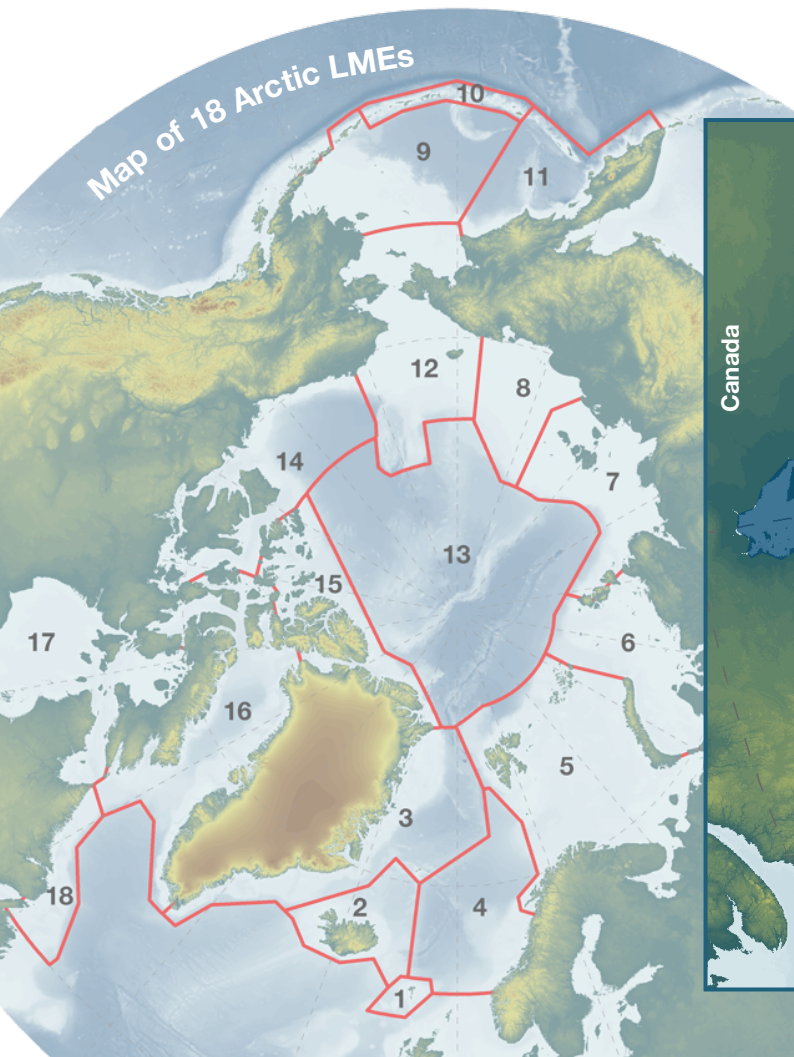


HUDSON BAY COMPLEX LME



ARCTIC LMEs

Large Marine Ecosystems (LMEs) are defined as regions of ocean space of 200,000 km² or greater, that encompass coastal areas from river basins and estuaries to the outer margins of a continental shelf or the seaward extent of a predominant coastal current. LMEs are defined by ecological criteria, including bathymetry, hydrography, productivity, and trophically linked populations. PAME developed a map delineating 17 Arctic Large Marine Ecosystems (Arctic LME's) in the marine waters of the Arctic and adjacent seas in 2006. In a consultative process including agencies of Arctic Council member states and other Arctic Council working groups, the [Arctic LME map was revised in 2012](#) to include 18 Arctic LMEs. This is the current map of Arctic LMEs used in the

work of the Arctic Council in developing and promoting the Ecosystem Approach to management of the Arctic marine environment.

Joint EA Expert group

PAME established an Ecosystem Approach to Management expert group in 2011 with the participation of other Arctic Council working groups (AMAP, CAFF and SDWG). This joint Ecosystem Approach Expert Group (EA-EG) has developed a [framework for EA implementation](#) where the first step is identification of the ecosystem to be managed. Identifying the Arctic LMEs represents this first step.

This factsheet is one of 18 in a series of the Arctic LMEs.

