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# Cruise Tourism and Sea Ice in Canada's Hudson Bay Region

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ABSTRACT. Tourism in the Hudson Bay region of central northern Canada generally is associated with non-consumptive forms of nature-based activities (such as polar bear viewing). However, the region has experienced variable growth in the cruise sector in recent years. This paper examines patterns of cruise activity in all subregions of the Hudson Bay region during three cruise seasons (2006, 2008, and 2009) and mainly reveals a pattern of decline. Since the prevalence of sea ice is an important part of visitor experiences of polar cruises, we examine sea ice change and occurrence of icebergs in the Hudson Bay region. Our sea ice analysis suggests that the length of the navigable shipping season is increasing in this region, which may facilitate both earlier and later shipping. But in terms of cruise traffic, we suggest that the demise of ice coverage signals a possible decline in cruise activity in most of the Hudson Bay region because ice-supported wildlife may shift north with the diminishing ice regime. Given the possible environmental and socio-cultural implications of changing cruise activity patterns in the Arctic and the absence of broad-scale monitoring and surveillance of the industry, use of these available data sources is vital to building a clearer picture.

Key words: Canadian Arctic, Hudson Bay region, sea ice, tourism, polar tourism, cruise tourism

RÉSUMÉ. De manière générale, le tourisme dans la région de la baie d'Hudson du centre-nord du Canada se rapporte à des activités non consomptibles en plein air (comme l'observation des ours polaires). Toutefois, ces dernières années, le secteur des croisières de cette région a enregistré un taux de croissance variable. La présente communication se penche sur les tendances en matière de croisières dans toutes les sous-régions de la région de la baie d'Hudson au cours de trois saisons de croisière (2006, 2008 et 2009), ce qui laisse principalement entrevoir un déclin à cet égard. Puisque l'existence de glace de mer revêt une grande importance pour les visiteurs des croisières polaires, nous avons examiné les changements en matière de glace de mer et l'occurrence d'icebergs dans la région de la baie d'Hudson. Notre analyse de la glace de mer laisse voir que la longueur de la saison de navigation augmente dans cette région, ce qui peut avoir pour effet de faciliter la navigation en début et en fin de saison. Cela dit, sur le plan de la circulation de croisière, nous donnons à penser que la disparition de la couche de glace laisse entrevoir un déclin possible des activités de croisière dans la plupart de la région de la baie d'Hudson parce que la faune qui évolue sur la glace pourrait s'en aller vers le nord en raison du régime de glaces à la baisse. Compte tenu des incidences environnementales et socioculturelles susceptibles de découler des tendances changeantes relativement aux activités de croisière dans l'Arctique et de l'absence de suivi et de surveillance à grande échelle de l'industrie, il est essentiel de recourir aux sources de données disponibles afin d'obtenir un meilleur aperçu de la situation.

Mots clés : Arctique canadien, région de la baie d'Hudson, glace de mer, tourisme, tourisme polaire, tourisme de croisière

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## INTRODUCTION

The Hudson Bay region has come under increasing international scrutiny in view of the proposed development of an "Arctic bridge," a shipping route between Churchill, northern Manitoba, and Murmansk in northwestern Russia. Both Churchill and Murmansk are ice-free seaports in summer, and it is claimed that under warming global conditions, shipping times between North America, Europe, and Asia via these two ports could reduce significantly (Mifflin, 2007). Despite the interest in commercial shipping through the Hudson Bay region, cruise ship tourism is rarely discussed. Given evidence of growth in this niche travel sector for at least some locations in the region, such as the 2005 launch of the first Inuit-operated cruise ship, based in Nunavik, this inattention is perplexing. It may be due in

