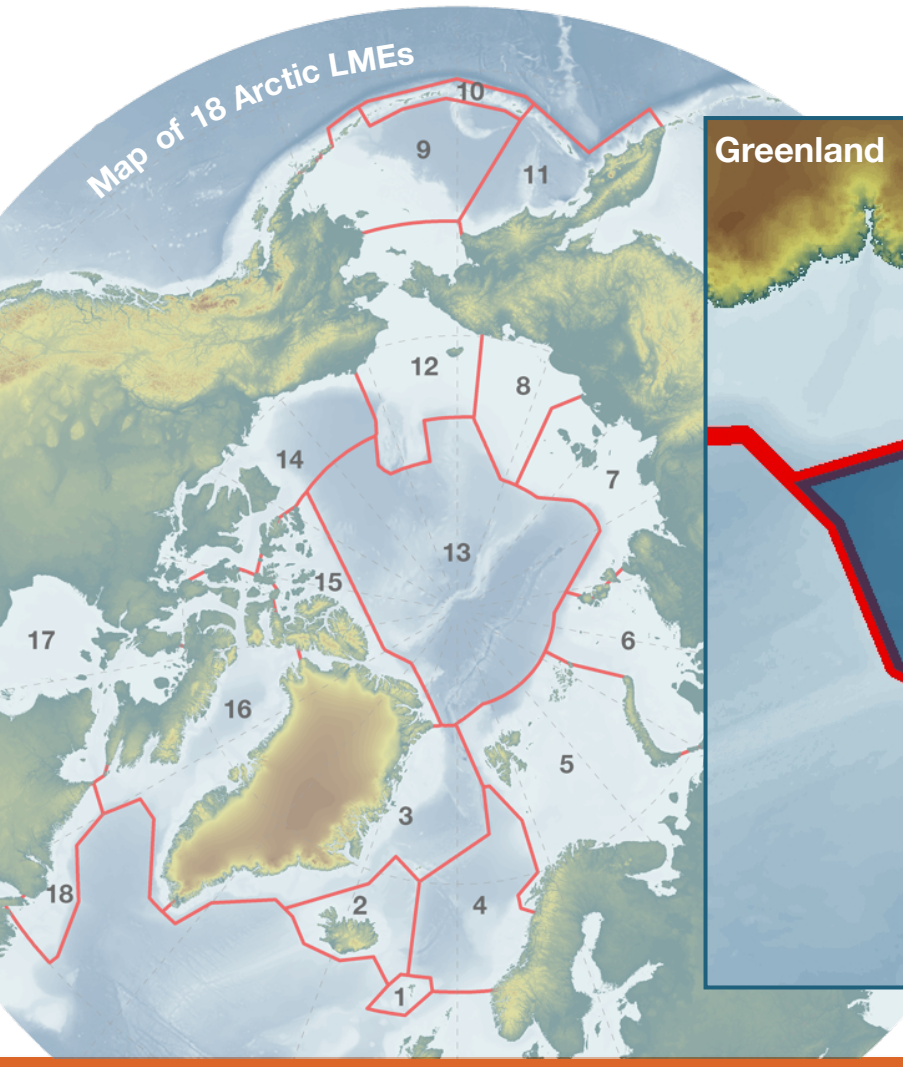
ICELAND SHELF AND SEA LME



ICELAND SHELF AND SEA LME MAP

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PAME

Protection of the Arctic Marine Environment

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 tropically 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: ICELAND SHELF AND SEA LME

The Iceland Shelf and Iceland Sea LME is a modification of the Iceland Shelp LME to include the Iceland Sea to the north of Iceland and the adjoining East Greenland shelf and coast. Reason for this extension is the seasonal feeding migration of a key species in this LME, capelin (Mallotus villosus), north into the Iceland Sea including the western part in Greenland waters.

The shelf along the south coast of Iceland is fairly narrow and with a steep slope towards the deep Iceland Basin. North of Iceland the shelf is wider, sloping down into the deeper basins (about 2.000 m) of the Iceland Sea. The mid Atlantic ridge continues as the Kolbeinsey Ridge north through the western part of the Iceland Sea before it shifts in a fracture zone east towards Jan Mayen. The Iceland Sea is bounded in the east by the Iceland-Jan Mayen Ridge which separates it from the deeper basin of the Norwegian Sea.