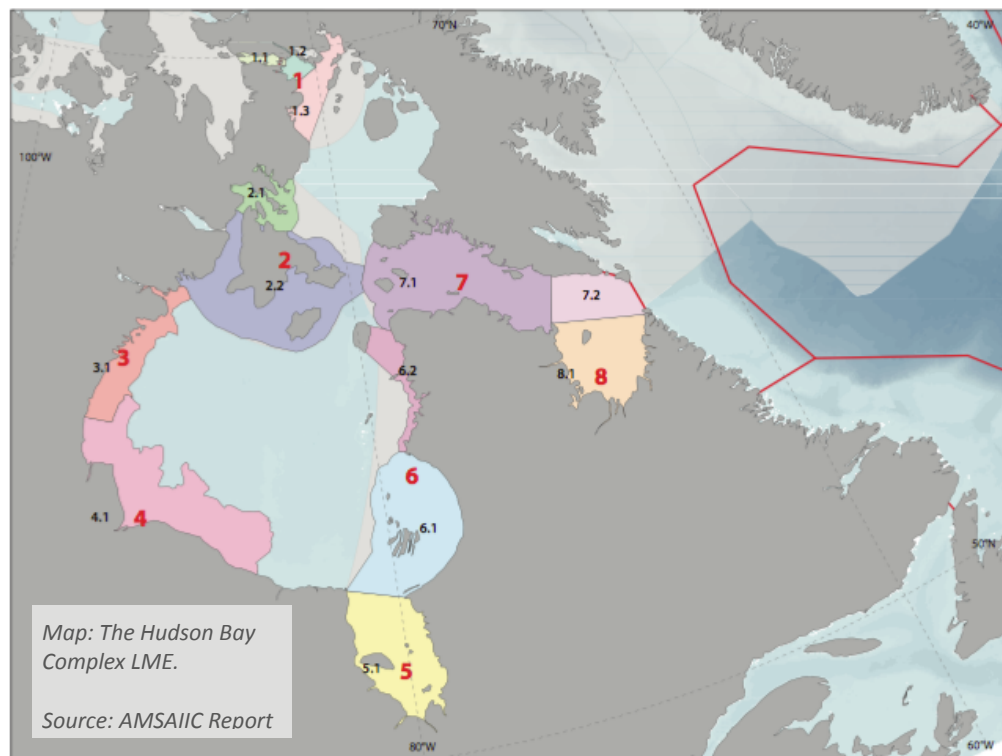
OVERVIEW: HUDSON BAY COMPLEX LME

The Hudson Bay (HB) complex is a large, Canadian inland sea with typical Arctic characteristics, including cold, dilute waters and complete, seasonal ice cover. Situated between 51° and 71°N latitude and 65° and 95°W longitude, it has a sea surface area of 1,242,000 km² and island surface area of 83,000 km². The basin is enclosed by Baffin Island and the Canadian mainland. Its main opening is to the Labrador Sea (North Atlantic) via Hudson Strait, and there is a smaller connection to the Arctic Ocean via Fury and Hecla Strait.

The HB complex is shallow except for Hudson Strait. The seafloor of Hudson Bay is comprised of two saucer-shaped basins separated by a ridge-like feature that extends from the south shore and rises to a depth of < 40 m at the Midbay Bank. A broad coastal shelf extends to 80 m depth offshore the coasts of Québec (20-50 km), Manitoba and Kivalliq (50-70 km), and Ontario and the northern islands (100 km). The bottom slopes gradually from the shelf to a smooth sea floor with an average depth of 250 m. Hudson Strait deepens progressively to 1,000 m in the east, north of Ungava Bay, and then rises to a sill less than 400 m deep that separates the HB complex from the Labrador Sea.

Hudson Bay is essentially ice-covered in winter and ice-free in summer. Most ice forms locally but a small amount of multi-year ice enters via Fury and Hecla Strait. Multi-year ice is rare in Hudson Bay and absent from James Bay. New ice forms progressively

across the HB complex from northwest to southeast, beginning in early October in northern Foxe Basin, spreading into northern Hudson Bay and Hudson Strait by mid-October, and finally into southern James Bay and eastern Hudson Strait by early December. The extent and thickness of the ice increase rapidly during November and December, with maximum coverage in late April or early May. Maximum ice thickness varies but generally increases from south to north, ranging from about 1 m in southern James Bay to 2 m in northern Foxe Basin.



