central Arctic Ocean to carry paying passengers to the North Pole.

VESSELS ON THE HORIZON

Several different classes of vessels could be expected to ply an ice-free Arctic waterway. Commercial vessels would include freighters, container ships, bulk carriers, and oil tankers – all driven by the economic imperative of maximizing their cumulative payloads by minimizing the time spent in transit between loading and unloading. Notably, the cruise industry could develop into a significant presence in the North by catering to a growing market of affluent travellers seeking to visit remote and untamed parts of the world – for example, the number of tour cruises in the Canadian Arctic increased from one in 1990 to fifteen in 1999. A smaller and more enthusiastic population would include the owners and crews of private ocean-going yachts, eager to push their personal limits and to test the endurance of their craft by exploring a part of the world that in centuries past presented a formidable challenge to sailing vessels.

With enhanced conditions for locating and extracting minerals and hydrocarbons, domestic resource industries could trigger a substantial increase in Arctic marine traffic through the deployment of vessels for several purposes: marine exploration and exploitation (*e.g.,* seismic boats and drilling rigs); transportation of equipment and construction material for the mobilization of extraction facilities; re-supply of extraction sites and their associated communities; and transportation of resources to distant processing and distribution centres. Conceivably, the Canadian fishing industry might discover and begin to exploit lucrative new grounds in the region, adding a fleet of trawlers or other specialized vessels to the general mix. Also, in a world that is increasingly beset by regional wars and confrontations, an Arctic waterway might offer a secure route for the rapid deployment of military equipment and associated materiel.

Finally, an increased volume of Arctic shipping would likely generate a need for supplementary vessels to remain semi-permanently on station in order to provide support and other services on a quick-response basis: patrol vessels for surveillance, enforcement, and search & rescue; icebreakers for escort and ice management duties; small tankers for secondary fuel delivery; tugboats, barges, floating cranes, and other special-purpose craft.

THE NORTHWEST PASSAGE IN INTERNATIONAL AND NATIONAL LAW

Canada's Arctic waterways are totally encompassed within the country's Exclusive Economic Zone, however national jurisdiction over some of these waterways is subject to the provisions of Part III of the UN Convention on the Law of the Sea (UNCLOS): *Straits used for International Navigation.* In general terms, a state cannot deny international transit passage through a strait that joins "one part of the high seas or an exclusive economic zone and another part of the high seas or an exclusive economic zone" – an apt description of Parry Channel – although it is entitled to enact legislation relating to safety of navigation, pollution, fishing, customs, and immigration.

An important proviso to the above is contained in Article 234, *Ice-covered areas,* which entitles a coastal state to impose more stringent restrictions for the "protection and preservation of the marine environment" (it is significant that in all of UNCLOS, ice-covered waters are mentioned only in Article 234). In Canadian law, these restrictions are articulated in the *Arctic Waters Pollution Prevention Act,* which is perceived – in this country, at any rate – as a regulatory barrier to indiscriminate use of the Northwest Passage. However, the effects of this legislation may not be as long-lived as initially anticipated: if M'Clure Strait does become passable for significant periods, the provisions of Article 234 might become less demanding, leading international shipping interests to seek increased access to the Northwest Passage.

It has been argued that the Arctic's marine environment is unique among the world's oceans and seas, and that it therefore deserves special treatment under international law. It may be possible to make a case for exceptionality, but this would probably entail a complex and lengthy series of negotiations aimed at persuading regional and international interests that such action is warranted. Prior to the conclusion of the process, Arctic shipping could well become a reality, and efforts to impose a new legal regime might meet with substantial resistance.

SAFETY OF NAVIGATION

A paramount concern among mariners is the safety of their vessels, of their passengers and crew, and of their cargo. Conscientious seamanship is the key guarantor of that safety, however a ship's master must rely on information and guidance from a variety of external sources to assist with decision-making. Accurate charts, complemented with timely notices to mariners and aids to navigation (channel markers, coastal lighthouses, etc.), are essential for the avoidance of shoals and hazardous obstructions. Weather forecasts, along with tide and ice predictions, are necessary for recognizing conditions that could affect shiphandling and seakeeping, and which could necessitate evasive action. Traffic management systems complemented by knowledgeable pilots can assist mariners by designating optimum routes under prevailing conditions.

EMERGENCY PREPAREDNESS

Given its remoteness and the sparseness of its inhabitants, Arctic Canada has not figured prominently in a catalogue of major maritime catastrophes. Many if not most disasters are historical, featuring shipwrecks and lost expeditions in past centuries.

This could change if the Northwest Passage became an international transportation corridor, with the potential hazards that accompany the regular movement of large vessels carrying numerous passengers or sizeable cargos. In order to minimize disasters and to mitigate their effects, it would be prudent to assess beforehand the probability and seriousness of the human and environmental hazards presented by this increased shipping activity. Breakdowns, collisions, groundings, and sinkings would likely occur over time, as well as medical emergencies. Some of these incidents could result in injury or loss of life, not to mention the involuntary release of cargo that could be detrimental to the Arctic's sensitive environment.

Clearly, it would be desirable to develop a capacity for intervening quickly and effectively in a critical situation, whether it be to take a disabled vessel under tow, to mount a salvage operation in case of grounding or sinking, to evacuate ailing, injured, or stranded crew and passengers (consider the hypothetical case of a passenger liner in trouble), or to deal with environmental cleanup.

SHIP SERVICES AND FACILITIES

Future users of Canada's Arctic waterways would operate in remote and largely unsettled areas. Above and beyond safety of navigation, they could create a demand for services and facilities that may be only partially available under present circumstances. Icebreaker escorts would likely be first and foremost among these, maintaining open channels in areas of persistent ice cover, and assisting vessels in transit. Ready access to towing services and to ship repair facilities would minimize downtime and risk caused by mechanical breakdowns or hull damage. In the event of shipwreck, a rapid-response salvage service would be useful for recovering valuable cargo, or for clearing a blocked navigational channel.

For bulk loading operations, for shelter during extreme weather conditions, or for performing emergency repairs, a network of well-charted harbours would be desirable, complemented by a system of docks and anchorages. Within these harbours, fuel storage facilities might prove useful in the future, as could services for disposing of leaky, unstable, or breakaway cargo. Similarly, strategically-located facilities for dumping bilges and discarding waste would help prevent fouling of the Arctic shoreline, not to mention the introduction of non-indigenous aquatic species.

SECURITY AND SOVEREIGNTY

In the past, the Arctic's remoteness and persistent sea ice provided natural barriers to regular ship traffic. While there have been instances where sovereignty and security concerns made themselves felt, they could often be dealt with on an ad-hoc or low-level basis. A characteristic of these actions was that they tended to be instigated by isolated incidents or challenges that tested Canadian jurisdiction.

If the Northwest Passage did become a major international and domestic waterway, issues related to security and sovereignty would no doubt demand greater attention. This could trigger a variety of mechanisms for asserting Canadian authority. Frequent or standing patrols by naval and coast guard vessels would be needed for surveillance and for the enforcement of Canadian laws enacted for the protection of the environment, for the safety of shipping, and perhaps for regulation of the fishery. These patrols could be augmented by supervisory overflights.

