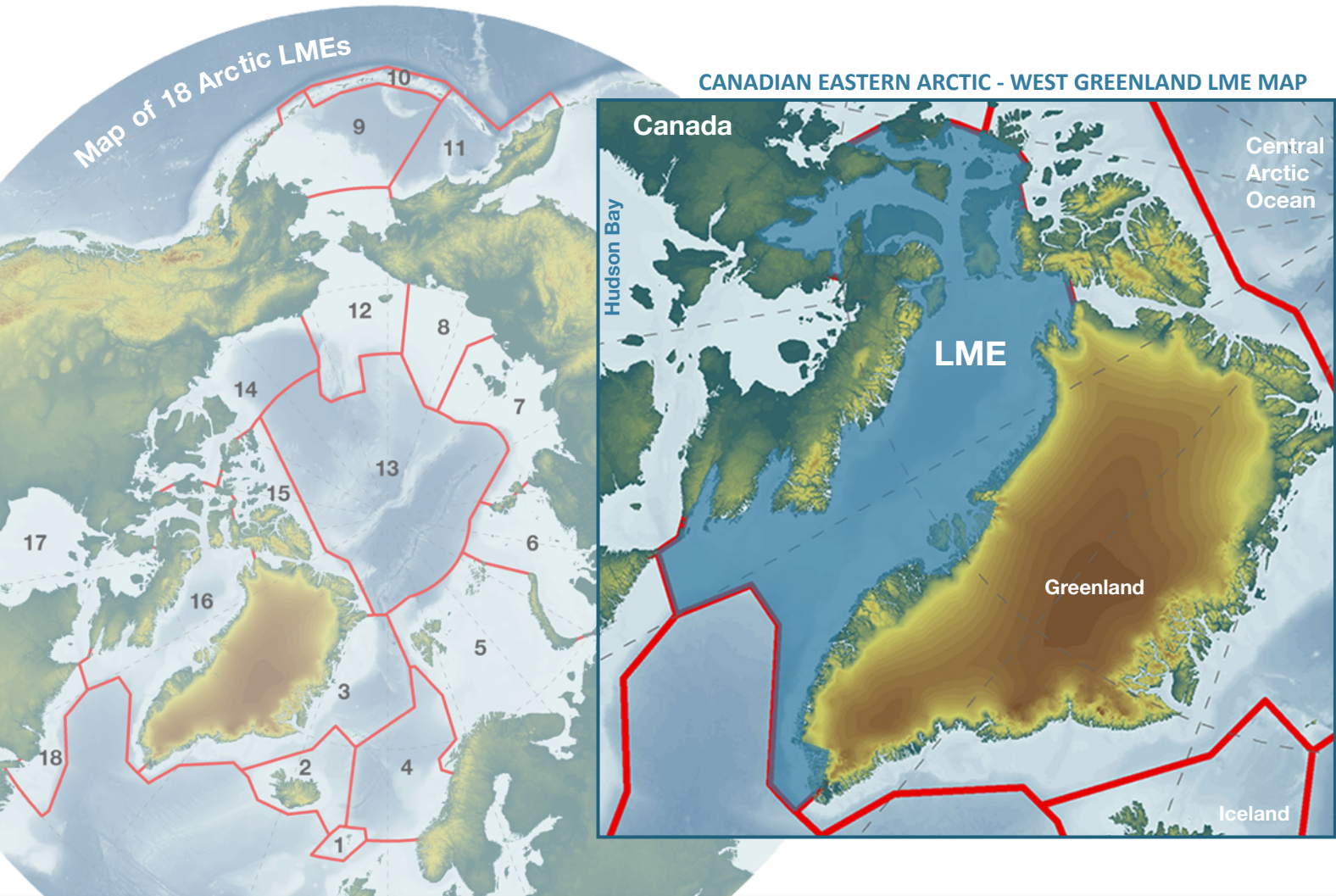


CANADIAN EASTERN ARCTIC - WEST GREENLAND LME



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.