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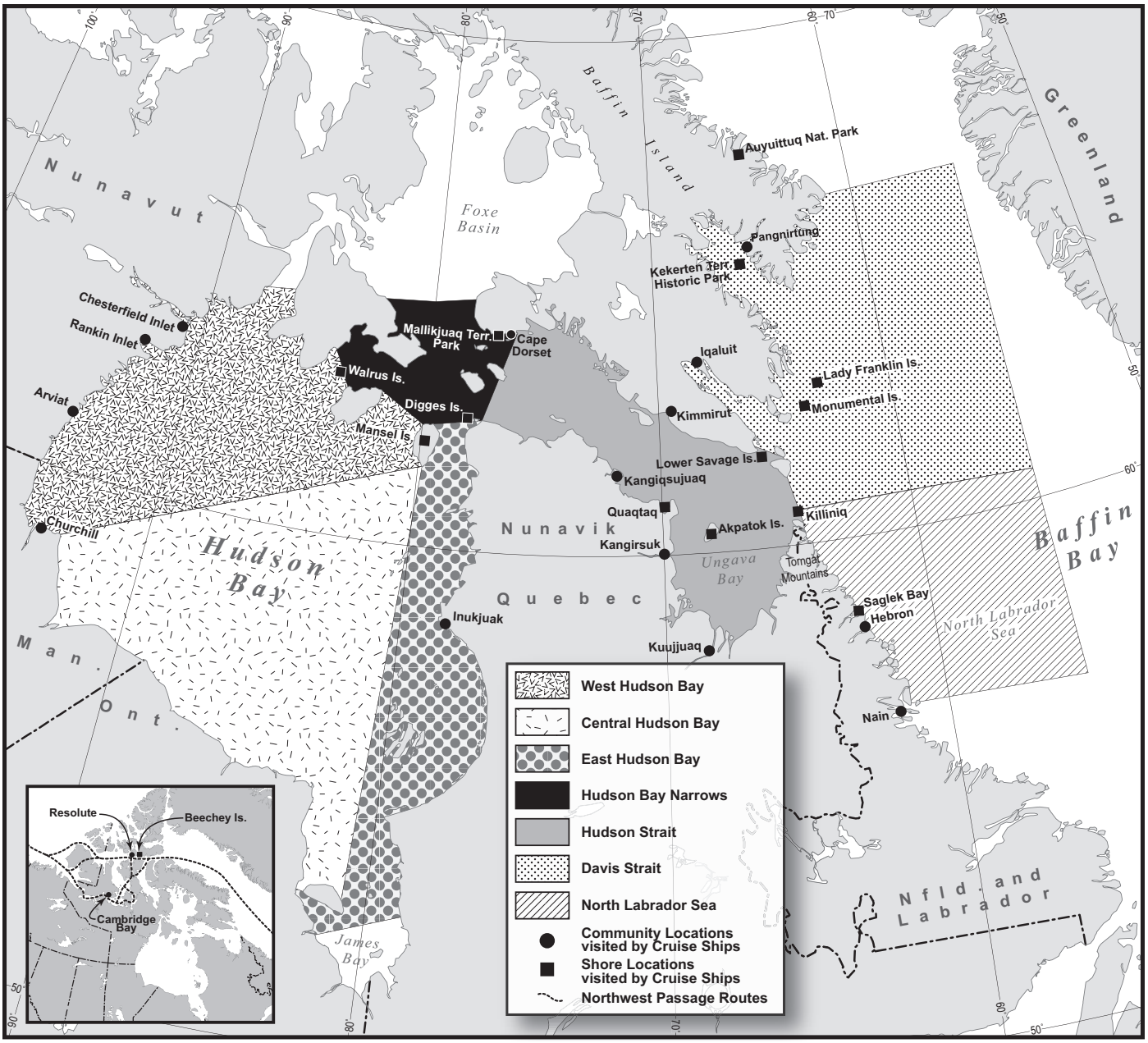


FIG. 1. Map of the Hudson Bay region, showing the Canadian Ice Service Ice Regime subregions (CISDA, 2007b). Locations of planned cruises to the Hudson Bay region for the 2006, 2008, and 2009 cruise seasons are also shown.

part to the general association of Hudson Bay tourism with non-consumptive, nature-based activities such as polar bear and beluga viewing near Churchill, or adventure tourism pursuits around Pangnirtung on Baffin Island, or arts and crafts as successfully developed and marketed in communities such as Cape Dorset.

Sea ice critically underpins the key resources of polar cruise tourism. Particularly important is the relationship between sea ice and ice-dependent wildlife species such as polar bears, seals, and walrus. Sighting of these and other Arctic wildlife is the raison d'être of expedition cruising in the Canadian Arctic. Mounting evidence that the Arctic region will continue to warm at a higher average rate than the rest of the globe (ACIA, 2004; IPCC, 2007) should spark concern that in the long term, the wildlife and icescapes that are the very basis of Arctic expedition cruising may be under threat. This concern is based on reports of increasing surface air temperatures in the Arctic (Rigor et al., 2000; Wang and Key, 2003) and accompanying decreases in sea ice extent (Serreze et al., 2007; Parkinson and Cavalieri, 2008). Given the reported decreases in northern hemispheric sea ice extent in every month of the year since 1979 (Serreze et al., 2007), some commentators suggest that easier ship access will mean continued increases in cruise activity in Arctic regions (Huebert, 2001; Scott, 2003; ACIA, 2004; Brigham and Ellis, 2004). Others have been more cautious in their observations, noting that the variability of climate change across the Arctic will have

more complex effects on cruise tourism operations than previously imagined (Stewart et al., 2007).

Most observations about cruise tourism activities in the Arctic referred to its northern reaches, namely the Canadian Arctic Archipelago, and to the historically important Northwest Passage (Stewart et al., 2007). This paper aims to develop a more complete picture of cruise tourism in a warming Arctic Canada by (a) examining ice regimes in the Hudson Bay region and their effect on cruise ship activities and (b) analyzing the scale and scope of past and current cruise activity in Hudson Bay. After a brief description of the sea ice regimes of the Hudson Bay region, we review trends in Hudson Bay cruise tourism. Using the Canadian Ice Service Digital Archive (CISDA) ice charts, we examine changes in sea conditions over the past 37 years and discuss their implications for cruise tourism in a warming Hudson Bay region.

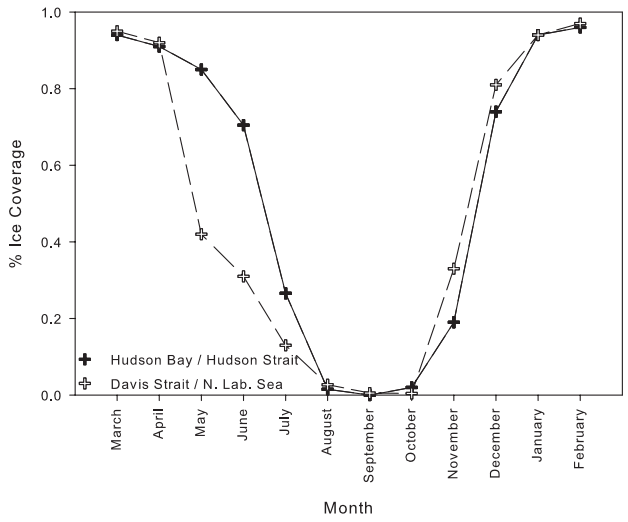


FIG. 2. Seasonal cycle in ice coverage for Hudson Bay and Hudson Strait (solid line) and for Davis Strait and the North Labrador Sea (dashed line), expressed as average monthly percent ice coverage (1971–2007) for each region.