Customs and immigration authorities would also need to establish a presence throughout the region. As in the south of Canada, their functions would be to monitor the entry of people and goods into the country, and to thwart attempts at illegal entry, such as human trafficking and the smuggling of contraband.

ANTICIPATING TRAFFIC IN THE NORTHWEST PASSAGE

With decreasing ice cover, Canada could begin to face international pressure for access to the Northwest Passage. Short of attempting to persuade the international community that Arctic waterways are unique and worthy of additional protection under international law, there may be limited options for holding back the parade of vessels waiting to get through. Nevertheless, Canada should be able to invoke provisions of UNCLOS and of national legislation in order to impose a level of control that would ensure orderly shipping operations within national waters, with minimal damage to a sensitive and so far relatively pristine environment.

Canada already has many of the legislative and technical tools for achieving this objective. *The Arctic Waters Pollution Prevention Act* regulates the conduct of shipping operations to promote the safety of shipping and the protection of the environment. Major Arctic waterways have been charted in whole or in part, with national expertise available to carry out additional surveys for describing navigational hazards, and to designate traffic separation schemes for the prevention of collisions.

In view of the environmental risks associated with major shipping operations, investigations would be required to assess the scope of any potential damage, and to determine appropriate response measures. This research would include sensitivity studies to identify coastlines and species at risk from anticipated sources of pollution. Prior mapping and sampling in key locations would establish baselines for assessing levels of degradation caused by future spills and dumping. Detailed tidal and current studies would enable the development of reliable models for predicting water movement throughout the Archipelago, and for estimating the direction and range of pollutant transport.

Key to the above would be the establishment of a regional infrastructure capable of providing a range of supervisory and service functions including, but not limited to: law enforcement, pilotage and traffic management, maintenance of aids to navigation, environmental protection, vessel towing and repair, and emergency response. Building and operating this infrastructure would be costly, but failing to do so could be more costly. It is beyond the scope of this paper to perform an economic analysis of the associated costs and benefits, but it would be necessary to devise a schedule for recovering those costs from users of the Northwest Passage. Presumably, the level of user charges would be based on vessel tonnage and on services rendered during transit.

Not discussed in this essay is the potential impact of major shipping operations upon Arctic settlements and lifestyles. There would be considerable scope for disruptions caused by environmental accidents, or by encroachments upon wildlife habitats and traditional hunting grounds. By then, however, the latter issues might be rendered moot on account of the effects of global warming and of thinning ice, which could be profound. On a compensatory note, it is conceivable that increased industrial activity in the form of shipping, tourism, or resource extraction could significantly improve the regional economy for the benefit of Canada's northern communities.

CONCLUSION

With the prospect of thinning sea ice over the next few decades, the waterways of Canada's Arctic could become a new shipping corridor for international and domestic vessel operators. Undoubtedly, there would be risks and problems associated with this development, however with proper advance planning accompanied by astute preparation, it should be possible to implement the necessary controls for ensuring an orderly flow of traffic with minimal harm to the environment. Major shipping operations in the Arctic are not likely to develop overnight, but the implications of such a development merit consideration now, in light of the significant lead times that would no doubt be needed to prepare for increased levels of traffic.

Ron Macnab (Geological Survey of Canada, Retired) is a marine geophysicist who maintains an interest in the Law of the Sea. He lives in Dartmouth, Nova Scotia.

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LEARNING FROM HISTORY: LESSONS FOR CUMULATIVE EFFECTS ASSESSMENT AND PLANNING

Michelle Boyle, Hadi Dowlatabadi, Milind Kandlikar, Susan Rowley

Is the Arctic context changing too rapidly and unpredictably for lessons from the past to have useful application in future assessment and planning? We explore this question by formulating a methodology based on historical patterns of development to estimate cumulative effects and draw lessons for regional planning. By paying heed to how defining variables of development patterns are expected to change, we conclude that history can provide valuable input into decision-making about future development options.

INTRODUCTION

It is now more than a decade since the discovery of high levels of contaminants (PCBs) in the breast milk of nursing Inuit mothers shattered the romantic image of the Canadian Arctic as a pristine environment. We now know that Earth's biological, chemical and physical flows bring a wide range of pollutants to the Arctic. We also know that this region likely will experience the most dramatic change in climate as greenhouse gases accumulate in the atmosphere.

Because of the Arctic's small, scattered population and vast area it is less often acknowledged that human activities there also have the potential to cause significant environmental effects. Local impacts are important for several reasons. Arctic ecosystems, enduring harsh conditions and seasonal sunlight, are relatively fragile and require more time to recover from disturbance (Forbes *et al.,* 2001, UNEP 1997). Also, pollutants released within the Arctic region tend to remain there. For example, aerosols are trapped by the cold, stable atmosphere, and contaminants are absorbed and magnified in lipid-rich food chains[1] (AMAP 2002). Finally, the Arctic system plays a significant role in global climate dynamics through sea ice, oceanic heat transport and carbon budgets (IPCC 2001). Therefore, any activities within the region that can amplify feedback processes, such as land use disturbance, have the potential to modify worldwide climate changes[2].

The above observations reflect changes only in the biophysical environment. The impacts on society are far more complex. Impact intensity is a function of cultural interpretation and the capacity to deflect, absorb or adapt to change. Measures to address change must also be socially acceptable; and in the Arctic persistent economic and social problems complicate the search for response options.

People have been repeatedly surprised by the extent to which human activity has damaged the environment. We need to incorporate the lessons learned from history to plan future development that avoids both inadvertent and intentional environmental damage. The environmental assessment process – particularly cumulative effects assessment (CEA) – is useful in preventing damage and in monitoring the impacts of development. CEA estimates prospective cumulative effects at the project level, in an attempt to anticipate and mitigate potentially adverse interactions with other projects and activities[3]. Actual cumulative effects can be measured only after the project impacts have accrued to larger temporal and spatial

1 Environmental pathways of pollutants and contaminants include air, water, snow, ice, flora and fauna. Climate change could have significant and uncertain effects on these pathways to and within the Arctic, and thus on the fate of pollutants in Arctic ecosystems and people.

2 For example, melting permafrost releases carbon (an important greenhouse gas) stored in the frozen ground. Disturbing the surface by mining, constructing roads or other land use changes may accelerate this climate feedback. The prediction of ultimate outcomes is difficult because of the complex interactions between processes like carbon emissions, temperature, precipitation, cloud cover, nutrient cycles, etc.

3 Cumulative effects include a variety of impacts from a single project or many projects in combination, over time and space. Griffiths and McCoy [no date] discuss frequency, density, synergism, time and distance lags, thresholds, fragmentation, and incremental and indirect changes as important factors in cumulative effects.

scales. This assessment may be done in the context of regional planning or monitoring initiatives.

In order to understand cumulative effects, we need to measure all the changes a project introduces into a natural setting. We also need to understand how these changes interact with everything else that is happening (or may occur at some future time) due to other disturbances brought about by local and distant developments. The challenge is like throwing a stone into a pond and working out how each ripple will propagate and interact with any other ripple (present or expected). Thus, assessing cumulative effects is difficult, for two reasons: a) because of the complexity of changes and interactions over space and time, and practical issues in measurement and detection (see Table 1); and b) because it is hard to know what may come in the future. Measuring and detection are especially daunting tasks in the Arctic region because of a general lack of data at local and regional levels, as well as uncertainty as to how the baseline (the surface of the pond) is shifting in response to the influx of pollutants and the onset of rapid climate change.