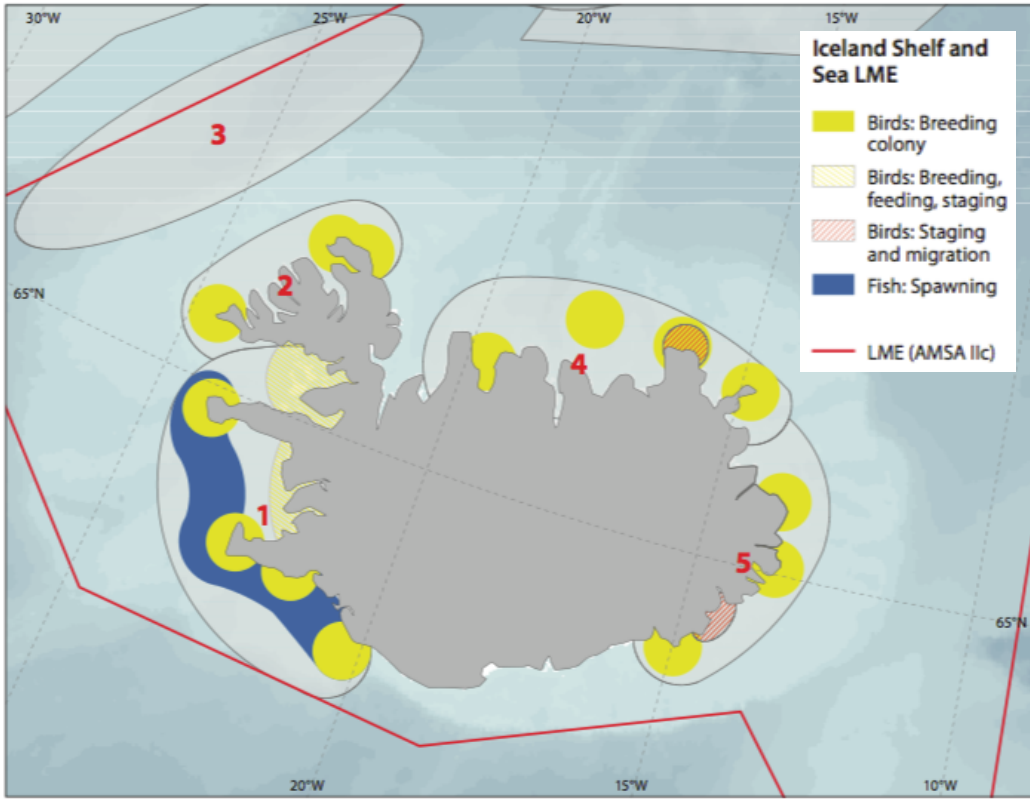


Figure A.3. Areas of heightened ecological significance in the Iceland Shelf and Sea LME.

Map: The Barents Sea LME. *Source: AMSAIIC Report*

The water circulation is clockwise around Iceland. Atlantic water from the Iceland Basin (south of Iceland) flows onto the shelf in south and continues up along the west coast of Iceland as the Irminger Current. A branch of this current is deflected west- and southwards by the sill across the Denmark Strait, while another part flows eastwards north of Iceland. The East Icelandic Current is a flow of cold Arctic water branching from the East Greenland Current and flowing eastwards and southwards along the east coast of Iceland into the Norwegian Sea. The East Greenland Current carries ice southwards and in winter the Greenland shelf and western Iceland Sea is usually ice covered. In summer the Greenland shelf is usually ice covered too. While multi-annual ice is transported into this LME from the north, the ice that forms is seasonal and in summer most of the area is ice-free except for partial ice cover over the Greenland shelf.

MARINE MAMMALS

The waters around Iceland are an important area for marine mammals. Some of the large baleen whale species migrate through or feed in this area during their seasonal migrations. The two most numerous species are fin and minke whales, which occur with about 15,000 and 65,000 individuals, respectively, in Icelandic waters.