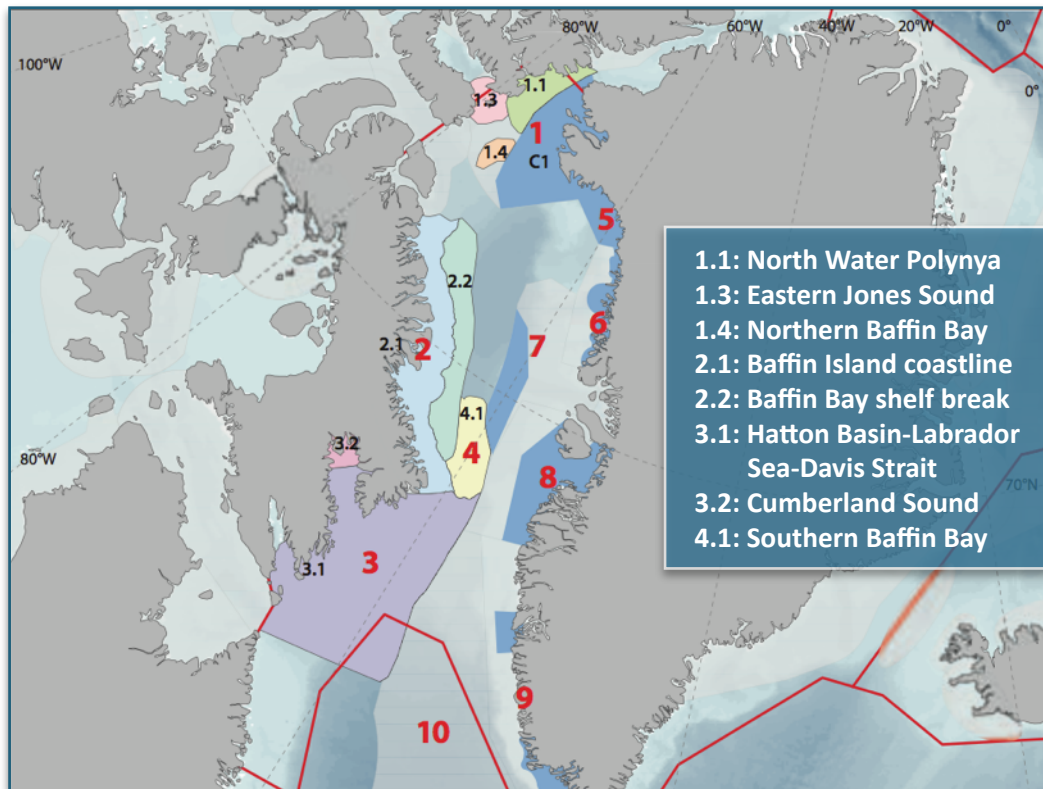
This factsheet is one of 18 in a series of the Arctic LMEs.

OVERVIEW: CANADIAN EASTERN ARCTIC - WEST GREENLAND LME

The Canadian Eastern Arctic – West Greenland LME includes Baffin Bay - a large, elongated basin with a maximum depth of >2300 m, Davis Strait, the south-western shelf of Greenland, and the northern part of the Labrador shelf. Baffin Bay's very large north-south extent, contiguity to the North Atlantic Ocean, multiple linkages to the Arctic Ocean, and direct contact with Greenland's vast terrestrial ice masses make this LME a particularly dynamic and sensitive Arctic regime.

Its deep and coastal shelf waters are, with the exception of the North Water Polynya and, in most years, its south-eastern areas off southern Greenland, fully ice-covered between January and April. The region's numerous icebergs, calved chiefly at the glaciers of West Greenland, are an equally dominant feature of the marine environment whose movements are determined largely by a combination of sea ice conditions and the region's strong cyclonic (anti-clockwise) system of currents in the upper water column.

It is also one of the largest Arctic LMEs, 1,4 million km².



Map: The Canadian Eastern Arctic – West Greenland LME.

Source: AMSAIIIC Report

The hydrography is characterized by circulation of Atlantic water through Baffin Bay and Lancaster Sound, and flow of Pacific water from the Arctic Ocean through passages in the Canadian archipelago and Nares Strait. The Pacific water is nutrient-rich and is one factor why the primary production is relatively high in this LME.



MARINE MAMMALS

Bowhead whale is one of only three whales that spend their entire lives in ice-covered waters of the Arctic (the others are Narwhals and Belugas). The number of bowheads in the Baffin Bay and Davis Strait region was until quite recently considered being in the low hundreds. The notion of a very low stock size was contested by Inuit hunters and elders who had observed a considerable increase in the occurrence of bowheads in their areas since the 1960s. It is now apparent that the earlier estimates of population size were much too low due to limited surveys in only parts of the range of the population. Large-scale aerial surveys in the eastern Arctic Canada in 2002-2004 resulted in best estimates ranging from 5,000 to 14,000 individuals.