## SEA ICE REGIMES IN THE HUDSON BAY REGION

In the context of this discussion, the Hudson Bay region (Fig. 1) is defined by the sea ice regime regions recently established by the Canadian Ice Service (Canadian Ice Service, 2007b) in consultation with Canadian sea ice experts. These seven sea ice regions—East Hudson Bay, West Hudson Bay, Central Hudson Bay, the Hudson Bay Narrows, Hudson Strait, Davis Strait, and the North Labrador Sea (Fig. 1)—represent areas for which a longitudinal data set (30 years or longer) can be constructed with confidence.

The Hudson Bay region undergoes a complete seasonal cycle in sea ice cover each year, transitioning from fully ice covered in winter to open water in summer. Compared to the Canadian Arctic Archipelago to the north of this region, the ice in the Hudson Bay region is relatively thin. The average winter ice thickness is about 1.6 m (Saucier and Dionne, 1998; Gough and Allakhverdova, 1999), and because the ice melts entirely every summer, the maximum thickness of level ice or undeformed ice is never much greater than 2 m (Maykut and Untersteiner, 1971). The thicker, denser multi-year ice that is a hazard to shipping in more northerly waters is not formed in situ in the Hudson Bay region. However, traces of multi-year sea ice originating in Foxe Basin and Baffin Bay do drift into the area each year and can be present in any month (Falkingham et al., 2001).

The minimum ice class of tourist vessels currently operating in the Hudson Bay region is 1A; by definition, this class of ship can navigate safely during the summer and autumn in first-year ice (70–120 m) (American Bureau of Shipping, 2008). At first glance, ice conditions in the Hudson Bay region are well within this ice class. However, ice in the Hudson Bay region is constantly in motion, and ridges up to 2–3 m in height have been observed, (Markham, 1986). These ridges exceed the recommended thickness for safe travel in 1A ice-rated vessels. Additionally, each year icebergs drift south from Baffin Bay, following the Labrador Current, and travel through Davis Strait and the Labrador Sea, some detouring in and out of Hudson Strait on the way. The sinking of the *Explorer*, an ice class 1A tourist vessel, in relatively benign ice conditions in the Antarctic Ocean in November 2007, highlights the risk associated with trace, yet extreme ice features (Stewart and Draper, 2008).

## SEA ICE VARIABILITY IN THE HUDSON BAY REGION: 1971–2007

A brief analysis of sea ice data (total ice coverage, the presence and proportion of multi-year ice or old ice, and the presence of icebergs) provides an ice climatology of the Hudson Bay area and exploration of recent changes in ice conditions during the navigable season. A consistent record of ice concentration and ice type throughout that season (mid-July to mid-October) from 1971 to the present is available from the Canadian Ice Service of Environment Canada (Canadian Ice Service, 2007a, b). The data set is a compilation of the weekly regional ice charts that integrate ice information from various satellite sensors, aerial reconnaissance, ship observations, and other in situ measurements. Also available from the Canadian Ice Service are iceberg counts from fall surveys of Hudson Strait, Davis Strait, and the North Labrador Sea (2000 to present), as well as the International Ice Patrol long-term monthly record (1899 to present) of icebergs crossing 45° N. Unfortunately, data on ice deformation are scarce, and as a result, the frequency of ridges is not addressed.

The seasonal cycle in ice coverage in the Hudson Bay region is shown in Figure 2. The region begins to freeze up in November and is completely ice-covered by January. Melt begins in early May and proceeds much faster in Davis Strait and the North Labrador Sea than in Hudson Bay and Hudson Strait. By August, the whole region is ice-free. In

