

13 Hudson Bay

Overview

The Hudson and James bays stretch across the northern reaches of Manitoba, Ontario and Quebec. The bays are fed by water from one third of all Canadian rivers, and form one of the world's largest seas. The catchment area covers 2,600,000 km², from Labrador in the east to the Rockies in the west, and from the Arctic Circle in the north to almost the Great Lakes in the south.

In this report, the Hudson Bay is defined to include James Bay unless the text indicates otherwise.

Location

Basic information¹¹

Surface area : 1,232,300 km²

Volume : 157,734 km³

Average depth : 128 m

Maximum depth : 183 m

Nature

< Background >

The Hudson Bay is a vast, shallow, semi-enclosed area, bordered by the Canadian provinces of Quebec, Ontario, Manitoba and Nunavut. It is connected to the Davis Strait, Labrador Sea and Atlantic Ocean through the Hudson Strait, and to the Arctic Ocean by the Foxe Basin and the Fury and Hecla Straits.¹

The Hudson Bay has a mean depth of 128 m with a maximum depth of 183 m. The Hudson Bay Complex has, since the last ice age, been undergoing isostatic rebound and, while the rate is declining, the region is still rebounding at approximately 1.2 m/century.^{2,11}

Climate

Mean annual temperatures range from -5 °C to -2 °C, mean summer temperatures from 10.5 ° to 11.5 °C, and mean winter temperatures from -19 °C to -16 °C. Mean annual precipitation ranges from 400 mm in the far north to 800 mm in the far east. Generally, the lowlands receive a mean precipitation of 500-700 mm annually. This ecoregion has a high subarctic ecoclimate in the north, a low subarctic ecoclimate in the lowland, and a high boreal ecoclimate in the James Bay lowland, all characterized by short, cool summers and cold winters.³

During the summer, when Hudson Bay is ice-free, fog banks and low stratus are common over the cold water. Snow squalls are common during the fall, often developing as cold arctic air (-8 °C or less) flows over the open and warmer waters of the Hudson Bay. During winter, large sections of Hudson Bay begin to freeze. Weather here can change rapidly. The passage of frontal systems can bring on periods of snow, strong winds, and sometimes blizzards or whiteout conditions. With the arrival of longer and warmer days of spring and summer, the last of the ice usually melts off of Hudson Bay by late June or early July.⁴

Hydrology

The water properties of these regions depend mainly on exchanges with Foxe Basin and Hudson Strait and the large freshwater input from both runoff and melting sea ice in the spring and summer. The northern area, or Hudson Bay marine region, is characterized by the presence of Arctic marine water and biota, complete winter ice cover and summer clearing, moderate semidiurnal tides of Atlantic origin, a strong summer pycnocline, greater mixing and productivity inshore than offshore, and low biological productivity relative to other oceans at similar latitudes.

In spring and summer, the cold saline surface water that enters the region is diluted by meltwater and runoff from the land, warmed by the sun, and mixed by the wind as it circulates through Hudson Bay. This produces the strong vertical stratification of the water column that is characteristic of the ecosystem in summer, particularly offshore. In summer, surface water circulates cyclonically (counterclockwise) around Hudson Bay, and the deep water moves in the same general direction. Cold, saline Arctic water from Foxe Basin enters Hudson Bay in the northwest via Roes Welcome Sound. As it flows eastward along the southern coast of Hudson Bay some of this water enters James Bay while the remainder is deflected northward to exit northeastward into Hudson Strait. In winter, lower runoff, ice cover, and surface cooling weaken the vertical stratification and permit very slow vertical mixing. Temperature and salinity are relatively stable below a depth of 50 m, but small changes



related to the seasonal disappearance of the pycnocline have been observed to 100 m in Hudson Bay.⁵

< Surrounding environment >

Biota

Ringed seals are found on all coasts of Hudson Bay, with the total populations estimated at 516,000. The main concentration of walrus are on the northeastern Coats Island and southeastern Southampton Island where they are found during all seasons, with an estimated summer population of 2,000. Polar bears, which depend on seals as their main food source, are found on the coasts during the summer and fall. Beluga whales are the main species of whale found in Hudson Bay. The most recent report estimates a population of 8,000 to 9,000 belugas that summer in western Hudson Bay, while a small population summers on the east coast of Hudson Bay. A population of possibly less than 100 bowhead whales inhabits northern Hudson Bay and Hudson Strait, most probably on a year-round basis. The species is endangered and has been protected by international protocols. Approximately 60 species of fish are known to inhabit the estuarine communities of Hudson Bay.