Belugas winter in loose pack ice along the west coast of Greenland south of Disko Island. Aerial surveys in late winter (March) have shown that most belugas are sighted within 50 km from the coast with concentrations. After 2001 there has been a dramatic decline in sea ice along West Greenland. With less ice there is a wider distribution of Belugas, while in years with heavy ice the whales occur more concentrated in restricted areas closer to the coast. Belugas were hunted in South Greenland and a large scale driving and netting fishery with motor boats started early in the 1900s. A total of more than 11,000 belugas were harvested in the Nuuk and Maniitsoq districts from 1906 to 1929 and resulted in the virtual disappearance of belugas from areas south of 66°N. Belugas feed on fish, including redfish, polar cod, Greenland halibut and squid beaks. The estimated population in 2002 was around 20,000 whales.

Narwhal occurs in the LME throughout the year, wintering in southern Baffin Bay and northern Davis Strait in areas of heavy pack ice with 90–99% ice cover for around 6 months. Tagging results and surveys have shown that narwhals are widely distributed and dispersed throughout the pack ice in the wintering areas. Narwhals are actively diving and feeding at the pack-ice covered wintering grounds. Whales have been recorded to make 13-26 deep dives to over 800 m on average per day and to spend an average time of about 3 hours per day at those great depths. Many of the deep dives went to 1400 m or more, and females were found to do more deep

dives than did males. Three prey items appear to be particularly important in the diet of narwhals in the Baffin Bay area: polar cod, Greenland halibut and the squid. The summed total for the subpopulations is of the order of 80-100,000 individuals.

Killer whale ranges from the Atlantic Ocean up into Davis Strait and Baffin Bay. Killer whales have historically been harvested in the LME because they have been seen as competitors with man. Early whales would kill them due to perceived competition for other whales, and also for shooting practices. Inuits have been afraid of killer whales, and kayak hunters in Greenland would return to shore or enter an ice floe when killer whales were nearby. They would nevertheless harvest killer whales if there were opportunities. Greenland and Norway operated commercial whaling for some years until 1972. Killer whales have been reported to attack and kill a wide range of mammal species including bowhead, beluga, narwhal and seals.

Walrus are associated with moving pack ice over shallow waters of the arctic coast for much of the year. When ice is lacking in summer and fall, they congregate and haul out on land at sites that are often situated on low, rocky shores with steep or shelving subtidal zones where animals have easy access to the water. Walrus are primarily benthic feeders, and are generally confined to shallow coastal waters (<80–100 m depth) where they forage on bivalve molluscs and other invertebrates. Their asymptotic length and weight were about 2.7 and 3.1 m and about 700 kg and 1100 kg for females and males, respectively. The population size appears to be around 3000 animals.

Bearded seal has a circumpolar distribution as far north as 85°N. Primarily a bottom-feeder, its distribution is largely determined by the presence of shallow water. Bearded seals usually move into areas of open water <200 m deep when the pack ice retreats, although some associate with ice year-round. They are rarely found in fast ice areas, but are widely dispersed in open water areas of pack ice where leads and cracks are frequent, and where ice pans are sufficient for haul-out sites.



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. Its population in Greenland was estimated to be less than 1.000 animals in 2007, compared to an estimated number of about 3.000 seals in 1950, and it is now protected. Harbour seals are known to enter rivers, and 60-100 seals were observed 80 km up a large river in south-western Greenland in recent years. They possibly pursue Arctic char which is considered to be an important prey in Greenland. Other prey include herring, polar cod, Atlantic cod, Greenland cod, golden redfish, and long-rough. Harbour seals usually forage <50 km from their haul-out sites, although tagged seals have been found to disperse farther.

Ringed seal is a widely distributed and abundant species in the Baffin Bay system where it occurs with the Arctic ringed seal subspecies which has a continuous circumpolar distribution around the Arctic Ocean. The ringed seal is an important element of the arctic marine ecosystems, both as a main prey of polar bears, and as a major consumer of marine fish and invertebrates. An estimated population has been around 1.2 million individuals. Historically it is a popular catch in Greenland with on average around 50 thousand seals per year for the period from the 1970s to the 1990s caught in Western Greenland. Ringed seal feeds generally on small pelagic fish and pelagic and ice-associated crustaceans, but they are versatile and can also feed on demersal prey at the seafloor. Polar cod is commonly the dominant prey, and the amphipod is often also an important prey in many areas.

Harp seal is a medium-sized (about 1.8 m in length and 130 kg in weight) ice-associated and migratory seal. The harp seals are usually found associated with sea ice and they move north into ice infested waters as the seasonal ice cover opens up and disintegrates. Adult harp seals are gregarious and typically occur in groups of 5-50 individuals when they are travelling in search of food, often 'porpoising' at the surface (Finley et al. 1990, Sergeant 1991). Two fish species are particularly important as food for the Northwest Atlantic stock of harp seals: capelin and polar cod. The Northwest Atlantic stock is estimated to have increased from around 2 million seals in the 1970s to about 7-8 million in 2010.