Map: The Hudson Bay Complex LME.
Source: AMSAIC Report

Hudson Bay Complex LME

1.1 Fury and Hecla Strait	2.2 Southampton Island	5.1 James Bay	7.1 Western Hudson Strait
1.2 Igloodik Island	3.1 Western Hudson Bay coastline	6.1 Belcher Islands	7.2 Eastern Hudson Strait
1.3 Rowley Island	4.1 Southwestern Hudson Bay estuaries	6.2 Eastern Hudson Bay coastline	8.1 Ungava Bay
2.1 Repulse Bay / Frozen Strait			— LME (AMSAIC)

Figure A.15. Areas of heightened ecological significance in the Hudson Bay Complex LME.



MARINE MAMMALS

Atlantic walrus and ringed, bearded, and harbour seals inhabit the waters of the HB complex year-round, while polar bears and Arctic foxes frequent coastal areas in summer and ice habitats during other seasons. Harp and hooded seals and at least six species of whales including beluga, bowhead, narwhal, killer, minke, and humpback whales are typically seasonal visitors to the region, although the first three species do overwinter in Hudson Strait and sometimes in leads and polynyas elsewhere. The quality, extent and duration of the sea ice cover are vitally important determinants of their seasonal distributions, movements, reproductive success, and survival.

The ringed seal is the most common and abundant species of seal in the HB complex, where it is resident year-round. Ringed seals occur in water of virtually any depth and their distributions likely are driven primarily by availability of predator-relief habitat, food availability and ice conditions. Ringed seals in Hudson Bay are relatively small with an asymptotic length of about 1.2 m and a weight of about 50 kg. Ringed seals are adaptable in their feeding habits and eat a variety of pelagic, nectonic, and benthic invertebrates and fishes—particularly the amphipod *Themisto libellula*, the mysid *Mysis oculata*, polar cod, and sculpins. Sandlance appears to be an important food item for ringed seals in Hudson Bay while polar cod contribute less to the seal diet here than in many other Arctic regions. The total number of ringed seals in the Hudson Bay Complex is not (well) known. Smith (1975) estimated a population of about 0.5 million ringed seals in Hudson and James Bays.

Bearded seal is a much larger species than ringed seal, weighing 250-300 kg and measuring 2-2.5 m in length. The species has a circumpolar distribution in ice-covered waters and occurs with two recognized subspecies for the Atlantic and Pacific sectors. Bearded seals of the Atlantic subspecies are patchily distributed in the HB complex, typically at low densities relative to ringed seals, in areas of moving sea ice and open water in depths of less than 150–200 m, especially areas in the 25-50 m depth range. Bearded seals are found throughout the Hudson Bay Complex with the largest numbers indicated to occur in Foxe Basin, Hudson Strait and northern and eastern Hudson Bay. There are no good estimates of population size of bearded seals in the Hudson Bay Complex. Cleator (1996) suggested a minimum of 190 thousand bearded seals for the total

Canadian Arctic area, with a large fraction of them occurring in the Hudson Bay Complex.

Harbour seal is a coastal and insular seal with wide distribution in temperate, boreal and sub-Arctic areas of both the North Atlantic and North Pacific. Small resident populations of harbour seals occur along the coasts of Hudson Bay and James Bay. They are found in areas where currents maintain open water year-round, typically in freshwater or estuarine rapids, small coastal polynyas, or at the ice edge. Harbour seals occur in many of the larger river systems of southern Hudson Bay including Thleiwaza, Seal, Churchill, and Nelson. There is little information on numbers of harbour seals and their population size in Hudson Bay has not been estimated.

Harp seal is a North Atlantic species that occurs with three stocks: Northwest Atlantic, Greenland Sea/West Ice, and Barents Sea/White Sea stocks. Harp seals from the large Northwest Atlantic stock are seasonal visitors to the HB complex which is part of the summer feeding range for these seals. Migratory harp seals move into Hudson Strait where they are common before the shore ice leaves in spring, rare in summer, and common again in autumn after the shore ice forms. Some seals move further west into northern Hudson Bay and some may also move north in Foxe Basin. The fraction of the stock of harp seals that move into Hudson Strait and Hudson Bay is not known but has been considered to be small. The Northwest Atlantic stock of harp seals has been increasing from a low of about 2 million in the early 1970s to around 7-8 million in 2010. Associated with this increase they are possibly re-occupying the former range within the HB complex.