Humpback whales which number about 1,800 individuals in Icelandic waters, feed on a mixture of krill and small fish. They appear to be particularly associated with capelin around Iceland. The more strict plankton feeding species, the **blue** and **sei whales**, are less numerous, occurring in Icelandic waters with about 1,000 and 2,000 individuals. Sei whales are seen mainly in the offshore waters south and west of Iceland, while blue whales are sighted in the slope waters west of Iceland. The frontal areas in the eastern Iceland Sea bordering the Norwegian Sea may also be important feeding areas for blue whales as well as **fin whales.** A few individuals of the very rare and endangered **North Atlantic right whale** occur each summer in the waters between Iceland and Southeast Greenland.

The northern bottlenose whale is a migratory species that moves into the northern waters in early spring. The Iceland Sea between Iceland and Jan Mayen appears to be an important feeding area for **bottlenose**, as indicated from previous whaling catches. Sighting surveys indicated about 45,000 bottlenose whales feeding in Icelandic waters. **Long-finned pilot whale** occurs mainly off southern Iceland with estimated numbers of 50-100,000 individuals. About 1500 **sperm whales** visit the Icelandic waters, where, in the area between Iceland and Greenland fish mainly redfish and Greenland halibut. About 5,000 **killer whales** occur around Iceland where they feed predominantly on herring. **White-sided and white-beaked dolphins** occur widely distributed with a total number of about 80,000 individuals, while **harbour porpoises** occur in the coastal waters with about 30,000 individuals.

Hooded seal and **harp seal** occur with fairly large populations in the Greenland and Iceland Seas. These are ice-associated seals that use the ice for breeding and moulting. They breed in the pack ice in the southwestern Greenland Sea and the northern Iceland Sea and have seasonal migrations that usually keep them in association with the drifting pack ice. During winter, harp and hooded seals occur mainly in the Denmark Strait and the western Iceland Sea. Both harp and hooded seals are frequently observed in Icelandic coastal waters, particulaly on the north coast. These are primarily young individuals which feed predominantly on redfish and cod (hooded seal) and sandeels (harp seal).

Ringed seal and **bearded seal** occur in the ice-covered waters along the coast of Greenland. These species also occasionally visit the coast of Iceland. Atlantic walrus of the East Greenland sub-population also occur along the coast but mainly north of 73.50°. Polar bears of the East Greenland sub-population is found along the whole coast of east Greenland mainly distributed on the sea ice.

Harbour seals and **grey seals** are common along the coasts of Iceland. Grey seals occur unevenly distributed with two main concentrations, one along the western and northwestern coast and another along the southern coast. Harbour seals are distributed around the whole coast of Iceland. For both seal species, sandeel was the dominant prey on the south coast of Iceland.

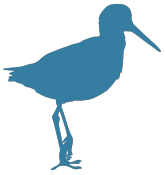
FISH

Capelin and cod are two major fish species in the Iceland Shelf and Iceland Sea LME, and their stocks show clear adaptations to the circulation features in this area. Both species spawn at the southern and southwestern coast of Iceland and the larvae drift with the Irminger Current to nursery areas west and north of Iceland. Capelin is itself an important prey for a range of consumers among seabirds, marine mammals (humpback and minke whales and harp seals) and fish, notably cod but also Greenland halibut and saithe.

The Iceland cod stock, like capelin, has the main nursery and feeding areas north of Iceland. The cod spawns in Atlantic water off the south and southwest coast in April/May, and the larvae drift northwards with the Irminger Current to the nursery areas. Cod depends on capelin as their main prey, but unlike capelin, cod do not migrate north into the cold and deep waters of the Iceland Sea. In years of low capelin abundance, the growth and weight of cod are substantially reduced compared to years with high capelin abundance.

During the change in climatic conditions in the 1960s the Norwegian spring-spawning herring stock and two Icelandic herring stocks collapsed, probably due to heavy overfishing combined with colder climatic conditions. The Icelandic spring spawning herring stock has not recovered and is no longer present in Icelandic waters. The stock of Icelandic summer spawning herring, in contrast, made a slow but complete recovery. This herring spawns in July on coastal banks in the south and southwest Iceland.