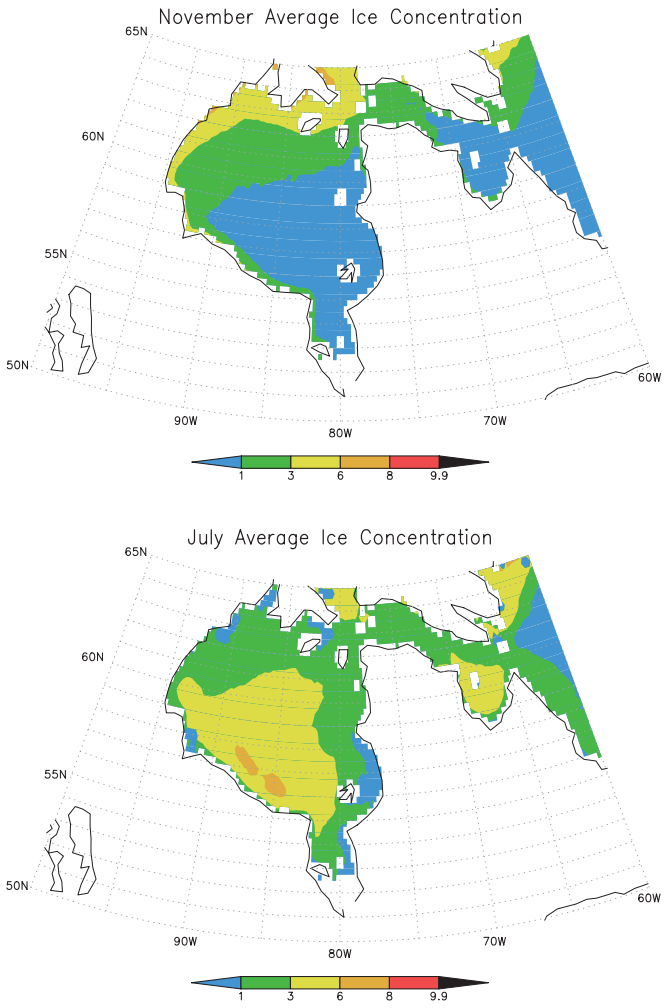


FIG. 3. Monthly averaged ice concentration (1971–2007) for November (top panel) and July (bottom panel).

general, the region is ice-free during the months of August, September, and October, and traditionally the shipping season runs from mid-July to mid-October (Falkingham et al., 2001).

The mean patterns in ice concentration for July and November (Fig. 3) are a good illustration of the annual growth and retreat of the ice. Sea ice begins to form in northwestern Hudson Bay at the beginning of October. As temperatures drop, ice forms along the western and southern coasts and the main ice edge proceeds southeast. By late December to early January, the Bay is completely ice-covered. In May, leads begin to form in the northwest part of the Bay. Dynamic and thermodynamically driven melt proceeds from the northwest and the east, and the ice along the southwest coast is the last to clear. Hudson Strait also freezes from west to east, with ice starting to form at the west end of the strait in late October. In spring, the ice typically clears from north to south, with Ungava Bay clearing last. In Davis Strait and the North Labrador Sea, the main ice edge slowly migrates south, reaching the South Labrador Sea by the end of December and its maximum extent in March. In spring, the ice edge begins to retreat northward and is typically north of the mouth of Hudson Strait by mid-July.

TABLE 1. Trends (% change per decade) in July and November monthly averaged ice coverage in each of the seven sea ice subregions for the period 1971 to 2007. Superscripts indicate statistical significance.

| Subregions | July | November |
|---|---|---|
| East Hudson Bay | -3 | -21[1] |
| Central Hudson Bay | -10[1] | -16 |
| West Hudson Bay | -22[2] | -12[1] |
| Hudson Bay Narrows | -14[1] | -12[1] |
| Hudson Strait | -20[2] | -23[2] |
| Davis Strait | -14[2] | -20[2] |
| North Labrador Sea | -12[2] | -29[1] |

[1] 95% confidence level
[2] 99% confidence level

Using satellite passive-microwave data for the 28 years between 1979 and 2006, Parkinson and Cavalieri (2008) report that annual sea ice extent within Hudson Bay is decreasing by 5.3% per decade, with summertime (July–September) decreases of up to 19.5% per decade. In our study, trends in July and November ice coverage are used to quantify the increasing length of the navigable season. Table 1 shows these trends in each of the seven distinct regions for 1971–2007. Over the past 35 years, with the exception of East Hudson Bay in July and Central Hudson Bay in November, each region has seen a significant decrease in ice coverage in late spring and early fall. In July, sea ice reductions range from 10% per decade in Central Hudson Bay to 20% per decade in Hudson Strait, with a region-wide reduction of 15% per decade. In November, reductions range from 12% per decade in West Hudson Bay to 29% per decade in the North Labrador Sea, with a region-wide reduction of 22% per decade.

Changes in the frequency of presence of old ice and the proportion of old ice cover during the navigable season, mid-July to the end of October, are shown in Table 2. During the last 35 years, old ice has been present in all regions except Central Hudson Bay. A comparison of the last ten years (1998–2007) with the beginning of the record (1971–97) shows a marked decrease in the presence of old ice in each region. For example, in the Hudson Bay Narrows, old ice from Foxe Basin was present in more than half the years in the first part of the record (1971–97), compared to only one year in the last decade (1998–2007). Ice coverage when old ice is present has also decreased: in the Hudson Bay Narrows, old ice covered on average roughly 4.5% of the region in 1971–97, but only 0.05% during the one year in the last decade when old ice was present.

Iceberg counts during the navigable season in the Hudson Bay region are not available. However, the Canadian Ice Service fall survey data provide an indication of the prevalence of icebergs in the area (see Table 3). Usually completed in October, the survey records icebergs in parts of Davis Strait and Hudson Strait. An iceberg is defined as

TABLE 2. Frequency of presence of old ice and the percent ice coverage of old ice in each of the sea ice subregions between mid-July and mid-October for 1971–97 and 1998–2007.

| Subregions | Frequency (%) of Presence (Old Ice) | | Percent Ice Coverage (Old Ice) | |
|---|---|---|---|---|
| | 1971–97 | 1998–2007 | 1971–97 | 1998–2007 |
| East Hudson Bay | 7 | 0 | 0.09 | 0 |
| Central Hudson Bay | 0 | 0 | 0 | 0 |
| West Hudson Bay | 22 | 0 | 0.15 | 0 |
| Hudson Bay Narrows | 56 | 10 | 4.64 | 0.05 |
| Hudson Strait | 74 | 40 | 4.47 | 0.44 |
| Davis Strait | 100 | 90 | 6.12 | 1.15 |
| North Labrador Sea | 44 | 20 | 0.68 | 0.17 |

any piece of ice that has broken away from a glacier and protrudes more than five meters above sea level. The geographic region and timing of the survey, and the technology used are inconsistent; as a result, direct comparisons between years cannot be made. Nevertheless, the data show that icebergs are present in the region and in large numbers, ranging from 825 in 2001 to 178 in 2007. And although the survey is completed during the fall, it can be assumed that icebergs are present throughout the navigable season.