Hooded seal is a North Atlantic species found with two main populations in the northwestern and northeastern Atlantic. It is a relatively large and sexually dimorphic seal where the males are larger than the females (mean lengths of 2.5 and 2.2 m, and mean weights of about 300 and 160 kg). Hooded seal is an excellent diver that can reach 1.500 m or more and remain underwater for up to one hour. It feeds on deepwater fish such as redfish and Greenland halibut and squid, and takes also pelagic fish like polar cod and capelin, and crustaceans like and northern shrimp. An estimate of about 600.000 individuals for the total Northwest Atlantic population of hooded seal was made in 2006.

Polar bear occurs widely distributed on sea ice in the LME from Smith Sound south to Labrador, but is rare in Greenland south of Disko Island. Polar bears are opportunistic feeders, but their primary prey is the ringed seal. The distribution and population size of polar bears are thought in general to be regulated by the distribution and numbers of ringed seals. A study indicated that beluga was the second most important prey for Baffin Bay bears (20-30%), followed by smaller amounts of bearded and harbour seals (around 5% each). These numbers vary between studies.

The Baffin Bay subpopulation was estimated to number about 2,100 bears in the late 1990s. There has been a controversy concerning the size and trend of the Baffin Bay polar bear subpopulation between Inuit traditional knowledge and the views of scientists. According to Inuit the bear population had increased and the quotas were increased in the co-management system. Scientists claimed that the population could in fact be decreasing, and that the reason for increased observations of polar bears near settlements had been less ice, forcing the bears to spend more time on land in poorer condition due to limited food.

The results of Taylor et al. (2005) suggested a fairly high natural population growth rate (unharvested) of about 5-6 % per year, and a positive annual growth of about 2% for the harvested stock. They suggested that what appeared to be the current harvest rate of 60-80 bears per year was likely to be sustainable. The average Greenland harvest of polar bears from Baffin Bay was reported to be even higher at 147 animals y⁻¹ for the period 2002-2007. Using the combined Canadian and Greenland harvest record and a population simulation model, the Baffin Bay subpopulation was estimated to have declined to <1,600 bears in 2004 reflecting substantial over-harvesting.



SEABIRDS

The LME supports a significant fraction of worldwide Arctic seabird breeding and over-wintering populations. The most numerous breeding species in this LME are dovekie or little auk (33 million pairs), thick-billed murre (1.2 million pairs), northern fulmar (242,000 pairs), and black-legged kittiwake (162,000 pairs).

Most seabird species are colonial breeders, often occurring in large colonies along steep rocky coasts, and they often occur as mixed-species aggregations. The highest diversity of breeding seabirds in this LME is found in West Greenland.

It has been estimated that about 20 million seabirds, including approximately 14 million dovekies, may winter in the area. These numbers include several marine bird species that breed, feed, and rear broods in terrestrial tundra habitats in summer and then winter in marine habitats, often in shallow waters along sheltered coasts. The most numerous of these tundra-nesting species is the king eider (300,000 birds).





WATERFOWL

Thirteen species of waterfowl are common or regular breeders in the LME. These are 5 species of sea ducks (common and king eiders, long-tailed and harlequin ducks, and red-breasted merganser), one dabbling duck (mallard), 4 geese (brent, snow, Canada and greater white-fronted), and 3 species of divers (red-throated, black-throated and great northern diver). In addition, 8 species breed more peripherally adjacent to the southwestern part of the LME (4 sea ducks (black and surf scoters, Barrow's and common goldeneye), 2 dabbling ducks (northern pintail and common teal), greater scaup, and tundra swan). The most common and widespread species are long-tailed duck, common eider, king eider, and red-throated diver.



SHOREBIRDS

About 13 species of shorebirds are regular breeders in the LME. These are 6 species of calidrine sandpipers (red knot, sanderling, and semipalmated, white-rumped, Baird's and purple sandpipers), 2 phalaropes (red and red-necked), ruddy turnstone, common snipe, and 4 plovers (American golden, grey, common ringed and semipalmated). An additional 5 species have a peripheral occurrence in the area (least, pectoral and buff-breasted sandpipers, dunlin, and common snipe).



FISH

The three most ecologically and economically important pelagic planktivorous fish species in this LME are Atlantic herring, capelin, and arctic cod (*Boreogadus saida*). Greenland halibut are distributed throughout the LME. Like the Greenland halibut, Atlantic halibut are widely distributed on the shelves and on the continental slopes of this LME.