The relative isolation of areas of development in the Arctic provides an unusual opportunity to study how single projects have led to subsequent development. Understanding this process is a fundamental challenge in CEA, and in order to do so we can make use of the historical record. The Canadian Arctic (defined for our purposes as the Yukon, Northwest Territories and Nunavut) has over 200 years of historical experience of development, beginning with the establishment of the first permanent settlements by peoples of European descent[4].

We received funding from the Canadian Environmental Assessment Agency to explore a methodology that uses historical patterns of development to anticipate future

Table 1: Key challenges in estimating cumulative effects

Challenge	*Description*	*Example(s)*
Legacy of past events	Lack of information or lag in impacts confounds attribution of their source.	• Discovering specific projects responsible for poor water quality in an area with a long history of mining and other human activity • Attributing causes for high cancer rates
Changing baselines	The interaction of local and higher scale processes makes it difficult to predict the impact of projects*.	• Climate change and long-range pollutant transport must be considered in local impact assessment
Interaction of impacts on valued components	The combined impact of two or more interacting projects is uncertain; the impact may be either amplified or attenuated.	• The impact of a road through a calving ground is amplified by food scarcity due to land use change to decrease caribou populations • High nutrient run-off may increase fish populations, while more people in the area increases harvest and decreases populations
Interaction of projects in inducing further development	The emergent pattern of development from an initial project is a function of all projects and their sequence.	• An airfield followed by a radar station will create a different subsequent pattern of development than an airfield followed by a tourist lodge
Uncertainty in future context	It is not known how various socio-political, technical and economic factors may lead to new patterns of human activity and development.	• The establishment of the DEW Line in the Arctic region would not have been imaginable in the 1930s
Changing definitions of what is valued	The evolution of impact assessment and measurement leads to a lack of relevant historical data and comparative assessments.	• New domains of valued components (*e.g.,* socio-economic impacts, sustainability) • New indicators to characterize valued components (*e.g.,* "effects to worker families", in addition to simply "jobs") • New understanding of ecosystem dynamics (*e.g.,* thresholds, TEK**)

* "Projects" includes other human activities; both always interact with natural processes.
** Traditional Ecological Knowledge.

development, estimate cumulative impacts, and forge links to regional planning. Our ultimate goal is better decision-making toward more sustainable development in the Arctic and elsewhere. To this end, we first recognized that the methodology must be acceptable to assessors and easily adopted as common practice within the current legislative framework. The key to its usefulness in future assessment and planning, however, is that it must be a robust template for estimating how present development initiatives lead to future projects. This point is especially pertinent in the Arctic since it is experiencing rapid and significant change simultaneously on several fronts: environmental, economic, socio-cultural, institutional, and technological.

The methodology is based on the concept that major development projects can act as catalysts to induce further development. For example, a road built to supply a new mine could provide the infrastructure for development of proximate deposits. Mines and workers require a variety of materials and services that may be drawn from nearby communities, or perhaps a new community would form in the area of the mines. In some cases this catalyst effect is intended (as in the proposed Bathurst Inlet Port and Road project), but often it is unplanned. Alternatively, the initial project might attract little or no further development, regardless of intent. Can we anticipate the pattern of development that emerges?

In answering this question, history becomes important because it can reveal patterns in how development occurs. The past also creates a legacy for the present in terms of both opportunities and constraints for development. To explore these ideas, we created a database of 267 development projects categorized by type (*e.g.*, mines, roads, airports, radar stations, etc.) and 78 communities, and then constructed an algorithm to relate them over time and space. This simple model can be used to conduct an analysis of broad patterns of development, and to estimate the type and likelihood of development projects that may follow a proposed project in order to estimate cumulative effects.

Figure 1
Year and duration of project "starts" for major categories of development drivers across all three Canadian Territories (1a). Nunavut (1b) has consistent drivers but shifted in time, likely due to restrictions to access in the eastern Arctic. "Services" includes both hubs (transportation and supply) and social service centres (health and education). "Government" refers to Territorial and Federal offices as a major employer. Religion was also a significant driver in roughly the same time period as trading posts but is not included in the graph due to insufficient data for the Yukon; missions were established in NWT between 1852 and 1962, and in Nunavut between 1900 and 1960. Activities that are less easily isolated or measured, such as fishing, forestry and arts and crafts have contributed to subsistence and economic activity throughout. Communities are a result of development drivers but are included here for comparison.

Figure 1(a) Development Drivers – All Territories

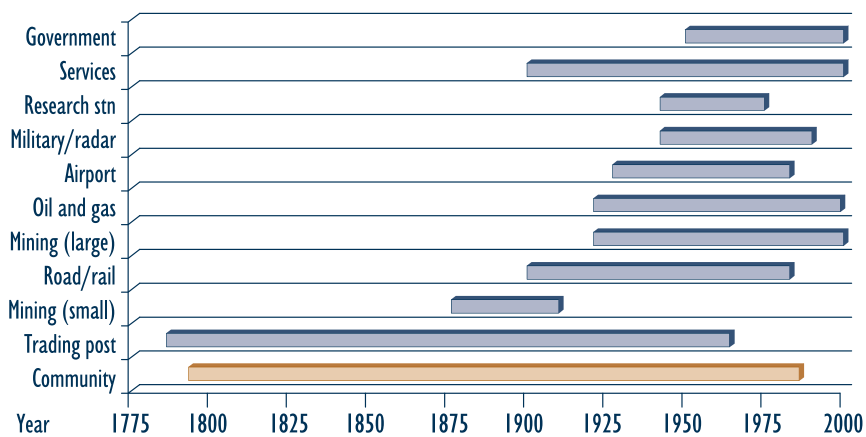
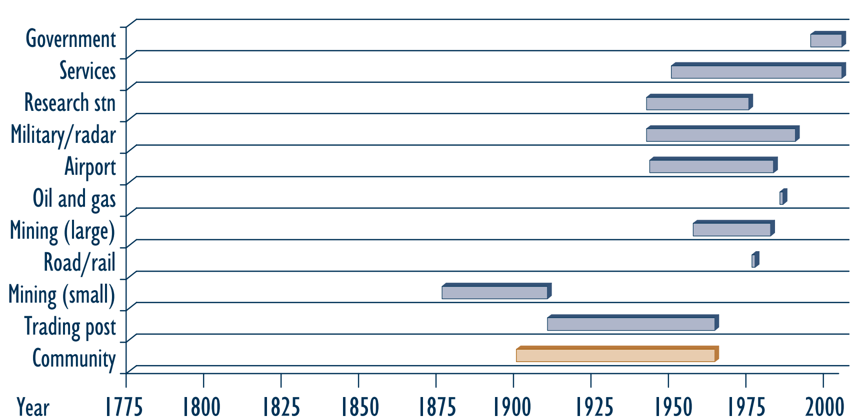


Figure 1(b) Development Drivers – Nunavut



4 "Development" here includes resource projects and economic activities, associated infrastructure, and communities to accommodate and service people and industries. The term is distinguished from the societal development attained by aboriginal peoples over centuries of skilled adaptation prior to the arrival of Russians and Europeans. It is the modern phase of development, marked in its ability to affect the environment at a much greater scale, which is of concern in this paper. However, traditional perspectives may offer innovative solutions to sustainable development.