## CRUISE TOURISM ACROSS ARCTIC CANADA

Since the 1984 inaugural Arctic sailing of the purpose-built cruise ship, the *Explorer*, cruise vessels have been operating in increasing number in the northern polar regions. Between 1984 and 1991, cruise activity throughout the Canadian Arctic was sporadic, and patterns were unpredictable, but from 1992 to 2005 a more regular pattern of cruise activity has emerged. Not only were between one and three successful voyages of the Northwest Passage completed each year, but cruise ships also visited additional locations in the Canadian Arctic, such as Baffin Island, Hudson Bay, and Ellesmere Island. In 2006 the number of cruise ships visiting the Canadian Arctic dramatically doubled to 22 cruises, up from 11 separate cruises in the previous season (Buhasz, 2006). During the 2007 season, the growth curve stabilized with 23 separate cruises planned by six different companies, who together brought approximately 2110 visitors to the Canadian Arctic (Maher and Meade, 2008). During the 2008 cruise season, six vessels (*Kapitan Khlebnikov*, *Ioffe*, *Polar Star*, *Lyubov Orlova*, *Bremen*, and *Hanseatic*) operated in the Canadian Arctic, carrying passengers on 26 separate planned cruises. Despite deepening concerns about the global economic climate, 25 separate cruises were advertised for 2009 departures that would make ports of call in the Canadian Arctic. However, in early 2009 it appeared that at least four of these 2009 cruises would be cancelled due to low bookings.

Determining the actual number of cruise ships, the destinations visited, and routes taken, as well as the number of passengers on board the cruise vessels, is problematic, as no one agency monitors or collects these data. Parks Canada collects a limited amount of information on visitors to the three national parks in northern Canada but, unfortunately, the data are not comprehensive and provide only a partial evidence base from which to evaluate cruise visitation to Arctic Canada. In order to address this data collection problem, we have compiled cruise ship data from Internet sites since 2006 (with the exception of 2007). The process of data collection involves a rigorous review of websites that advertise cruises to Arctic Canada, and builds a database of planned cruises, taking particular note of the locations the cruise ships intend to visit. Although this is a crude data collection methodology, to our knowledge, it provides the only consistent data set on recent cruise activity in Arctic Canada. It should be noted however, that the data set reviews *intended* cruises and locations to be visited, rather than completed cruise journeys. Given the unpredictability of the Arctic sea ice environment, locations visited and routes taken could be different than those reported here.

TABLE 3. Iceberg counts from the Canadian Ice Service[1] fall survey (2000–07).

| Year | Subregion | Time Period | Number of Icebergs |
|---|---|---|---|
| 2000 | Davis Strait / Hudson Strait | Mid-October | ~637 |
| 2001 | Davis Strait / Hudson Strait | Mid-October | ~825 |
| 2002 | Davis Strait / Hudson Strait | Early October | ~646 |
| 2003 | Davis Strait / Hudson Strait | Mid-/End October | ~461 |
| 2004 | Hudson Strait | Mid-October | ~451 |
| 2005 | Davis Strait | Mid-/End October | ~262 |
| 2006 | Davis Strait / Hudson Strait | Early October | ~309 |
| 2007 | Davis Strait / Hudson Strait | Mid-/End October | ~178 |
| 2008 | Davis Strait / Hudson Strait | Early October | ~217 |

[1] The exact geographical region, technology used, and time-period of the survey differed for each year. The regions in column 2 correspond to the ice regimes in Fig. 1; however, the whole region was not necessarily surveyed in each year. Data provided by Luc Desjardins, Canadian Ice Service, Environment Canada.

## CRUISE TOURISM IN THE HUDSON BAY REGION

For this paper, our data set has been refined to include locations visited by cruise ships in the Hudson Bay region (excluding Central Hudson Bay, since no cruise visits have occurred in this subregion) during the 2006, 2008, and 2009 Northern Hemisphere cruise seasons (see Fig. 1). The frequency of both shore and community visits for each of these years is presented in Table 4.

### *West Hudson Bay*

Churchill, the only community visited by cruise ships in the West Hudson Bay subregion, has seen a consistent two visits by Cruise North's *Lyubov Orlova* during each of the three cruise seasons under investigation. Cruise tourism in Churchill has had a rather ad hoc and uneventful history, in comparison to the more fully developed land-based

tourism activities. Prior to 2006, the Nunavut communities of Arviat, Rankin Inlet, and Chesterfield Inlet, each to the north of Churchill along the coast of Hudson Bay, were also visited by cruise ships. Our data set shows the only location for shore visits in northwestern Hudson Bay (2006–09) is Walrus Island, which was visited twice in 2008 and twice in 2009 by the *Lyubov Orlova*. This visit is likely an important break in the journey to Churchill to reduce consecutive days on the ship.

*East Hudson Bay*

The small Nunavik community of Inukjuak (population 1184) was featured in the first itineraries of the Inuit-owned company Cruise North. In 2006 the community welcomed four separate cruises, but no ships have visited since, likely reflecting lack of demand for cruises on the eastern shores of Hudson Bay. To the north, however, passengers on board the *Lyubov Orlova* make regular shore visits to Digges and Mansel islands, where polar bear and walrus viewing is possible. Digges Island was also visited by the *Explorer* on one of her last tours of the Canadian Arctic in 2006.