The main nursery grounds are fjords in north and northwest Iceland. The wintering areas have varied, with adults overwintering in fjords and coastal waters of eastern Iceland and recruiting yearclasses overwintering off southwest Iceland. Other important fish species that form the basis for fisheries in this area are saithe, haddock, Greenland halibut, and various flatfish species. Greenland halibut occurs primarily in the colder waters north and east of Iceland. The northern shrimp is an important demersal species and the target for an important fishery on the shelf north and east of Iceland.



SHOREBIRDS

The land and coasts of Iceland offer habitat for a rich fauna of shorebirds. Ten species are regular and common breeders on Iceland. These are Eurasian oystercatcher, Eurasian golden and common ringed plovers, common snipe, black-tailed godwit, whimbrel, common redshank, purple sandpiper, dunlin, and red-necked phalarope. Four of the breeding species are very abundant, each with total populations of 0.5-1 million individuals. These are Eurasian golden plover which breeds widespread in heathers, dunlin which breeds mainly in coastal wetlands, and whimbrel and common snipe which breed in wet habitats like bogs and moors.

Six of the shorebird species are represented with separate subspecies that breed primarily on Iceland but also in lower numbers on the Faroes and partly Scotland. These are common snipe, black-tailed godwit, whimbrel, common redshank, purple sandpiper, and dunlin. Except for purple sandpiper, which is resident on Iceland, these subspecies form migratory populations that winter mainly in western Europe, or western Africa in the case of whimbrel.

Iceland provides migratory stop-over and staging areas for high-Arctic shorebirds that breed in northeastern and northern Greenland and northeastern Canada. These are ruddy turnstone, red knot, sanderling, and dunlin. Common ringed plovers from northeastern Canada and Greenland which form a migratory population along with breeders from Iceland and the Faroes, also stage in Iceland for a part of the population. Important staging areas are located primarily on the southwestern coast of Iceland (e.g. Alftanes-Skoganes, Alftanes-Akrar, Alftafjördur-Hofsstadavogur, Innstavogsnes-Grunnafjördur, Löngufjörur, Stokkseyri-Eyrabakki) but also on the north coast (Melrakkasletta).

Four of the 10 species which are common breeders on Iceland also breed in southeastern Greenland, mainly in the Ammassalik area and generally in relatively low numbers. These are common ringed plover, purple sandpiper, dunlin, and red-necked phalarope.

SEABIRDS

Seabirds are abundant around Iceland with a total number of about 7.5 million breeding pairs. The most abundant species is the Atlantic puffin (10 million individuals). Northern fulmar is probably as abundant, as it has been increasing for a long time. Both species occur all around Iceland. There are many colonies of common murre and thick-billed murre, most as mixed colonies, with the largest in northwestern Iceland. Their total populations number about 1 million and 0.5 million breeding pairs, respectively. Other common species are black-legged kittiwakes (0.6 million pairs), razorbill (380 thousand pairs), and Arctic Tern (250-500 thousand pairs).