HISTORICAL PATTERNS OF DEVELOPMENT IN THE CANADIAN ARCTIC

The motivations or drivers of development in the Canadian Arctic have evolved over time, but remain limited in number. Figure 1(a) shows the time periods when historical drivers were a significant factor in catalyzing development across the Canadian Territories. Figure 1(b) isolates Nunavut to reveal a consistent pattern of development drivers, but shifted in time[5]. This observation implies determinants of development. We can hypothesize, for example, that more restricted access and logistic challenges are critical factors that have resulted in the later development of Nunavut[6].

Initially, shifting settlement patterns resulted from the locations of biological resources that aboriginal peoples need for subsistence. Then Europeans began to arrive to exploit mostly whales and fur-bearing species. The first permanent communities grew up around trading posts and missions established to exchange products and to service these industries. Non-renewable resource exploitation subsequently became a main motivation for development. The economic formula for extracting deposits was (and is) a function of value and volume of the resource, and ease of access. Easily reached deposits were mined first by individuals or small companies. It took large companies with sophisticated technology to extract and transport high volume minerals, or oil and gas. Mineral and hydrocarbon exploration and exploitation received an enormous boost during and after the Second World War. The Canadian and U.S. governments provided financial incentives and greatly improved access by expanding the system of roads, railways and airports. The War also brought security and sovereignty into focus. Military bases were established, and the Distant Early Warning radar system (DEW Line) was built across Alaska, Canada and Greenland in 1955–57. Today, resource exploitation continues to be vital for development, but government, health and education services now employ more people and are the economic centre of many communities.

The challenge in creating a robust template to anticipate future development is in striking the right balance between accepting historic patterns and allowing evolution of

Figure 2
Dawson (2a) boomed in 1896–98 reaching a population of more than 30,000, experienced a bust after prospectors sought other gold finds, and further declined when the Alaska Highway bypassed it in favour of Whitehorse. This boom/bust economic and population cycle is common to other towns with the single driver of mining (2b). There are some exceptions that began as mining towns and demonstrate more stable population and economic growth (*e.g.,* Yellowknife 2a); these were able to prolong the development of proximate resources and/or diversify into other activities such as services or government. Studying many such examples gives clues for more sustainable development in the future.

Figure 2(a) Historical Population of Dawson and Yellowknife

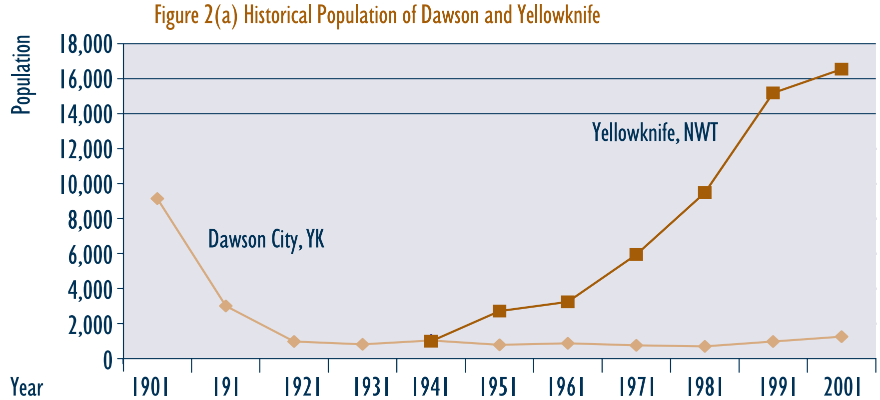
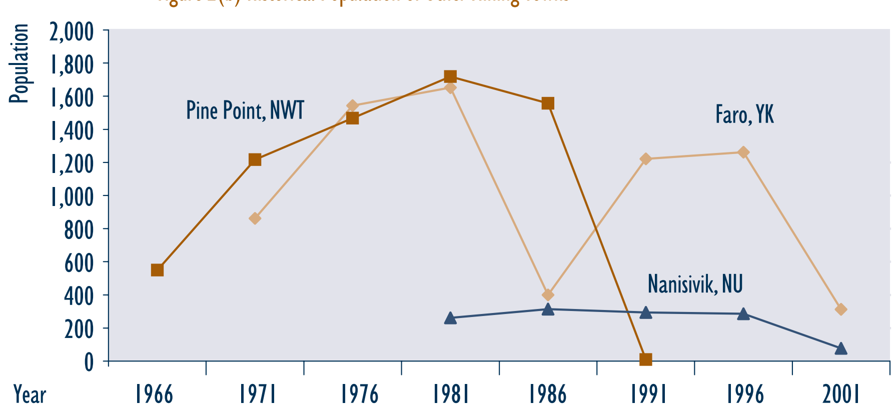


Figure 2(b) Historical Population of Other Mining Towns



5 There are some differences. Nunavut did not experience the equivalent of the "gold rush" that occurred in the western Arctic (early mining activity involved mica operations and iron exploration; reports of gold on Baffin Island turned out to false). In general, the logistics challenges of mining Nunavut's resources rule out small-scale operations. Nunavut also relies on shipping and air cargo for transportation, rather than road or rail (the only inter-community road is 28 km from Nanisivik to Arctic Bay), but this may soon change given proposed and conceptualized road projects.

6 Although explorers of the Northwest Passage and surveyors for the Geological Survey of Canada had an early and strong interest in the eastern Arctic, business interests were likely deterred by the difficulty and cost of resource exploitation relative to the western Arctic.

these patterns in response to changing values of people and communities. For example, throughout the last two centuries, there have been a number of other drivers of economic development, among them fishing, forestry, and co-operatives for arts and crafts or hunting. Trapping still contributes to individual income local economies, but it is no longer a significant driver of development. While these activities are less lucrative from an overall perspective, their potential importance in subsistence and economic diversification, now and in the future, cannot be ruled out.

At the local level, the Yukon Gold Rush offers one of the most dramatic examples of how development opportunities and communities co-evolve. The town of Dawson, which sprung up after the discovery of gold at Bonanza Creek in 1896, had a population of between thirty and forty thousand within two years – with all the expected challenges in meeting infrastructure, service and social needs. The bust came quickly when prospectors were drawn to Alaska, and by 1911 only about 3,000 people remained. The Alaska Highway bypassed Dawson on its way to Whitehorse (supplanting Dawson as the Territorial capital) and its population never recovered. Currently, there are about 1,200 residents.

Studying many such examples can lead to lessons for future development. Single driver mining towns often demonstrate this classic boom/bust trend (Figure 2). Other mining towns such as Yellowknife have managed to diversify, and continue to grow. Figure 3 categorizes existing communities by their initial development driver, suggesting areas for further research on the long-term success of communities motivated by various types of development.

At the regional scale patterns emerge in the structure of settlements (Figure 4). Each Territory is distinct. The Yukon supports many more small communities, likely a reflection of greater road access; by contrast, Nunavut communities receive their supplies by annual sea-lift or costly air cargo, making it difficult to maintain and service small communities. Over half of Nunavut communities support 600 to 1,300 people, suggesting one or more key factors at this scale[7].