Along the West Greenland shelf, commercial fish species include Atlantic cod, Greenland cod, redfish, Greenland halibut, long rough dab, wolffish, sandeel, and northern shrimp. Atlantic cod are found from inshore waters out to the edge of the continental shelf along southern Baffin Island, Labrador, and southwest Greenland, whereas Greenland cod are more common in the harbours and fjords of western Greenland and Labrador.

Other fish species in the LME include sand eels or sand lance, in coastal and offshore banks along south-western Greenland, roundnose grenadier, in deep waters along the slopes south of the Davis Strait (Atkinson 1995), Greenland sharks, in deep waters throughout the LME, and Greenland cod, mainly in coastal areas at depths <200 m in cold waters off western Greenland and on the western side of the LME, including the northern Labrador shelf.

The arctic char is found in lakes, rivers, and estuaries along the coasts of Greenland, Labrador, and Baffin Island. Anadromous juveniles spend their first five to seven years of life in rivers or lakes before going to sea for the first time. When at sea, most char apparently remain within 30 or 40 km of their natal rivers, although long-distance movements (e.g., 400 km) have been documented.

LITERATURE REFERENCES

- *The 2007 assessment of Oil and Gas in the Arctic (OGA) - AMAP (2007)*
- *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)*

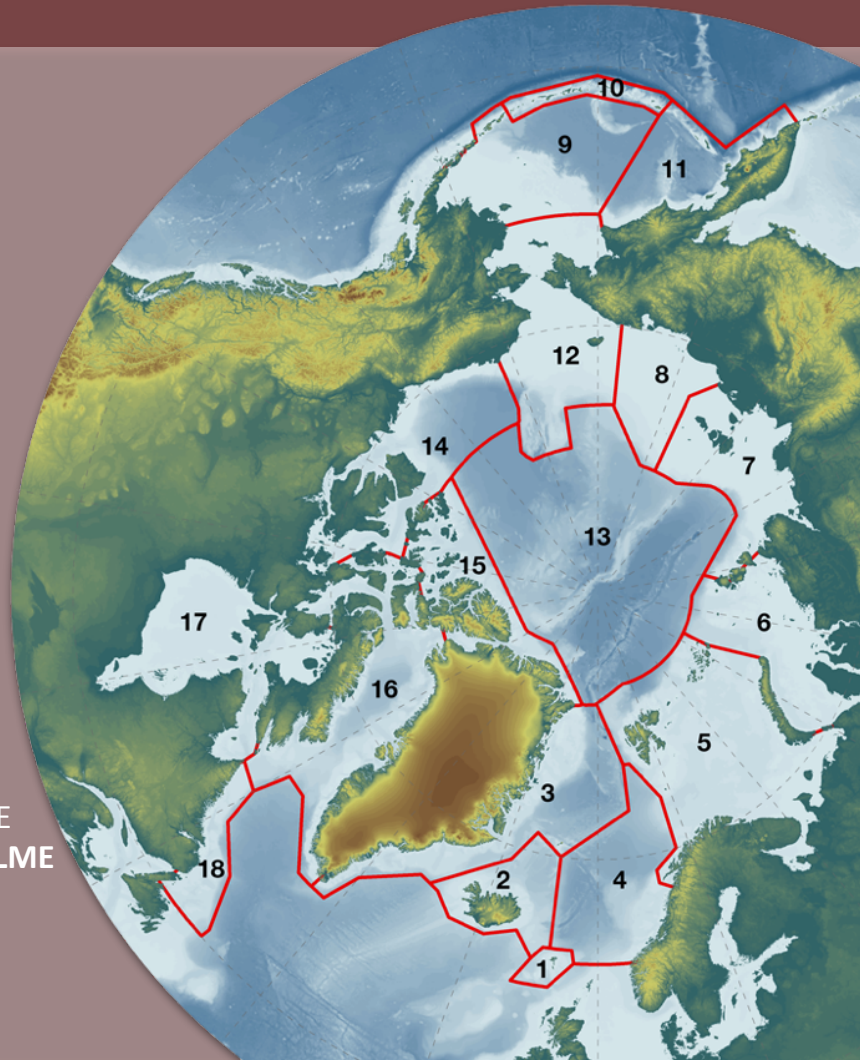
Acknowledgements

PAME gratefully acknowledges the financial support provided to this project by the Nordic Council of Ministers and the OAK Foundation.



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



PAME INTERNATIONAL SECRETARIAT
BORGIR
NORDURSLOD
600 AKUREYRI
ICELAND

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