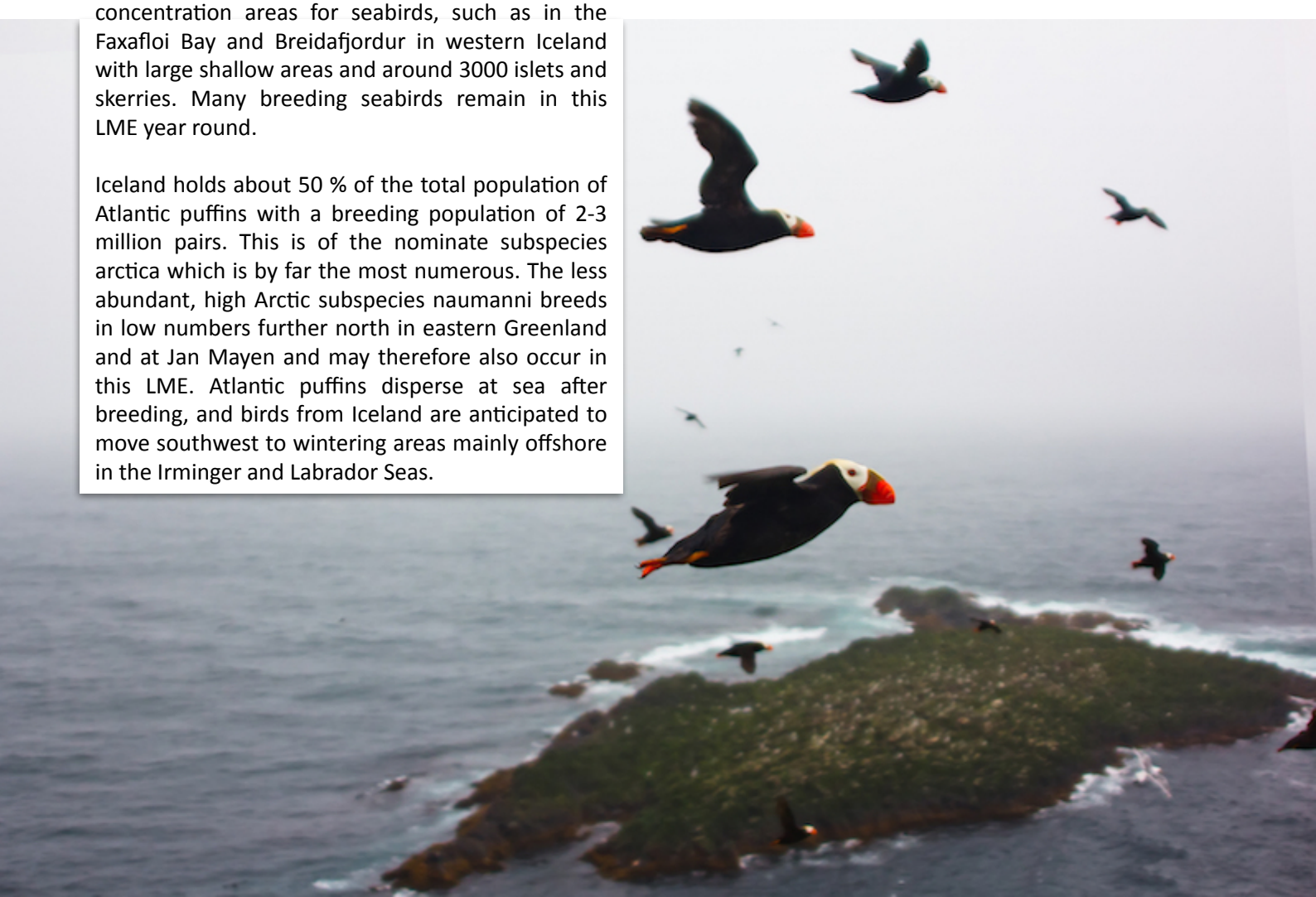
There are many cliffs with breeding colonies of seabirds around Iceland. Major seabird colonies include the cliffs at Latrabjarg, Hornbjarg and Haelavikurbjarg in northwestern Iceland, Drangey and Grimsey on the north coast, Langanes in northeastern Iceland, Skrudur on the east coast, and the seas around the Westman Islands in southern Iceland. There are also other important concentration areas for seabirds, such as in the Faxafloi Bay and Breidafjordur in western Iceland with large shallow areas and around 3000 islets and skerries. Many breeding seabirds remain in this LME year round.

Iceland holds about 50 % of the total population of Atlantic puffins with a breeding population of 2-3 million pairs. This is of the nominate subspecies arctica which is by far the most numerous. The less abundant, high Arctic subspecies naumanni breeds in low numbers further north in eastern Greenland and at Jan Mayen and may therefore also occur in this LME. Atlantic puffins disperse at sea after breeding, and birds from Iceland are anticipated to move southwest to wintering areas mainly offshore in the Irminger and Labrador Seas.