Figure 3
The relative importance of various drivers in the establishment of 79 existing communities across the three Territories is shown. "Bio-commercial" refers to both trading posts and whaling stations, and "bio-subsistence" refers to traditional resource harvesting areas that eventually became permanent settlements. "Military" includes bases and radar stations. "Services Hub" implies a strategic location for transportation and supply to other areas, while "Services Social" refers mainly to health and education facilities provided by government. Some communities were formed through government "Relocation" to areas where food was more plentiful or services more efficiently supplied.

Figure 4
Overall, communities of less than 1,000 are most common. However, there are distinct patterns for each Territory, potentially associated with ease of access and cost of maintenance. The Yukon with more roads and links to the south has the greatest number of small settlements. A higher critical mass of people is preferred in Nunavut where the trend tends to communities of size 600 to 1,300.

Figure 3 Relative Importance of Initial Drivers in Existing Communities

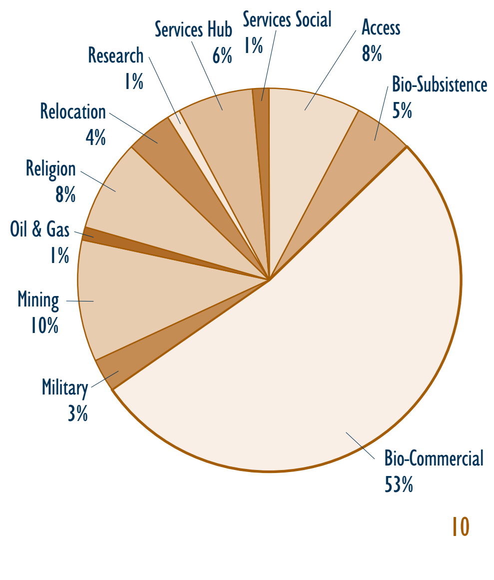
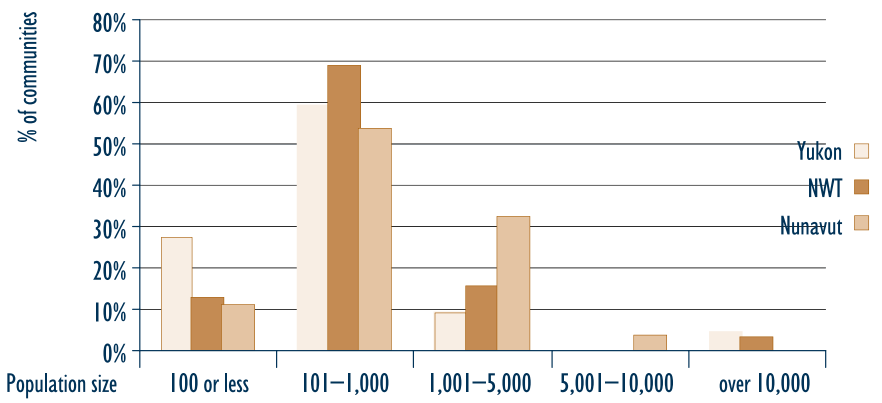


Figure 4 Relative Distribution of Community Populations



ESTIMATING THE CUMULATIVE EFFECTS OF INDUCED DEVELOPMENT PROJECTS

Analysis of historic patterns may bring insights about regional planning and the cumulative effects of induced development, which can then be used in developing patterns that are more sustainable and socially acceptable.

In cumulative effects assessment, legislation dictates that the impacts of a proposed development project on "valued components" (such as water quality or caribou) must be considered in interaction with past, present and future projects. Because it is difficult to predict future development, usually only projects already in the approvals process (and thus highly likely to go ahead) are included in the analysis.

Our database of development projects gives us the ability to assign probabilities for induced development based on empirical evidence. For example, in the Northwest Territories mines have been established within 100km of roads, within 30 years of the road's construction, in 3% of cases. Construction of another road within 100km of the first road occurred 9% of the time. Within the database temporal and spatial ranges can be adjusted to whatever is relevant for assessing the valued component of interest, and the baseline can be chosen to most closely reflect current or local conditions (*e.g.,* comparable geographic conditions or times when similar development policies were in place). We emphasize that these numbers are suggestive only and must be considered in the context of all other relevant pieces of information.

Estimating cumulative effects using these probabilities is relatively straightforward. First, we identify the temporal and spatial range where the interaction of projects and activities could influence each valued component. Next, we identify the number and type of potential projects in that range, each multiplied by the appropriate probability of occurrence (calculated from the database). Their aggregate, the "cumulative impact multiplier", represents an estimate of the additional impact on the valued component by induced projects.

CONCLUSIONS AND NEXT STEPS

The methodology is limited by its dependence on large numbers of projects (events) in the historical record to generate reliable probabilities, and in its base assumption that projects located together in time and space are related rather than merely coincidental.

The approach has several benefits: It can provide insight into the type and likelihood of future developments yet to be realized. It is most useful in circumstances where there is a lack of local baseline information. And finally, it is easy to implement.

A further benefit of this approach is the value of studying past patterns of development for planning more robust patterns of development in the future. The methodology permits us to determine the drivers and circumstances that led to more diversified and sustainable communities, and to distinguish these from initiatives that resulted in failed or persistently dependent communities. Such insights are critical to strategic planning for a more sustainable Arctic region, whether viewed from the perspective of a regulator or a private or public investor.

At the beginning of this article we posed the question, "Can historical patterns be helpful when the Arctic context is changing so rapidly?" If applied carefully, the answer is yes. We can determine the useful boundaries of a pattern by assessing the impact of expected changes on its defining variables. We do this by performing sensitivity analyses across the range of likely values to see how previously observed patterns might respond in novel circumstances. For example, we know that access has always been a limiting factor in northern development. Climate change may improve routes for shipping, yet make overland travel more difficult or costly in areas where continuous permafrost begins to thaw. An assessment of the rate and magnitude of such changes can tell us the extent to which opportunities and constraints on development might shift. As in all analyses, conscientious description of the uncertainties is necessary to convey the reliability of predictions.

Several lines of inquiry extend from this initial research project. We can improve upon the cumulative effects methodology by gathering more data on past development projects and activities, refining categories of development, and more thoroughly analysing determinants of development patterns. We also can apply and expand our knowledge of development patterns to inform regional planning initiatives and strategies for more sustainable arctic communities. Finally, we can conduct a comprehensive and integrated analysis of expected changes in the arctic region and assess the implications for economic and community development into the future.

The wisdom of the elders accumulated over generations has long been a guide to sustainable livelihoods in the Arctic. Here, it seems, we can learn from their legacy and apply knowledge of the past to understanding the future in new and unexpected ways.

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7 There are several possible factors. There may be some economic or service provision efficiencies of scale in this range. It could also be due to the fact that Inuit -miut groups prefer to remain in their traditional areas rather than move to large centres. Another possibility is that the community population distribution reflects Nunavut's policy for decentralization of government offices and jobs to communities (although recipient communities account for only a third of those in the 600 to 1,300 range).

Michelle Boyle is a Ph.D. candidate at the Institute for Resources, Environment and Sustainability, UBC; Hadi Dowlatabadi (Canada Research Chair in Integrated-assessment Modelling and Global Change) and Milind Kandlikar (assistant professor) are with the Sustainable Development Research Initiative, UBC; Susan Rowley is assistant professor of anthropology and sociology and curator of public archaeology, Museum of Anthropology, at the University of British Columbia.