Hooded seal is a North Atlantic species found with two main populations in the northwestern and northeastern Atlantic. Seals of the western population are seasonal visitors to the HB complex. The Northwest Atlantic population has three whelping areas on pack ice in the 'Front' area (off southern Labrador and northern Newfoundland), Gulf of St. Lawrence, and Davis Strait. Some hooded seals migrate via Hudson Strait into northern Foxe Basin in July and return south in September. It is not known if these are seals that arrive from the molting area in the Denmark Strait or if they molt on the Canadian side before they move into Foxe Basin. Hooded seals are uncommon in Hudson Bay and James Bay.



Atlantic walrus were once widely distributed in the Canadian Arctic from the northern Scotian Shelf to the central High Arctic including Hudson Bay. Since the 1920s there has been a general shift in walrus distribution in the HB complex away from human communities to areas that are less accessible. Three Atlantic walrus populations or stocks have been identified in the HB complex: Foxe Basin, Southern and Eastern Hudson Bay, and Northern Hudson Bay-Davis Strait. The Foxe Basin stock is distributed year-round in the relatively shallow waters of northern Foxe Basin. The Southern and Eastern Hudson Bay stock is distributed from Cape Henrietta Maria in southern Hudson Bay north through the Belcher and Sleeper islands to the Ottawa Islands in eastern Hudson Bay. Born et al. (1995) suggested that the stock sizes were about 5,500 walrus for the Foxe Basin stock, about 6,000 for the Northern Hudson Bay-Davis Strait stock, and possibly around 500 animals for the Southern and eastern Hudson Bay stock. COSEWIC (2006) reviewed these estimates but there were little new information available to provide a basis for new estimates.

Beluga whales of 3 (or more) populations are found in the Hudson Bay Complex. The Western Hudson Bay population is the largest, with its main summering areas along the coast of southwestern Hudson Bay. The Eastern Hudson Bay population has its summering area along the coast of the Nastapoka Arc, inside of Belcher Islands. These two populations have their main wintering areas in Hudson Strait and adjacent areas. The Ungava Bay population had a restricted distribution in Ungava Bay along southeastern Hudson Strait.

Belugas make use of most of the Hudson Complex LME while foraging or during migration between summering and wintering areas. From the main wintering areas in Hudson Strait, belugas migrate in spring along ice leads into Hudson Bay. Some also remain year-round to winter in polynyas and leads in Hudson Bay. The central portions of Hudson Bay and most of Foxe Basin appear not be much used by

belugas from any of the stocks. The Western and Eastern Hudson Bay belugas are on average smaller than those of the High Arctic and Cumberland Sound populations. This may be a reflection of the difference in diets between the Hudson Bay populations and the more northern populations of beluga.

Narwhals in Hudson Bay are from the Hudson Bay population which is considered to be separate from the Baffin Bay metapopulation. These narwhals summer in northwestern Hudson Bay and most of them are believed to winter in eastern Hudson Strait. Narwhals migrate out of Hudson Strait to winter east of Resolution Island in the southwestern Davis Strait area. This wintering area is separated geographically from those of the Baffin Bay subpopulations in Baffin Bay and northern Davis Strait, which is one reason why Hudson Bay narwhals are considered to be a distinct and separate population. Westdal et al. (2009) estimate a Narwhal population of about 5,600 individuals for the HB complex.

The only baleen whale that occurs commonly in the HB complex is the **bowhead**, and it is seldom seen in southern Hudson Bay and James Bay. The HB complex is used by bowheads as wintering, migration, summer feeding, and nursery areas. Prince Regent Inlet has historically been known as a main nursery area for bowheads, and many or most of the whales that summer here, are believed to return through Fury and Hecla Strait and Foxe Basin, including bowheads that have entered through Lancaster Sound. The population of bowheads in Baffin Bay and Hudson Bay was severely depleted by the commercial whaling that ended a century ago. Close to 30,000 individuals were killed in Baffin Bay and Davis Strait over a 200-years period from 1719 to 1915, with lower numbers taken in Hudson Bay and Foxe Basin. The number of bowheads summering in Hudson Bay and Foxe Basin is not well known.