The land around the coast of Hudson Bay is tundra, taiga and peatlands. The Hudson Bay coasts provide a major migration pathway and a breeding ground for many species of geese and ducks. Approximately 2.5 million lesser snow geese and 20,000 Canadian geese use staging areas on the coastal marshes of the Hudson Bay lowlands during spring and fall migration. In an average year, 1.5 million lesser snow geese use the James Bay coastal areas. The high fertility and productivity of the coastal zone supports a wide range of food types, which enable reproduction, growth of juveniles and fattening of all ages prior to fall migration. A major breeding colony of lesser snow geese is located just west of Cape Henrietta Maria, with smaller breeding areas located on Akimiski Island, near Churchill, and in the vicinity of Arviat. Approximately 75% of the global population of Atlantic brant geese is concentrated on the eel grass beds of the Quebec coast and parts of the Ontario coast of James Bay. Also, almost the entire North American population of up to 320,000 black scoters uses southern James Bay as a staging area.⁶



Wildlife that live around Hudson Bay⁹

History and Culture

< History >

Human activities have strong historical roots in the Hudson Bay. The ill-fated expedition of Henry Hudson, who was set adrift by his mutinous crew in 1611, left the legacy for most of the names on today's maps. Later, interest in fur drew other English and French explorers to the area. In the late 1600s, the Hudson's Bay Company erected a series of forts along the bay at the Albany, Rupert, Moose and Hayes rivers and, later in the early 1700s, on the Churchill River. These posts were the early gateways to the riches of central Ontario, Manitoba, Saskatchewan and the Northwest Territories.

The fur trade brought European and aboriginal cultures together and for years it was a prosperous venture. Unfortunately, fierce competition for furs between the North West Company, from lower Canada, and the Hudson's Bay Company eventually strained the native economy, affecting subsistence and commercial activities.⁷

< Culture >

The Hudson Bay bioregion has been occupied by Cree and Inuit people for thousands of years. The Cree occupy the southern part of the region in Manitoba, Ontario and northern Quebec, as far north as Whapmagoostui. Inuit communities are found along the eastern shores of Hudson Bay in Quebec, north from Kuujuarapik to Ivujivik and Salluit. In the Northwest Territories, Inuit communities extend from Arviat, on the western shore of Hudson Bay, to Coral Harbour on Southampton Island. The Inuit community of Sanikiluaq is found on the Belcher Islands in southeastern Hudson Bay, about 100 km from the mouth of the Great Whale River.

Cree regard their part of the bioregion as a "garden" providing for all their needs. As part of their traditional subsistence economy, the Cree hunt migratory birds, particularly in the spring, as well as terrestrial mammals, such as moose. The Cree fish the rivers in the region and trap fur-bearing mammals, such as muskrat and beaver. Traditionally, Inuit have focused their harvesting efforts on fish and marine mammals, such as seals, walrus and whales. Some communities also depend heavily on caribou. A collective body of knowledge on the dynamic ecosystem and the complex relationships that govern the behavior of animals, fish and birds in the Hudson Bay area has been gathered from observation and experience that has been passed down through the generations by song, story and dance.⁶

Social Environment

< Population >

Except for a few coastal villages, the area is almost unpopulated. Approximately 32,000 people, primarily native Cree and Inuit, are widely dispersed around Hudson Bay. The percentage of the population that is aboriginal is relatively high in these regions.⁸

