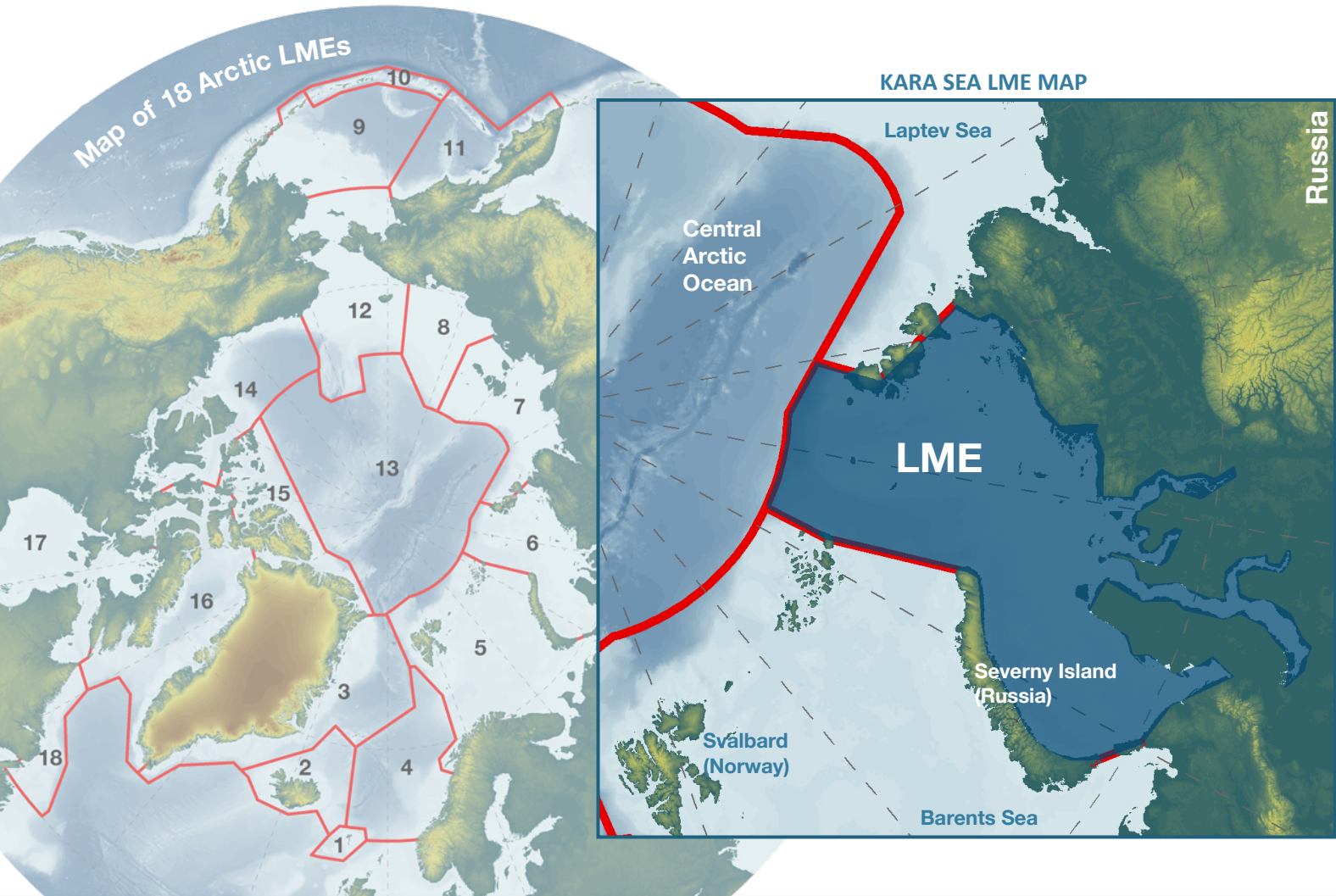


# KARA SEA LME



# ARCTIC LMEs

Large Marine Ecosystems (LMEs) are defined as regions of ocean space of 200,000 km<sup>2</sup> 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.