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Killer whale is now a regular summer visitor to the northwestern Hudson Bay and Foxe Basin. Historically killer whales were not known to occur in the Hudson Bay region, despite extensive observations during the bowhead whaling period in the 1800s and early part of the 1900s. There were a few sightings from Hudson Strait in the early part of the 1900s, with a marked (exponential) increase in the number of sightings in Hudson Bay after 1940. The increased occurrence of killer whales in Hudson Bay followed a change to lighter ice conditions with earlier break-up in Hudson Strait, which may have served as a blocking 'choke point' for killer whales previously. Killer whales in the Hudson Bay region appear to be of the mammal eating ecotype, and they have been reported to prey on narwhal, beluga, bowhead, and seals. The number of killer whales that use the Hudson Bay region for summer feeding is not known

Polar bears from three subpopulations inhabit the Hudson Bay Complex: the southern Hudson Bay, western Hudson Bay, and Foxe Basin subpopulations. In addition, bears from a fourth subpopulation, the Davis Strait subpopulation are found in the eastern part of Hudson Strait and Ungava Bay. The most important factor affecting the seasonal distribution and movement of polar bears is the seasonal variation in sea ice conditions. Bears rely on the ice to provide a travel platform for hunting ringed and bearded seals, and prefer areas where wind, water currents or tides cause the ice to

crack and re-freeze. They move onto the ice when it forms in the fall and travel widely until melting forces them ashore to fast until freeze-up. The ice clearance pattern combined with site fidelity to denning areas contributes to the separation of subpopulations in the HB Complex. The ice generally clears from north to south in Hudson Bay, opening first in the eastern and northwestern parts, and with the last ice to melt away usually found in southern Hudson Bay off the coast of Ontario.

Polar bears from western and southern Hudson Bay have tended to be larger than bears from other subpopulations in the Canadian Arctic. Polar bears of the Western Hudson Bay subpopulation were found also to have higher reproductive rates than populations further north, with 40% of the females having a two-year rather than a three-year reproductive cycle, weaning the cubs after 1.5 year. With earlier break-up of ice in spring or early summer, the period of spring feeding on ringed seal pups becomes shorter and the period on land fasting with little or no food becomes longer. This has been associated with bears of the Western Hudson Bay subpopulation coming ashore in poorer condition and having lower reproductive success. The Western Hudson Bay polar bear subpopulation was recently (2004) estimated to be about 950. The Southern Hudson Bay subpopulation was recently estimated to be about 700 bears in 2005. The Davis Strait subpopulation was estimated to be about 2,100 bears in 2006.





FISH

Knowledge of fishes in the HB complex is scant except for harvested anadromous species, and in the vicinity of large estuaries. Lack of a proven, commercial offshore fisheries resource has limited offshore fisheries research, and ice conditions have limited seasonal research.

At least 61 species of fish use the waters of Hudson/James Bay—fewer than are present in Hudson Strait (89) and along the Atlantic coast. Very little is known of the fishes in Foxe Basin. Species richness and abundance increases in an easterly direction through Hudson Strait. James Bay and southern Hudson Bay support characteristic and unusual estuarine fish communities that consist of a mixture of Arctic marine, estuarine, and freshwater species. Estuarine communities in the south include more freshwater and anadromous species and fewer Arctic and deepwater species than those to the north.

Warm, shallow, dilute estuaries along the Quebec coast, from the Eastmain River north to Lac Guillaume Delisle (Richmond Gulf), attract typically freshwater species such as lake trout, lake whitefish, lake cisco, and burbot. Further north and moving offshore, where the salinity is higher and water colder, there are fewer freshwater species and more Arctic species such as Arctic charr, Greenland cod and shorthorn sculpin. The estuaries provide important seasonal foraging and nursery habitat for many species, spawning habitat for some, and year-round habitat for fourhorn sculpin. Offshore, the relatively shallow depths in James Bay, Hudson Bay, and much of Foxe Basin likely exclude many of the deepwater fishes that occur in Hudson Strait, including commercially valuable species such as the Greenland halibut (turbot) and redfish.