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CANADA AND THE INTERNATIONAL POLAR YEARS

Claire Eamer

The first International Polar Year (IPY), 1882–83, almost didn't happen. Even with the start date delayed for a year, the nations involved in polar exploration and research were slow to commit to the project. Canada – barely a dozen years old at the time – helped tip the balance.

The IPY was inspired by Austrian naval officer and physicist Karl Weyprecht, who began campaigning in 1875 for a full year of international, coordinated scientific research in the polar regions. However, European wars and national and personal rivalries intervened. The study period was moved from 1881–82 to 1882–83, but even then some nations didn't sign on until the spring of 1882, only months before the start of observations.

Britain was one of the last nations to join, despite its centuries of polar exploration. The factor that tipped the balance was a modest sum of money voted by the Parliament of Canada to help finance the establishment of an IPY observatory at Fort Rae, a Hudson's Bay post on Great Slave Lake in the Northwest Territories. As a result of that donation, Canada is listed as one of the participating nations in the International Polar Year.

In the end 11 nations sent 14 separate expeditions to locations in the polar regions, 12 to the north and 2 to the south. Three of the northern observatories were located on what is now Canadian soil. The four-man British-Canadian expedition led by Captain Henry P. Dawson was the most southerly of the three at 62°39' north latitude. The German Polar Commission established an observatory on Baffin Island at Qinngua (Kingua Fjord, north latitude 66°36') in Cumberland Sound. The third Canadian-based observatory was the furthest north of all the IPY observatories and one of the most ambitious. Established by the United States Signal Corps at Lady Franklin Bay on the northeast coast of Ellesmere Island, at 81°45' N, the observatory was christened Fort Conger and operated for a full two years, from 1881 to 1883.

The American expedition to Fort Conger was also the one true disaster of the IPY. A combination of bungling and indifference at home and bad ice conditions in the waters between Greenland and Ellesmere meant that scheduled relief ships did not appear in the summers of 1882 and 1883. When the second ship failed to reach Fort Conger, the expedition's commander, Lieutenant Adolphus Greely, followed orders and led his party of 25 south in search of rescue. They spent the winter stranded on Cape Sabine, slowly starving. By the time a ship finally reached them in June 1884, only seven men, including Greely, remained alive, and one of those died on the voyage south.

The disastrous ending of the Fort Conger expedition should not diminish its accomplishments and those of the other expeditions. For a full year, they took and recorded meticulous observations of meteorology, magnetism, and auroral activity. The same rigorous schedule of observations was also kept at other temporary observatories in sub-polar regions and 39 permanent observatories in 25 countries around the world. The schedule required manual observations every hour and, during special periods, every 20 seconds, all synchronized to the time in Göttingen, Germany. All this was

Balfour Currie (centre), with RCMP Constable Yates and local hunter Singaqtuq preparing for the twenty-mile dogsled trip to "Fort Sik-Sik", a sod hut used for auroral observation. (Second International Polar Year, 1932–33, Chesterfield Inlet). Photo: University of Saskatchewan Archives.

accomplished under extremely difficult conditions and without benefit of modern communications.

Chance also played a role in determining the ultimate value of the observations made during the IPY. The famous eruption of the volcano Krakatau occurred in 1883, toward the end of the IPY observation schedule. IPY atmospheric observations in the aftermath of that eruption were still providing useful information a century later and have helped our understanding of processes that affect Earth's climate.

However, in the immediate wake of the IPY, the scientific achievement of the year was overshadowed by worldwide political and economic turmoil. When the idea of a second International Polar Year surfaced in 1927, the world was a dramatically different place. The waning of the European age of empire and the cataclysm of the First World War had reshaped the globe's human systems. Changes in technology and advances in science had reshaped the human view of polar processes.

In the 19th century, the vagaries of Earth's magnetic field had been a problem for ocean navigation. In a dawning age of air travel, the problem was even more pressing. The curious effects the aurora appeared to have on Earth's atmosphere and magnetic field also took on new importance with the spread of radio communications. Moreover, scientists had begun to recognize the controlling role played by large weather systems circulating in the polar regions on the global climate.

Planning began for a second IPY in the late 1920s, with the 50-year anniversary of the first IPY, 1932–33, as the target year. By the time the anniversary rolled around, the Great Depression had struck and the IPY had to be reduced substantially. Nevertheless, 44 nations took part in the program of observations, and 22 nations set up observing stations outside their own borders. Observations focussed on climate studies related to the role of polar systems, geomagnetic studies, and solar and auroral studies.

This time Canada had ambitious plans for direct participation in the IPY, with three temporary observatories north of 60 – at Chesterfield Inlet off Hudson Bay, Cape Hopes Advance in Hudson Strait, and at Kugluktuk (Coppermine) on Coronation Gulf. A fourth permanent observatory at Meanook, Alberta, also recorded the prescribed observations. In the end, economic realities reduced the staffing levels and resources of the program, but all four observatories functioned to some degree.

The primary Canadian station for the second IPY was located at Chesterfield Inlet and staffed by four young men, all in their twenties. Frank Davies and Balfour Currie were physicists, both associated with the University of Saskatchewan and McGill; Stuart McVeigh had responsibility for meteorological observations; and John Rae was hired to handle logistics and provide general assistance. The four men and all their gear travelled north by train and ship.

They spent the year following a strict schedule of meteorological, magnetic, and auroral observations, launching balloons and kites to study the upper atmosphere, and photographing the auroral display. The attic of their borrowed house, where the temperature rarely moved above freezing, served as a darkroom. Balfour Currie, the party's darkroom specialist, warmed the developing liquid downstairs and then carried it to the attic and rushed through the developing process before the chemicals congealed in the cold.

The information collected at Chesterfield Inlet and at the other Canadian stations in the second International Polar Year remained the foundation of Canadian scientific knowledge about polar regions for decades afterward. But even more important was the experience Canadian scientists gained in the IPY. Balfour Currie went home to the University of Saskatchewan after his year at Chesterfield Inlet and continued his interest in auroral studies, eventually as head of the university's Physics department.

Fifty years after IPY2, Dr. Gordon G. Shepherd of the Centre for Research in Experimental Space Science at York University wrote: "The real legacy of Chesterfield Inlet is not a string of discoveries, but rather the number of upper atmospheric and space scientists, who trained at the University of Saskatchewan and now are working throughout Canada and other parts of the world. It was only because of Currie's success at Chesterfield Inlet, and in gleaning the results afterwards, that the University of Saskatchewan was able to embark on upper atmospheric physics at such an opportune time, in the early fifties. Currie's contribution enabled Canada to participate actively in space science in the latter part of the 1950–60 decade. That is the real legacy of Chesterfield Inlet and Balfour Currie." (*The Musk-Ox,* No. 35, Spring 1987, p. 42)

Currie's experience and his legacy were drawn upon 25 years after his Chesterfield Inlet adventure, when the third International Polar Year was transformed into the International Geophysical Year (IGY). The IGY, which actually ran for 18 months in 1957–58, was a vastly expanded version of an IPY, fueled by the prosperity and technological progress of the era following World War Two and the international competitiveness of the Cold War. The scope of the exercise extended well beyond the polar regions, applying the IPY technique of simultaneous

John Rae and Stuart McVeigh used kites and balloons to take meteorological observations at Chesterfield Inlet during the second International Polar Year (1932–33). Photo: University of Saskatchewan Archives.

observations to the geophysical systems of the entire globe. All told, 67 nations took part, studying 14 themes that ranged from geomagnetism to the new fields of rockets and satellites.