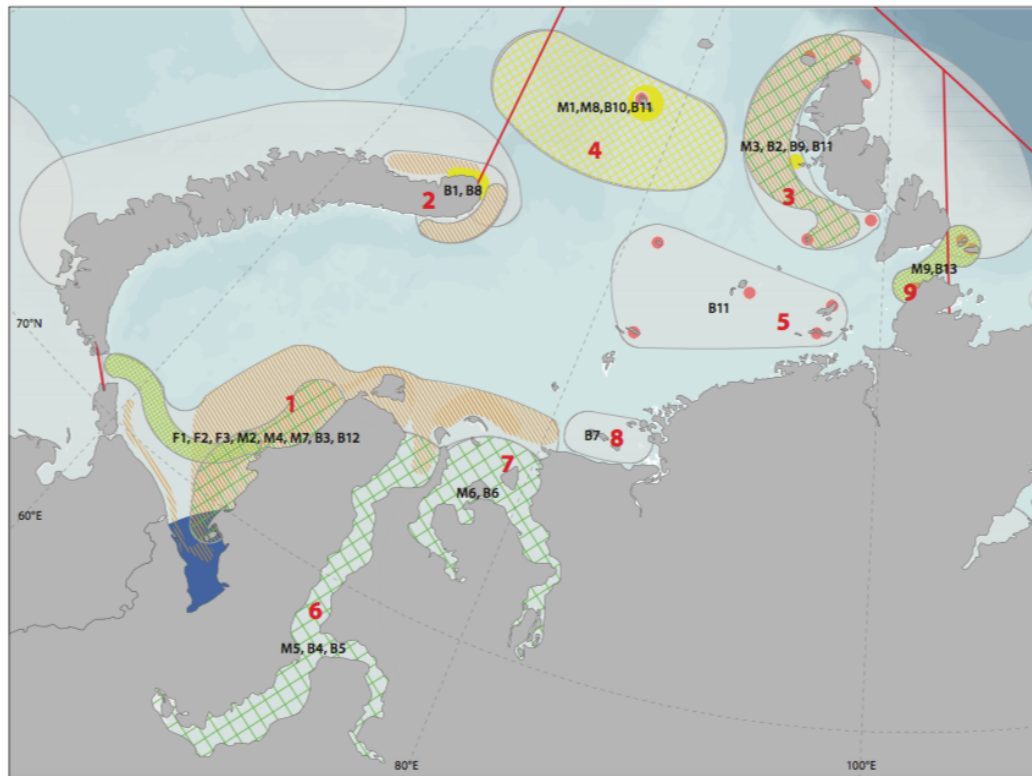
This factsheet is one of 18 in a series of the Arctic LMEs.

## OVERVIEW: KARA SEA LME

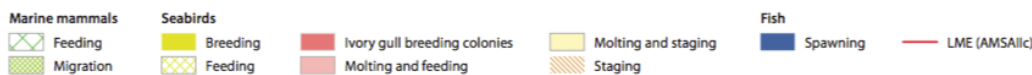
The Kara Sea is a wide and shallow shelf sea located on the western Siberian shelf between Novaya Zemlya and Franz Josef Land in the west and the Taimyr Peninsula and Severnaya Zemlya in the east. The total area is about 0.9 million km<sup>2</sup> and the mean depth is 111 meters. The Kara Sea is connected to the Barents Sea in the northwest between Novaya Zemlya and Franz Josef Land. The east the Kara Sea is connected to the Laptev Sea through the Vilkitskiy Strait between Severnaya Zemlya and the Taimyr Peninsula.

Water flows into the southwestern Kara Sea from the Barents Sea through the straits south of Novaya Zemlya. This water flows north as the Yamal Current before it branches north of the Yamal Peninsula where it is joined by discharges from the Ob and Yenisey rivers. The Kara Sea receives a very large input of freshwater by Siberian rivers, discarding over 1200km<sup>3</sup> annually. The Yenisei and Ob Rivers are among the largest rivers in the Arctic. Almost 40 % of the area of the Kara Sea is directly influenced by brackish water from the river plumes.