*Hudson Bay Narrows*

Cape Dorset, located on Dorset Island off the southern coast of Baffin Island, has for many years marketed itself as the "Capital of Inuit Art." Since the 1950s, local printmaking and carving have attracted global attention, so it is not surprising that the community has been a regular port of call by cruise ships, evidenced by six visits in 2006. Strangely, in subsequent years the numbers of visits diminished to only one in 2008, and only two visits were planned for 2009. The decrease may be due to the general northerly shift of cruise itineraries, rather than the lack of interest in this community per se.

*Hudson Strait*

The Nunavik community of Kuujjuaq is the home base of Cruise North. As a regional centre and transportation hub (the community has the longest airstrip in Nunavik and daily flights), Kuujjuaq is an obvious and convenient location for Cruise North's operations. With one exception, the Northwest Passage tours, all cruises offered by Cruise North, either start or finish in this community. These activities make Kuujjuaq the most consistently visited community in the Hudson Bay region for the years 2006 (11 visits), 2008, and 2009 (7 visits for both years). In 2009, the community was expected to host the *Lyubov Orlova* from mid-July to late September. However, like Resolute and to a certain extent Iqaluit to the north, Kuujjuaq likely is a convenient entry-exit point for tourists to the Canadian Arctic, rather than a desired location for tourists in its own right.

The Nunavik community of Kangirsuk to the northwest of Kuujjuaq was featured regularly on Cruise North's itineraries with four visits in 2006, but cruise visits appear to have declined, as no visits occurred in 2008 and only one was planned for 2009. However, the northern Nunavik coastal community of Kangiqsujuaq has featured annually on Cruise North's itineraries; here passengers taste locally harvested foods and watch local Inuit throat singing and drum dancing performances (four visits in 2006, and three each in 2008 and 2009). The community was visited exclusively by the *Lyubov Orlova* until 2009 when Adventure Canada's *Clipper Adventurer* planned to make its first visit to the community. Across Hudson Strait on the southern shore of Baffin Island is Kimmirut, a previously popular cruise port of call. As in Cape Dorset, an overall lack of cruises along the southern and eastern shores of Baffin Island left Kimmirut with only a few cruise visits. In 2008 only one cruise was expected in Kimmirut, and the same is true for 2009 when the *Clipper Adventurer* was scheduled to make her first visit to the community in late September.

Several islands and island groups in the Hudson Strait subregion have become popular for shore visits. The most popular visited of these is Akpatok Island, in the entrance of Ungava Bay, where passengers are promised good wildlife viewing, particularly of polar bears, walrus, thick-billed murres, and other Arctic bird species. The majority of Cruise North's tours visit the Island on their way to or from Kuujjuaq. In addition to the *Lyubov Orlova*, during each of the three cruise seasons investigated, the *Polar Star* has made the island its last port of call for the season (usually in late September) while on her way out of the Canadian North. Other island groups in the vicinity also are valued by cruise operators. At the entrance of the Hudson Strait, for example, Killiniq and Button islands attract marine mammals, including several species of whales. The presence of such wildlife have made the island group consistently popular with the *Lyubov Orlova*, which made three cruise

TABLE 4. Community and shore visits to Hudson Bay for the 2006, 2008, and 2009 tourist seasons (Cruise North, 2009; Polar Star Expeditions, 2009; Quark Expeditions, 2009).

| | 2006 | 2008 | 2009 |
|---|---|---|---|
| Community Visits | | | |
| Cape Dorset | 6 | 1 | 2 |
| Churchill | 2 | 2 | 2 |
| Hebron | 2 | 2 | 1 |
| Inukjuak | 4 | 0 | 0 |
| Iqaluit | 8 | 14 | 4 |
| Kangiqsujuaq | 4 | 3 | 3 |
| Kangirsuk | 4 | 0 | 1 |
| Kimmirut | 5 | 1 | 1 |
| Kuujjuaq | 11 | 7 | 7 |
| Nain | 0 | 2 | 1 |
| Pangnirtung | 4 | 6 | 3 |
| Shore Visits | | | |
| Akpatok Island | 9 | 7 | 7 |
| Auyuittuq | 4 | 2 | 0 |
| Digges and Mansel Islands | 5 | 3 | 2 |
| Killiniq | 3 | 5 | 3 |
| Lower Savage Islands | 2 | 2 | 1 |
| Monumental Island | 0 | 6 | 2 |
| Torngat Mountains | 1 | 4 | 1 |
| Quaqtaq | 2 | 2 | 2 |

visits in both 2006 and 2009, and five in 2008. Similarly, the *Lyubov Orlova* has made two visits to Quaqtaq and the neighbouring Diana Islands (where muskoxen roam) in each of the three cruise seasons under review. The Lower Savage Islands, just off the southeast tip of Baffin Island, have been frequented to a slightly lesser extent by the *Polar Star*, *Explorer*, and *Akademik Ioffe* (see Table 4).