Balfour Currie's auroral specialists at the University of Saskatchewan were part of the substantial Canadian effort in the IGY. The National Research Council led Canada's program, but the work of the IGY was decentralized and distributed among universities and research groups with particular strengths. "Special instances of extensive cooperation might be mentioned", wrote Dr. J.H. Meek in a 1959 report on Canada's participation. "The Physics Department of the University of Saskatchewan supervised the operation of a number of magnetic and auroral stations in Western and Northwestern Canada. In addition, that department carried out an extensive auroral program in conjunction with the Defence Research Northern Laboratory at Churchill."

The IGY was a massive undertaking, well beyond the scope of any previous and probably any succeeding IPY. It was the occasion for a number of firsts, including the first extensive program of Antarctic research and the first launch of an artificial satellite. Its legacy includes the international treaty governing the Antarctic and, to some degree, the space age. Canada was a full and very active participant in most aspects of the IGY, including contributing one of the leading international organizers, the respected University of Toronto geophysicist J. Tuzo Wilson.

The IPY currently being planned for 2007–08 returns to the traditional focus on the polar regions – although with a new understanding of the importance of those regions in global processes. Between each of the previous IPYs, the world changed dramatically, affecting the nature of each scientific exercise. The world has changed again since 1957–58, and the 2007–08 IPY will undoubtedly reflect that change. This time Canada will participate not just as a member of the world scientific community but also as a member of the rapidly-maturing international community of circumpolar nations. How that shift will be reflected in Canada's IPY has yet to be determined.

Claire Eamer is Coordinator for the Yukon Office of the Canadian Climate Impacts and Adaptation Research Network (C-CAIRN North) in Whitehorse.

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CANADA AND IPY 2007–08

In 2007–08 the international polar research community will celebrate the 125th anniversary of the First International Polar Year (IPY), the 75 th anniversary of the Second IPY and the 50th anniversary of the International Geophysical Year (IGY). The IPY and IGY were major initiatives that brought significant new insights into global processes and laid the foundation for decades of invaluable polar research. International Polar Year 2007–08 offers a chance to build on existing programs and develop an exciting range of education and outreach activities that will attract the next generation of polar scientists and engage the public. An intense, global campaign of coordinated polar observations and analysis, it will be bipolar in focus, multidisciplinary in scope, and truly international in terms of participation.

The international effort will be coordinated by the IPY Joint Committee established by the International Council for Science and the World Meteorological Organization. Each participating country has been asked to form a national IPY committee. In Canada, the Canadian Steering Committee is supported by the Canadian Secretariat, which is hosted at the University of Alberta, and works in concert with the Canadian Polar Commission and the IPY Federal Working Group to coordinate Canada's IPY initiatives. The Canadian IPY Steering Committee's role is to ensure that Canadian IPY activities address both Arctic and Antarctic regions, involve scientists from a range of disciplines, and maintain a focus on compelling scientific questions.

CANADIAN IPY STEERING COMMITTEE MEMBERS

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Dr. Charles Bélanger, Laurentian University
Dr. Gérard Duhaime, Université Laval
Mr. Ian R. Church, Yukon Government
Dr. Nancy Gibson, Canadian Circumpolar Institute, University of Alberta
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Mr. Geoff Green, Students on Ice
Dr. Peter Harrison, National Research Council of Canada
Dr. Helmut Epp, Government of the Northwest Territories
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Dr. Sally Webber, Yukon College

EX-OFFICIO

Mr. Steven Bigras, Canadian Polar Commission
Mr. Paul Dufour, Office of the National Science Advisor, Privy Council Office
Dr. David Hik, Canadian IPY Secretariat

More information is available at Canada's International Polar Year web site, at www.ipy-api.ca.

NEW WEBSITES

CANADA'S INTERNATIONAL POLAR YEAR 2007–08 WEB SITE

www.ipy-api.ca

This website provides current information about the Canada's IPY research efforts. It also contains discussion fora and links to the main IPY website hosted by the International Council for Science, and to the IPY websites of other nations.

KITIKMEOT HERITAGE SOCIETY

www.kitikmeotheritage.ca

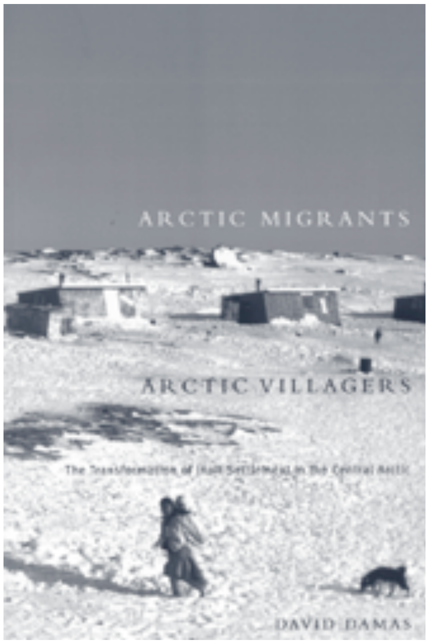
The Kitikmeot Heritage Society preserves, promotes and celebrates the history, culture, language and diversity of the people of the Kitikmeot region of Nunavut.

John MacDonald

Arctic Migrants/Arctic Villagers primarily offers an account of the Canadian government's settlement policies in the Central Arctic (now largely Nunavut) during the 1950s and 1960s. The book is also touted as challenging the current perception that these policies coerced Inuit into abandoning their traditional hunting camps in favour of settlement life.

Damas goes about his task with vigour and thoroughness. Page after page is filled with exhaustive – occasionally exhausting – clinical detail documenting the government's northern policies, the pros and cons of "dispersal" versus "in-gathering" of Inuit populations, and finally the historical, economic and political factors leading to the settlement pattern and social conditions across Nunavut today.

Relentlessly, the book explores the intricacies of two very different approaches to northern administration embodied in what he terms the "Policy of Dispersal" and the later "Welfare State Policy". Characterized as "austere and preservationist" the Policy of Dispersal, aided and abetted in the field by the Royal Canadian Mounted Police, the Hudson's Bay Company, and the Anglican Church, conspired to keep Inuit on the land. "In-gathering" or "loitering" of Inuit around trading posts, was actively discouraged – by some accounts prohibited – on the grounds that it would lead to a retreat from the hunting and trapping economy, an increasing dependency on nascent welfare programs, idleness, and moral degradation. By the late 1950's the Policy of Dispersal faltered and was rapidly replaced by the Welfare State Policy. Deteriorating social conditions among Inuit, including starvation and epidemic disease, accelerated this policy, founded on a fuller awakening to northern



possibilities and the misplaced optimism of the Diefenbaker "vision". The Welfare State Policy drove the government's wholesale, hands-on involvement in the lives of Inuit and, for better or worse, by the mid 1960s most Inuit were living in settlements availing themselves of the policy's housing, health, education, and social assistance programs.