The whole of the Kara Sea is usually covered by sea-ice in winter. Freeze-up starts in September in the north and in October in the southern parts of the Kara Sea. Multi-annual ice may drift into the northern Kara Sea and persist as a stable ice massifs there.



Kara Sea LME



Map: The Kara Sea LME.

Source: AMSAIIC Report

Stable ice massifs also occur west of Severnaya Zemlya and east of Novaya Zemlya. There are also recurrent polynyas north and east of Novaya Zemlya. Ice melt starts in June and the fast ice along the southern and eastern coasts typically breaks up and disintegrates in July. Much of the Kara Sea is ice-free in late summer and the last ice to disappear is typically the Novaya Zemlya, Severnaya Zemlya and northern ice massifs.



## MARINE MAMMALS

Nine species of marine mammals occur regularly in the Kara Sea. These are 4 species of whales (beluga, narwhal, bowhead and harbour porpoise), 3 species of seals (ringed, bearded, harp), walrus and polar bear. In addition, 3 more whales may occur as vagrants in the westernmost part of the Kara Sea in the ice-free season (killer, humpback and fin).

**Belugas** are assumed to feed on aggregations of polar cod in the northern Kara Sea in the early summer, later following the polar cod into the shallower parts of the southern Kara Sea. Primary feeding grounds of belugas are the shallow waters off the Taimyr Peninsula, the Obskaya Inlet and the Yenisey Gulf. Here they also feed on whitefish during summer and early autumn. As the winter approaches, the belugas return to their wintering areas in the Barents Sea. There appears to be few belugas that overwinter in the Kara Sea. IWC (2000) recognized 8 stocks in the Barents and Kara seas region with two of them having summer feeding areas in the Kara Sea (Ob Gulf and Yenisey Gulf) and a third in the western Laptev Sea. The total number for the migratory Karskaya population has been suggested to be 15-20,000 belugas.

**Narwhal** occurs mainly in the northern and deeper parts of the Kara Sea. There are limited observations and most of them from the waters around Franz Josef Land in the northern Barents Sea. The narwhals may occur as far north as 85°N in the Arctic Ocean north of the Kara Sea in summer. They winter possibly in areas with recurrent polynyas or in the marginal ice zone of the Barents and Greenland Seas.

**Bowhead whales** have occasionally been observed in the northern Kara Sea. These are possibly individuals of the strongly depleted and 'Critically endangered' Spitsbergen stock. **Harbour porpoise** is a regular visitor to the western areas of the Kara Sea during the ice-free period in summer.

The most common mammals in the Kara Sea are **ringed seal** and **bearded seal** that occur widely distributed in ice-covered waters. The extensive areas of fast ice in the shallow waters in the Obskaya and Yenisei Inlets and off the Taimyr Peninsula and the western Severnaya Zemlya provide vast areas of breeding habitats for ringed seal. With the onset of freeze-up, some seals migrate from the southwestern Kara Sea through the straits south of Novaya Zemlja into the southeastern Barents Sea. Ringed seals

migrate from the Laptev Sea through the Vilkitskiy Strait into the northeastern Kara Sea during spring and summer. The main prey items for ringed seals in the Kara Sea are polar cod and various crustaceans. Bearded seal is distributed over large areas of shallow water where it dives to feed on a variety of benthic animals including crabs, shrimps, gastropods, polychaetes and sea cucumbers. It lives mainly solitary or in small groups of 2-3 individuals but may concentrate in larger groups in the autumn.

**Atlantic walrus** occurs in the Kara Sea with animals from possibly two populations. The 'Kara Sea-Southern Barents Sea-Novaya Zemlya' stock is distributed in the southeastern Barents Sea and the Kara Sea. There is limited information and some uncertainty regarding the status of this stock, which is considered to number less than 500. The distribution of walrus in the northern and eastern Kara Sea is unclear. Walrus of the 'Svalbard-Franz Joseph land' stock are found in the northern Barents Sea adjacent to the northern Kara Sea, estimated to be about 2,000 animals.