WATERFOWL

Iceland holds a large number of waterfowl of many different species. About 22 species are regular breeding birds on Iceland. These include 7 species of seaducks, 3 diving ducks (or pochards), 6 dabbling ducks, one swan, 2 geese, 2 divers, and one grebe species. The most common and abundant is the common eider. Other common seaducks are long-tailed duck, harlequin duck, and red-breasted merganser. Greater scaup and tufted duck are common diving ducks, while Eurasian wigeon, common teal and mallard are the most common dabbling ducks.

Many of the waterfowl are found mainly in inland terrestrial or freshwater habitats. This is the case for many of the dabbling and diving ducks. The most coastal species is the common eider, whereas several other sea ducks and the divers move to coastal marine habitats after breeding. Some remain to winter in Icelandic waters, notably on the milder southern and western coasts. Iceland is also winter area for some sea ducks that breed further north, notably king eider and also common eider and long-tailed duck.



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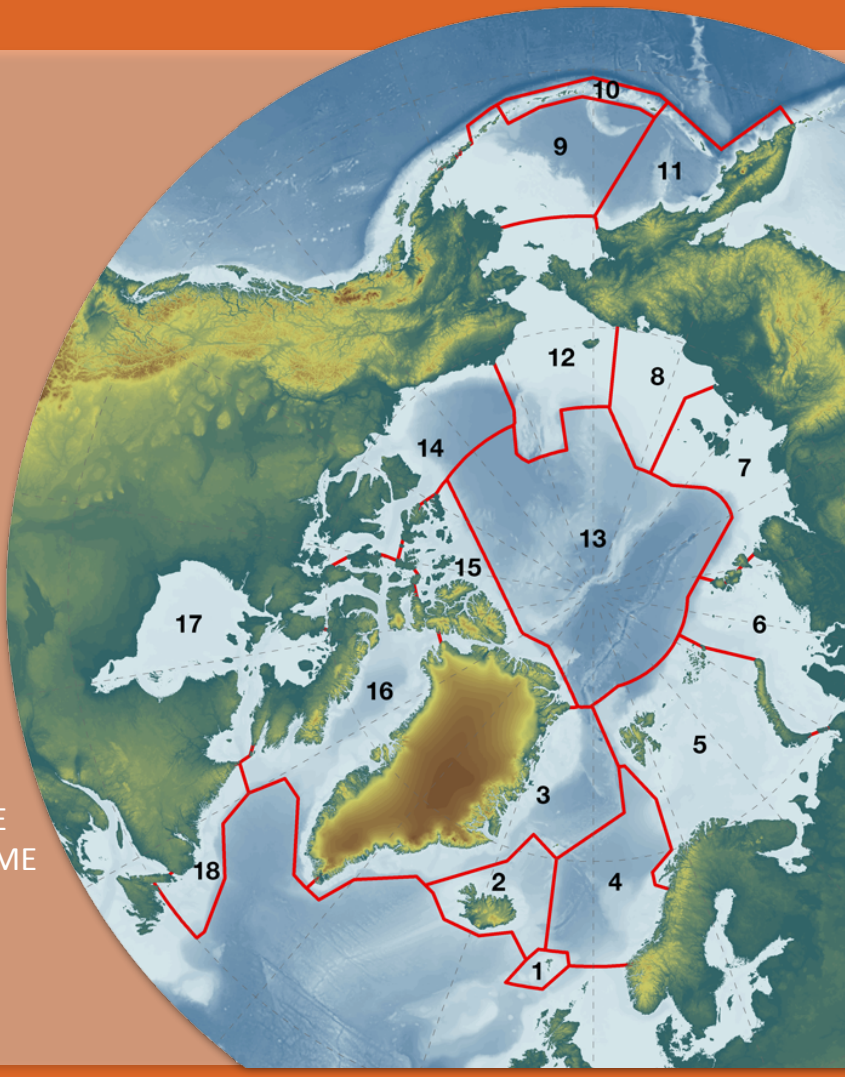
Protection of the Arctic Marine Environment

ARCTIC LMEs

1. Faroe Plateu 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



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