*Davis Strait*

The Davis Strait subregion has, in the past, been a focus of cruise activity in Arctic Canada. This status is evidenced by cruise visits to Nunavut's capital, Iqaluit. With 14 scheduled cruises in 2008, the territorial capital was the second most visited community in Nunavut, marginally behind Resolute in the High Arctic. However, the data set reveals that for 2009 Iqaluit was scheduled to host only four cruise ships, again echoing the apparent shift of cruise itineraries away from southern and eastern Baffin Island toward more northerly locations. The community of Pangnirtung, nestled along the shore of the dramatic Pangnirtung Fiord, is well regarded internationally as a gateway community for adventure and nature-based tourism activities in the neighbouring Auyuittuq National Park. Four vessels visited Pangnirtung in 2006, six cruise ships (including the former Russian icebreaker the *Kapitan Khlebnikov*) visited in 2008, and three visits were scheduled during the 2009 cruise season. To the south of Pangnirtung in Cumberland Sound, Kekerten Territorial Historic Park hosted the *Lyubov Orlova* twice in 2008 and anticipated two visits in 2009. At the entrance to Cumberland Sound, Monumental Island, a favorite place to view walrus, anticipated six cruises in 2008, and expected two visits from the *Lyubov Orlova* in 2009.

*North Labrador Sea*

The final subregion under review is the North Labrador Sea, where communities such as Nain and Hebron have hosted a small number of cruise vessels in recent years (two each in 2008 and one each was planned for 2009). These communities often are visited at the start (June) or the end (September) of the cruise season as vessels position or reposition themselves relative to the Canadian North via Newfoundland and Labrador destinations. The Torngat Mountains National Nature Reserve has received sporadic cruise ship interest, with one visit in 2006, four in 2008 and only one planned in 2009 by the *Lyubov Orlova*.

## IMPLICATIONS OF SEA ICE CHANGE FOR CRUISE TOURISM IN THE HUDSON BAY REGION

This is the first examination of the implications of sea ice change for cruise tourism specifically in the Hudson Bay region. The sea ice climatology reveals that the region has experienced an overall decline in sea ice cover over the past 35 years, a trend that is projected to continue as the Arctic warms (ACIA, 2004; IPCC, 2007). Generally cruise activity takes place in the Hudson Bay region from the start of July through the end of September, with occasional cruises falling outside these dates. The sea ice analysis in this paper suggests that the length of the navigable cruise season is increasing in this region, which may facilitate both earlier and later shipping; this observation is not lost on the proponents of the Arctic Bridge concept. However, what does this scenario mean for cruise tourism in the Hudson Bay region?

*A Decline in Cruise Activity in the Hudson Bay Region*

As other commentators have observed, a warming Arctic climate with fewer sea ice obstacles should facilitate an overall growth scenario in the Arctic cruise industry (Furgal and Prowse, 2008). However, we would contest this view, suggesting that the demise of ice coverage signals a possible decline in cruise activity in the Hudson Bay region precisely because ice-supported wildlife may shift north with the diminishing ice regime. Arguably, the presence of sea ice is critical to Arctic cruise tourism, and without the opportunities to see ice-dependent marine wildlife such as polar bear and walrus, the focus in the long term may need to shift to other environmental and cultural assets if Hudson Bay is to be a viable cruise region.

However, in the short term, as this region transitions to an ice-free summer, cruise operators may be able to capitalize on the concept of last-chance tourism. A somewhat macabre concept, last-chance tourism has been promoted in the popular travel media as a way to witness key species (mostly polar bear) and landscapes (such as glaciers and ice-capped mountains) before they are gone for good (Dawson et al., in press; Lemelin and Johnson, 2008). In the short term, Cruise North, the tour operator based in Nunavik, may be well positioned to market last-chance tours. As our study reveals, other cruise operators are already favouring locations to the north, leaving previously well visited locations such as Kimmirut and Cape Dorset with fewer planned cruise visits. If this trend continues, and if there is to be a concentration of cruise activity farther north, this should signal concern for a number of reasons.

First, the ice regimes in the Northwest Passage as it transitions to an ice-free summer may present navigational problems due to higher levels of multi-year ice from the polar cap (Stewart et al., 2007, 2008). Second, certain communities and shore locations may become even more crowded than they are already. Our study reveals that communities such as Resolute and Cambridge Bay are already busy with cruises throughout the summer season. Resolute had a bumper season in 2008, when 17 cruises either started or ended their journeys there, and expected to host even more visits the following year. Similarly, Cambridge Bay expected to double its typical number of cruise ships. Remote landing spots along the Northwest Passage, notably Beechey Island, are also experiencing unprecedented numbers of cruise visits. From 2 August until 9 September

2009, Beechey Island was expected to be visited by 16 different cruises and possibly have multiple visits on the same day. Prince Leopold Island, another landing site along the Northwest Passage, was expected to receive seven cruises in 2009, up from three cruises both in 2006 and 2008. Third, there are concerns regarding the environmental and sociocultural impacts of such growth, particularly in communities and shore locations where the concentration of cruise visitors is high over a short period.

*Problematic Encounters with Ice*

The possibility of random encounters with icebergs and multi-year ice in the Hudson Bay region is an ever-present danger. This danger was evidenced most dramatically by the sinking of the *Explorer* in Antarctica in 2007, an incident that occurred in addition to other major accidents in the Antarctic involving cruise ships. In 2006 the *Lyubov Orlova* was grounded, and in the following year the same thing happened to the *Nordkapp*. In both cases, there were serious environmental concerns related to fuel spillage. In the same year that the *Explorer* sank, a power failure aboard the *Fram* caused the ship to drift into an iceberg (Black, 2008). The Arctic is not immune to such incidents. In 2007, 17 cruise passengers onboard the *Aleksei Maryshev*, which was visiting the Svalbard Islands, were injured by a wave from a calving glacier (Knight, 2007). In a similar accident later in the same year, two Danish tourists were killed while photographing a glacier in Greenland (*Sermitsiaq*, 2007). There have been surprisingly few mishaps of this magnitude with cruise ships in the Canadian Arctic, but as mentioned elsewhere, what happened to the ice-strengthened *Explorer* in the Antarctic could happen to other ships operating in the Canadian Arctic (Stewart and Draper, 2008). Incidents such as these may increase as climate change subjects polar environments to greater unpredictability in ice conditions.