In Damas's delineation of these policies, the government and its agents for the most part come across as benevolent, well-meaning, anxiety-ridden, and even compassionate. A case in point is the response of government authorities to a virulent disease that decimated dog teams in the Cumberland Sound area in 1962, seriously curtailing access by the region's dispersed camps to seal and other game. Inuit were moved (many by RCMP aircraft) from their camps into Panniqtuuq (Pangnirtung) where they were supported with temporary shelter, rations, and other necessary supplies until the disease had run its course. The following year, with the dog population re-established, and the government's dog innoculation program – involving some 8,000 dogs across the Canadian Arctic – well underway, Inuit returned to the relative self-sufficiency of their camps. (This action, incidentally, flies in the face of the Qikiqtani Inuit Association's current investigation into allegations that government authorities engaged in a systemic slaughter of dogs on Baffin Island ostensibly to serve the "in-gathering" policy).

The book also reveals the considerable interplay of confusion, ethnocentrism, and paternalism in the cobbling of Arctic policy. Commissioner Nicholson of the RCMP, for example, in an address to the Northwest Territories Council in 1959 insists on the one hand that "Eskimos who continue an old-fashioned nomadic existence must accept primitive health standards", and on the other calls for "firm steps to be taken to keep these people from clustering about white centers of population and housing". He then adds, with unwitting hypocrisy, that "these things should be tackled with all possible attention to the Eskimo's own wishes. He must not be looked upon as a curiosity but as a man and as a Canadian".

Damas uses his sources to make a convincing case for the absence of institutionalized coercion in the government's Arctic settlement policies. He sifts through an enormous amount of published and unpublished material apparently sticking to his declared approach that "proper" ethnohistory should, among other things, "eschew excessive polemic or partisan positions" and on this score, for instance, rejects the "revisionist studies" of the likes of Frank Tester and Peter Kulchyski (*Tammarniit: Mistakes,* 1994).

The book's bibliography, particularly for published sources is remarkably comprehensive omitting few relevant titles. I would like to have seen included, for instance, Diamond Jenness's *Eskimo*

Administration: V. Analysis and Reflections (1968), and Graham Rowley's *Cold Comfort* (1996). Moreover, given the acknowledged "ethnohistorical" formula of the book, a major deficiency must surely be the paucity of direct Inuit comment and opinion on the perceived effects of government policy. We hear far more from the policy authors and implementers than from the policy recipients. This omission is unfortunate because there's a growing and accessible body of fascinating Inuit oral history dealing either directly or peripherally with the transition from camp life to settlement life. The inclusion and close consideration of such material would have added more balance to the equation. More importantly, it might have shed some light on why so many Inuit continue to believe that they were in fact coerced, albeit subtly, into the settlements where they exchanged self-sufficiency for a deepening dependency and the attendant loss of culture and language. (And this in spite of the Nunavut Land Claims Agreement, which Damas tellingly characterizes as "an extension of the Welfare State Policy".)

In the end, *Arctic Migrants /Arctic Villagers* is clearly a major and necessary contribution to our understanding of recent Canadian Arctic history just prior the emergence of Nunavut. Less clear, however, is the book's ultimate impact on questions surrounding the extent of coercion involved in the government's settlement policy. At least for the time being, proponents on opposite sides of the issue are not likely to be swayed by each other's arguments no matter how convincingly put.

John MacDonald lives in Igloolik, Nunavut, where for many years he has been closely involved in the collection and documentation of the area's oral history and traditional knowledge.

NEW BOOKS

Writing Geographical Exploration: Thomas James and the Northwest Passage, by Wayne K. Davies. University of Calgary Press, 352 pp. (ISBN 1-55238-062-9) $49.95

Writing Geographical Exploration summarizes the various factors that influence the writing and interpretation of exploration narratives, demonstrating the limitations of the assumption that there is a direct relationship between what the explorer saw and what the text describes. Davies offers a revisionist evaluation of Captain Thomas James, who spent eighteen months in search of the Northwest Passage in the 1630s, to illustrate how modern textual analysis can enrich the appreciation of a traveller's account. Though James's work has been dismissed in the modern period, his work was highly regarded in previous centuries by scientist Robert Boyle and poet Samuel Coleridge. James was not a first-rank explorer, but he was an able navigator and leader, a perceptive scientific observer and a master author who produced a thrilling tale of adventure that should occupy a more prominent place in exploration writing and history, literary theory, and post-modern geography.

War North of 80: The Last German Arctic Weather Station of World War II, by Wilhelm Dege, Translated and edited by William Barr. University of Calgary Press, 500 pp. (ISBN 1-55238-110-2) $49.95

Obtaining weather data was vital for military operations in Northwestern Europe during World War II. In an effort to secure this data, the German Navy and Air Force secretly established manned weather stations in East Greenland, Svalbard, and Franz Josef Land. *War North of 80* is the personal story of Wilhelm Dege, the leader of the last weather station, code-named "Operation Haudegen". Originally written in German, Dege describes the mission from beginning to end. On May 9, 1945, the Allies dispatched a vessel to pick up Dege and his team; in effect, Dege and his team were the last German troops to surrender. With a detailed introduction, Barr's translation offers Engish-speaking readers a rare glimpse into the Germans' account of weather activities during World War II in the Arctic. An epilogue written by Dege's son offers insight into the various fates of the expedition members who worked alongside his father.

Uqalurait: An Oral History of Nunavut, compiled and edited by John Bennett and Susan Rowley. McGill-Queen's University Press, 520 pp. (ISBN: 07735234055) $49.95

Uqalurait presents a comprehensive account of Inuit life on land and sea ice in the area now called Nunavut, before extensive contact with southerners. Drawing on a broad range of oral history sources – from nineteenth-century exploration accounts to contemporary community-based projects – the book uses quotes from over three hundred Inuit elders to provide an "inside" view of family life, social relations, hunting, the land, shamanism, health, and material culture. Based on a larger research project developed under the guidance of six Inuit from across Nunavut, *Uqalurait* consists of thousands of quotations organised thematically into cohesive chapters.

HORIZON

Aboriginal Oral Traditions: Theory, Practice, and Ethics
April 21–23, 2005
Gorsebrook Research Institute, St. Mary's University, Halifax, Nova Scotia, Canada
www.stmarys.ca/administration/gorsebrook/conferences.htm.
gorsebrook@smu.ca.

Symposium on International Global Ocean Ecosystem Dynamics (GLOBEC) Symposium: "Climate Variability and Sub-Arctic Marine Ecosystems"
May 16–20, 2005
Victoria, B.C., Canada
www.globec.org

Airships to the Arctic III symposium
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SUBMISSION GUIDELINES

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Canadian Polar Commission
1710 – 360 Albert Street
Ottawa, Ontario, Canada
K1R 7X7

Email: bennettj@polarcom.gc.ca

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Canadian Polar Commission
Suite 1710, Constitution Square
360 Albert Street
Ottawa, Ontario
K1R 7X7

Tel.: (613) 943-8605
Toll-free: 1-888-765-2701
Fax: (613) 943-8607
E-mail: mail@polarcom.gc.ca
www.polarcom.gc.ca