In bottom trawls of eastern Hudson Strait, Arctic cod are dominant in terms of numbers and Greenland halibut in terms of weight; in western Hudson Strait they are replaced by lumpfish and seasnails. Small, shallower water species such as capelin and Arctic cod are vital links in the food chain of the HB complex between pelagic invertebrates and larger fish, marine mammals and birds. Large numbers of capelin spawn on beaches in the Belcher Islands and near the Nelson River in June. Arctic cod are often associated with ice cracks of edges and move inshore in late summer, sometimes in very large schools. Larval Arctic cod are very common in the coastal waters of southeastern Hudson Bay.

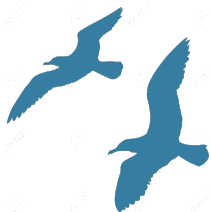


WATERFOWL

Large areas of the Hudson Bay and James Bay coasts provide critically important habitat for migrating and moulting North American waterfowl. During the breeding season most of these waterfowl frequent low-lying tundra near lakes or coastal river mouths. Low-lying coasts with important habitats for waterfowl are also found on islands in the northern Hudson Bay and in the Foxe Basin, as well as along western Baffin Island from the Foxe Peninsula north to Taverner Bay. Coastal habitats are important post-breeding feeding areas for many waterfowls including molting ducks and geese. They are also important staging areas for migratory waterfowls, including populations of sea ducks and geese that breed further north in the Canadian Arctic Archipelago and the northern Baffin Bay area. The vast majority of waterfowl are migratory and leave the Hudson Bay Complex to winter either on coasts or inland further south in North America.

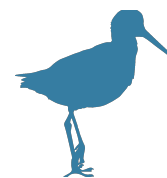
The Hudson Bay Complex spans a wide range of latitudes (from 52 to 70°N) and climatic conditions, and the number of species generally decreases from south to north. A total of 33 species of waterfowl are common or regular breeders in this LME. They include 12 species of sea ducks, 7 dabbling ducks, 3 diving ducks, 6 geese, one swan, and 4 species of divers. The most numerous and widespread are common and northern eider, long-tailed duck, red-breasted merganser, Canada goose, snow goose, and red-throated diver.





SEABIRDS

The Hudson Bay Complex LME provides resources of critical national and international importance to migratory seabirds, waterfowl, and shorebirds. Few species remain year-round due to the near complete ice cover. The Hudson Bay Complex LME provides breeding habitats and feeding grounds for several seabird species, and serves also as migration area and to lesser extent as wintering habitat for seabirds and other birds. Eleven species of seabirds are regular breeders in this LME (2 auks, 5 gulls, Arctic tern, and 3 skuas. The most abundant breeder by far is the thick-billed murre (670,000 pairs), which constitute 90% of the summer seabird biomass in northern Hudson Bay and Hudson Strait and supports the third-largest seabird community in the Canadian Arctic. The seabirds migrate into the region mostly from the east via Hudson Strait. In contrast, waterfowl and shorebirds typically enter from the south via James Bay or southern Hudson Bay.