*Monitoring Issues*

The availability of short-term and long-range sea ice forecasts to aid in safe vessel transits, route planning, and long-term planning will be a key concern for all Arctic shipping given increased inter-annual variability in sea ice hazards (Stewart et al., 2007). The Canadian Ice Service of Environment Canada is the government department responsible for monitoring and relaying ice information to the public. In the Hudson Bay region, individual multi-year ice floes or icebergs are difficult to detect via satellite and are not monitored or tracked by the Canadian Ice Service. On the water, it is the responsibility of the ship captain to avoid such hazards. Short-term forecasts of ice conditions are not issued by the Canadian Ice Service because the operating season in the Hudson Bay region is considered to be ice-free. Seasonal forecasts are made six to nine months ahead of the date when the commercial shipping route to Churchill is expected to be ice-free, however the shipping route is a direct transit through the Bay and would not be relevant for cruise operators who favour the coastal regions.

An additional concern is that no comprehensive monitoring and surveillance system exists to scrutinize actual cruise activity through Canadian Arctic waters. Cruise ships do not have to register with the Canadian Coast Guard's Arctic marine traffic system, called NORDREG (CCG, 2009). However, the current Canadian government is attempting to make registration mandatory for all ships entering Canadian waters (Office of the Prime Minister, 2008). Apart from exercises such as those presented in this paper, very little is known about the scale and scope of cruise tourism in Arctic Canada. Without a basic data set in place, it is impossible to monitor patterns of cruise activity over time. This lack of data reduces the chance of managing cruise activity so that it is beneficial for communities visited, a positive experience for passengers, and an environmentally responsible form of tourism.

Furthermore, without a Canadian Arctic equivalent of the International Association of Antarctica Tour Operators (IAATO), there is no regulatory body overseeing the development of cruise tourism in the Canadian North. IAATO was founded in 1991 to advocate, promote, and practice safe and environmentally responsible private sector travel to the Antarctic. IAATO currently has just over 100 members, who work together to develop, adopt, and implement operational standards that mitigate potential environmental impacts (IAATO, 2008a). The closest parallel organization is the Association of Arctic Expedition Cruise Operators (AECO), which works to ensure that voluntary codes of practice are adhered to in the European Arctic, but Arctic Canada falls outside of the regional remit of AECO (AECO, 2008). The sinking of the *Explorer* should provide impetus to create a new body, or extend the remit of IAATO or AECO to the Canadian Arctic. Such action is critical because it is clear that emergency and contingency response plans developed by IAATO prior to the *Explorer* incident contributed significantly to the successful rescue operation (IAATO, 2008b).

If a similar incident were to occur in Arctic Canada, it is unclear that the outcome would be as favourable. Barring the fortunate circumstance of a Canadian Coast Guard (CCG) or other commercial vessel being in the immediate vicinity of an incident to provide search and rescue (SAR) functions, the CCG's response time could be 10 hours or more depending on ice, weather, hydrographic, and other conditions (CCG, 2007, 2008c). While six icebreakers (heavy and medium duty ships) are deployed to the Arctic in summer, and while SAR operations take precedence in CCG operations, icebreakers serve different areas of the Hudson Bay region for varying periods of time. For instance, icebreakers may be available for deployment to Foxe Basin from August 20 to September 15, to serve East Baffin from August 14 to September 18, and may be present in both Ungava and Hudson bays between July 3 and October 24 (CCG, 2008b). In a 2008 review of their service levels, CCG's clients across the country requested that SAR services be available for a longer season to better coincide

with schedules of the shipping industry, ferries, and recreational boaters (CCG, 2008a). With the perceived lengthening of the Arctic shipping season, cruise ship operators also might be among those who would benefit from extended CCG service dates.

## CONCLUSION

The development of a robust policy and management framework is vital to monitor the cumulative effects of cruise tourism in Arctic Canada. But in the absence of broad-scale monitoring and surveillance, it is important to build a picture of cruise ship tourism using available data sources. Although far from satisfactory, the data presented in this paper are important to understand regional patterns of cruise tourism. Currently there is a balance of cruise activities throughout Arctic Canada, with all regions (apart from the ice-infested Queen Elizabeth Islands) experiencing some level of cruise activity. However, our analysis of cruise activity in the Hudson Bay region illustrates considerable variability and shows that a change in distribution of cruise activity may be underway. Northwest Passage tours are among the most popular expedition cruises in Arctic Canada because of the combination of good wildlife viewing opportunities and unrivalled opportunities to witness the relics associated with the historical exploration of the Passage. The Hudson Bay region currently struggles to compete with these destination characteristics and will continue to do so, particularly when the southern reaches of the Canadian Arctic will transition faster to an ice-free summer. In the long term, the focus for cruise operators wishing to remain active in the Hudson Bay region (if market conditions allow it) may require a shift toward more land-based tourism activities such as those related to arts and crafts and Inuit culture.

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