< Land use >

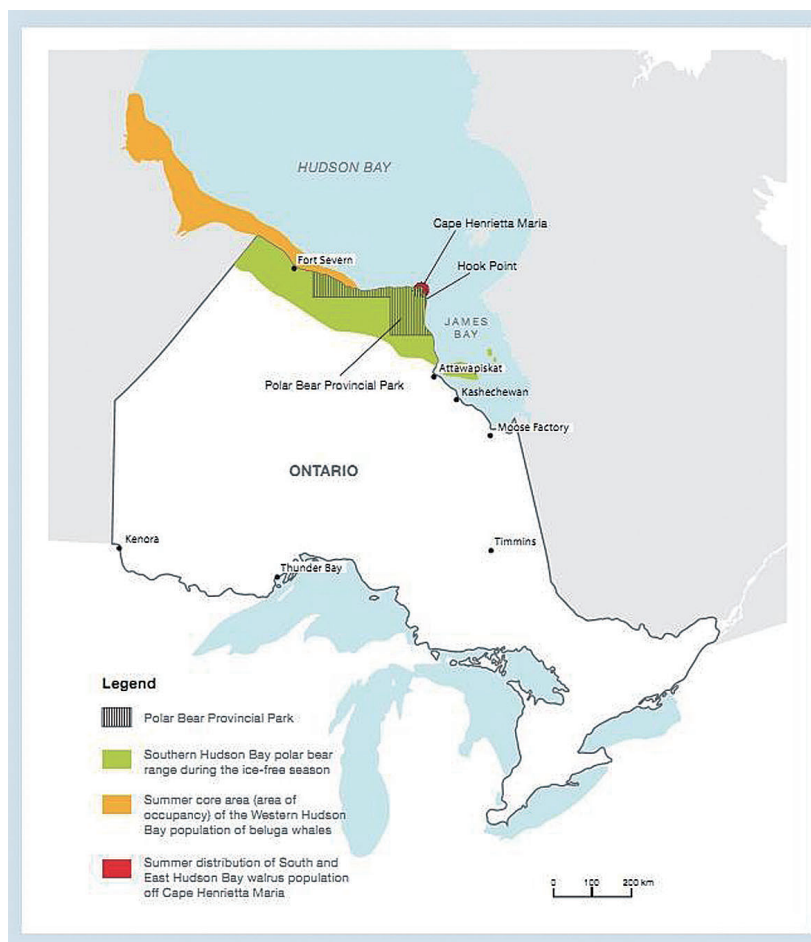
Land uses include trapping, hunting, fishing, mineral exploration and hydroelectric development. Most of the human population and land use is along the coast. As the period without sea ice increases, during the warmer months, there is more frequent use of Hudson Bay for travel, distribution of goods and the harvesting of resources.

< Industry >

Tourism

While the Hudson Bay area is ecologically diverse, it is not well-endowed with timber. Instead, tourism, fishing, hunting and trapping provide the main economic base.⁷

Opportunity exists to maximize use of existing tourism infrastructure outside the six- to eight-week polar bear season in the fall by expanding the brand to increase marketing of whales and birds, and develop an "Arctic Safari" experience in Hudson Bay in conjunction with tourism destinations in Nunavut, Ontario and possibly Quebec. This option may include cruise ships or traditional land-based tourism.⁹ The Polar Bear Provincial Park (see figure below) draws many tourists. The varied wildlife, contrasting landscapes, ocean coasts and scenic rivers of the area have become popular attractions. As the period without sea ice increases, during the warmer months, there is more frequent use of Hudson Bay for travel, distribution of goods and the harvesting of resources.⁷



Polar Bear Provincial Park¹⁰

Fishery

Most fish harvested from James Bay and Hudson Bay are taken from estuarine or coastal waters during the open water season by Cree and Inuit food fisheries. Neither culture has a tradition of offshore marine fishing. Fish are harvested for the food they provide, and as a traditional social and cultural activity. Anadromous Arctic charr are the fishes most sought after for subsistence by Inuit in Nunavut and north of Kuujjuarapik in Nunavik.⁵

Shipping

Shipping is an important commercial activity in Hudson Bay, particularly near the coast of Manitoba at the Port of Churchill. Shipping is one of the main commercial activities in or near the Port of Churchill, although the port itself is not as busy as other Canadian ports. The current shipping season runs from mid-July to the beginning of November, making it difficult to compete with shipping routes open for 10 months (i.e., St. Lawrence Seaway) or ports that are open year-round, when continuity of the supply chain is an important business consideration.⁹

Mining

The Hudson Bay region is attracting hundreds millions dollars of investment for new mineral exploration. Nunavut has one gold mine in commercial production; three projects (gold, uranium and iron ore) advancing towards production; and three projects likely to enter the regulatory process in the near term. Each mine and type of commodity will determine the extent of the opportunity, but there is the potential for these mining companies to construct facilities in Churchill that would support the mine during both its development and operational phases.⁹

Environmental Problems

<Water and Sediment Quality>

The Hudson Bay is relatively pristine. The human activities that can affect the natural environment are resource exploration, marine transportation, mining, hydrocarbons, sewage disposal and the diversion of freshwater for industrial and agricultural purposes.

Ecosystem pollution

Synthetic organochlorines and radionuclides produced by nuclear fission are two groups of contaminants found in the Hudson Bay marine ecosystem that result exclusively from human activities. High levels of both DDT (56 ng/g OC) and PCBs (920 ng/g OC) have been reported from eastern Hudson Bay. Levels of PCBs in female ringed seals were quite similar across the range of Arctic locations sampled. The value for PCB in seals from western Hudson Bay of about 700 ng/g in 1998-2000 may be compared with a value of 2,100 ng/g for female seals from the same area in 1989-94. This implies a decrease in PCB contamination over the interval.