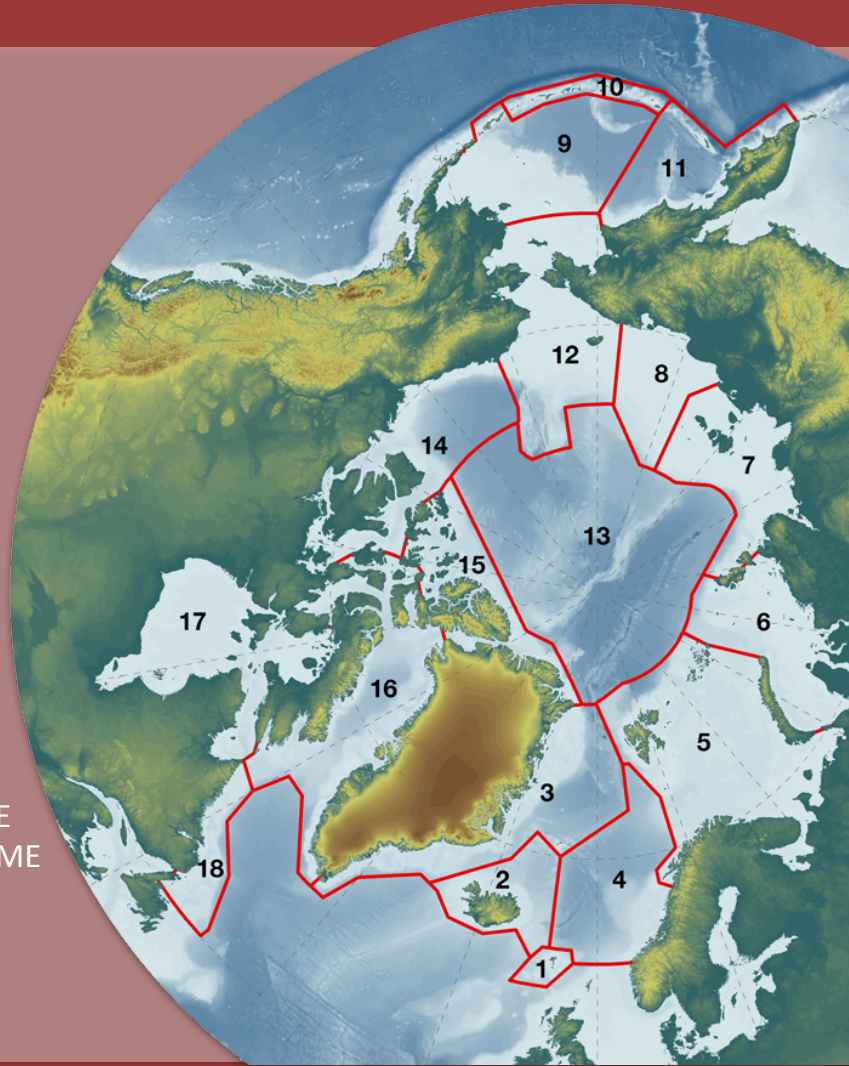
SHOREBIRDS

The Hudson Bay Complex offers extensive habitats for shorebirds particularly along lowlying coastlines where high tidal ranges provide large areas of intertidal flats adjacent to tundra and marshes. These provide important breeding, feeding and migration habitats for a large number of shorebirds of many species. The wide latitudinal range from southern James Bay (52oN) to northern Foxe Basin (at about 70oN) spans a wide range of environmental conditions from northern boreal to near high arctic, contribution to a high diversity of shorebirds in this LME.

About 27 species breed regularly around the coastlines of the Hudson Bay Complex. These comprise 10 calidrine sandpipers, 3 phalaropes, ruddy turnstone, 4 plovers, 3 godwits and curlews, 4 shanks, and 2 snipes and dowitchers. All the shorebirds are migratory and leave the Hudson Bay Complex to winter at lower latitudes and in South America. The extremely flat shorelines of southern Hudson Bay and western James Bay combined with relatively large tidal ranges result in very wide tidal flats, extensive eelgrass beds and rich coastal marshes make it one of the most important stopping places in North America for migrating Arctic-breeding waterfowl and shorebirds.

ARCTIC LMEs

1. Faroe Plateau LME
2. Iceland Shelf and Sea LME
3. Greenland Sea-East Greenland LME
4. Norwegian Sea LME
- 5. Barents Sea LME**
6. Kara Sea LME
7. Laptev Sea LME
8. East Siberian Sea LME
9. East Bering Sea LME
10. Aleutian Islands LME
11. West Bering Sea LME
12. Northern Bering-Chukchi Sea LME
13. Central Arctic Ocean LME
14. Beaufort Sea LME
15. Canadian High Arctic - North Greenland LME
16. Canadian Eastern Arctic - West Greenland LME
17. Hudson Bay Complex LME
18. Labrador-Newfoundland LME



LITERATURE REFERENCES

- *The 2007 assessment of Oil and Gas in the Arctic (OGA) - AMAP (2007)*
- *AMAP OGA 2007 - Updated description of the Barents Sea LME. Lead author: Hein Rune Skjoldal.*
- *Arctic Marine Areas of Heightened Ecological and Cultural Significance: Arctic Marine Shipping Assessment (AMSA) IIC - AMAP/CAFF/SDWG (2013)*
- *Large Marine Ecosystems (LMEs) of the Arctic area Revision of the Arctic LME map - PAME (2013)*

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Nordic Council of Ministers



OAK
FOUNDATION

Text: David J. Prieto

PAME INTERNATIONAL SECRETARIAT
BORGIR
NORDURSLOD
600 AKUREYRI
ICELAND

TEL.: +354 4611355
EMAIL: PAME@PAME.IS
WWW.PAME.IS