The source of anthropogenic cesium-137 in this area was atmospheric testing of nuclear bombs, most of which ended in 1963 by international agreement. Little information exists on radionuclides in the aquatic biota of Hudson Bay. Levels of cesium-137 in animals today will have fallen below the values recorded in the early 1980s because the half-life of cesium-137 is only 30 years and inputs of new Cs-137 have fallen dramatically.⁵

< Other Environmental Problems >

Climate change

The extent of the ice cover in the Hudson Bay area has been decreasing in June and July and in November and December, indicating that the ice is melting earlier in the spring and forming later in the fall.

A three-dimensional coupled ice-ocean model suggests that a simple 2°C increase in air temperature might reduce volume of the sea ice produced in Hudson Bay by 20%, increase summer sea surface temperature by 4°C, and cause a two-week advance of breakup and delay of freezeup.

Migratory birds visiting the Hudson Bay marine ecosystem are heavily dependent on appropriate time and space linkages for successful passage. Given the dependence of so many species on the timing of break-up and freeze-up, changes to either could have extremely wide-reaching effects.

Climate change may also be affecting the polar bears in western Hudson Bay. As the top carnivores at the southern limits of their distribution, they are the "canaries in the coal mine" for regional climate change. Their dependence on ice cover makes them very vulnerable to changes in its quality, distribution, and duration. Recent declines in body condition, reproductive rates and cub survival, and an increase in polar bear-human interactions, suggest that these bears are under increasing nutritional stress. These changes have been correlated with earlier breakup and later freeze-up that have increased the ice-free period, reducing feeding opportunities and prolonging their fast.

Climate change will effect major changes in the life style, housing, travel, harvesting, and health of people who live along the coasts of Hudson Bay and James Bay and use the resources of the marine ecosystem. It may fundamentally alter the resource base of communities, such that traditional knowledge is no longer applicable.⁵

< Environmental Protection Measures >

The Hudson Bay areas are under Canadian federal jurisdiction. There is a federal responsibility to protect the integrity of the marine and fresh water ecosystems of the region. Under Canada's Oceans Act, the Department of Fisheries and Oceans (DFO) has a mandate to lead and facilitate the integrated management of all Canada's estuarine, coastal and marine environments.

DFO is taking an ecosystem-based approach to integrated oceans management. In addition to the Oceans Act, several pieces

of relevant federal legislation that apply to Arctic marine waters contribute to the conservation and protection of the Hudson Bay: the Fisheries act, Canada Water Act, Canada Shipping Act, Arctic Water Pollution Prevention Act (up to 60° N), Species or Risk Act, Canadian environmental Assessment Act, Canadian Environmental Protection Act. Main federal responsible authorities are Fisheries and Oceans Canada, Transport Canada, Environment Canada, Indian and Northern Affairs Canada.

The Nunavut Wildlife Management Board (NWMB) makes decisions relating to fish and wildlife in Nunavut. This includes setting quotas, fishing and hunting seasons and regulating harvesting methods, and approving management plans and the designation of endangered species. The NWMB has instituted a flexible quota system for polar bear hunts by Kivalliq communities and a community-based management of the Repulse Bay narwhal hunt, to provide communities with more responsibility in the management of their renewable resources. Wapusk National Park, Manitoba's Cape Churchill and Cape Tatnam Wildlife Management Areas, and Ontario's Polar Bear Provincial Park provide protection for marine mammals, birds and coastal wetland habitats along the south coast of the Hudson Bay.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) provides assessment and makes recommendations about the status of species. Actually, species at risk are designated as such under the Species at Risk Act which is under the responsibility of Environment Canada (in general) and DFO (for marine species). The Committee on the Status of Endangered Wildlife in Canada has designated the bowhead whale as endangered in the Hudson Bay and the beluga whale as threatened in the eastern part of the Hudson Bay. There is 'special concern' for the Lac des Loups Marins subspecies of harbour seal and for the polar bear. The Ivvavik National Park and the Tukturnogait National Park include a marine component. The Canadian Arctic resources Committee has proposed a Hudson Bay Programme, in an attempt to implement sustainable development policies in the region.¹

Monitoring programs

The environment of Hudson Bay is monitored by various programs, such as the Arctic Monitoring and Assessment Program (global), Ecological Monitoring and Assessment Network (regional), Char and Beluga Monitoring Program (local) and Mackenzie Valley Cumulative Impact Monitoring Program (local).

Related organizations and NGOs

· Canadian Arctic Resources Committee < <http://www.carc.org/> >

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