The Kara Sea subpopulation of **polar bears** includes the Kara Sea and overlaps in the west with the Barents Sea subpopulation in the area of Franz Josef Land and Novaya Zemlya archipelagos. The population size of the Kara Sea subpopulation is not. Reported harvest activities have been limited to defence kills and an unknown number of illegal kills and these are not thought to be having an impact on the size of the subpopulation. However, contaminant levels in rivers flowing into this area and recent information on nuclear and industrial waste disposal raise concerns about the possibility of environmental damage. Recent studies clearly show that polar bears from the Kara Sea have some of the highest organochlorine pollution levels in the Arctic.



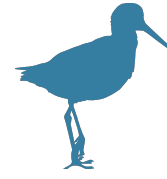


## FISH

The distinguishing feature of the Kara Sea fish fauna as compared with the Barents Sea is quite large number of freshwater fishes, which occur offshore. This is due to much larger influence of freshened waters from outflow of numerous rivers. Characteristic is also a small number of “guest” warm-loving species coming from the Barents Sea such as Atlantic cod, Atlantic herring, haddock, lump-sucker *Cyclopterus lumpus*. A total number is 54 species of marine fish are found in the Kara Sea. The most specious are families Zoarcidae and Cottidae, which count 25 species or 46.3%. Other marine fish families include: Squalidae, Rajidae, Clupeidae, Osmeridae, Myctophidae, Cottidae, Cottunculidae, Agonidae, Cyclopteridae, Liparidae, Lumpenidae, Zoarcidae, Ammodytidae, Gadidae, and Pleuronectidae.

Arctic species predominate, which permanently live and reproduce in water with negative temperatures. Endemic species in the sea are absent. Benthic and near-bottom species predominate. Three categories of fish can be distinguished in relation to their vertical distribution. Fish of coastal shallow waters occur at a depth less than 50 meters (*Myoxocephalus scorpius*, *Triglopsis quadricornis polaris*, *Arctediellus scaber*, *Liparis tunicatus*); species occurring at a depth of a few meters to 400–500 meters (*Icelus bicornis*, *Liparis fabricii*, *Lycodes rossi*, *L. pallidus*, *Gymnelus andersoni*, *Boreogadus saida*); and deepwater species occurring at a depth from 100–

250 to 700 m (*Triglops pingelii*, *Careproctus reinhardtii*, *Cottunculus sadko*, *Leptagonus decagonus*, *Lycenchelys sarsi*, *Lycodes seminudus*). The two latter groups predominate as shallow water coastal zones are poorly inhabited by fish due to heavy ices present during almost the whole year.



## SHOREBIRDS

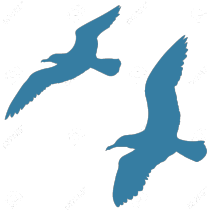
The coasts and estuaries of the Kara Sea provide habitats for many shorebirds, particularly during the post-breeding period. A total of nearly 30 species breed adjacent to the Kara Sea, many of them on various tundra habitats. The number of breeding shorebird species is 20 on the Yugor Peninsula and Vaigach Island in the southwestern Kara Sea, 17 on the Yamal Peninsula, and around 22 on Taimyr in the southeastern Kara Sea.

Only two species breed on the high Arctic Severnaya Zemlya (purple sandpiper and sanderling), while only one species (purple sandpiper) is known to breed on eastern Novaya Zemlya. Among the most numerous or common species are common ringed plover, little stint, Temminck’s stint, dunlin, and red-necked phalarope.

The shorebirds arrive at their northern breeding grounds in June, typically in the first part of the month to the southern sub-Arctic tundra and around mid-June to the northern areas. The movement to coastal habitats takes place in July and August. The shorebirds generally leave the Arctic coasts in the latter part of August and early September on the fall migration to wintering areas at lower latitudes or in the southern hemisphere.

Shorebirds use a range of protected coastal and estuarine habitats for feeding and staging in the post-breeding period. Low-lying coasts with important shorebird habitats are found in the Yugor Shar Strait area and Kara Bay on the Yugor Peninsula, along southwestern Yamal in the Baidaratskaya Bay, along northern and northeastern Yamal, northern Gydan and Taz Peninsulas, the eastern shore of Taz Bay, the northern Yenisey Bay, Sibiryakov Island, Pyasina delta, and various places in northern Taimyr.





## SEABIRDS

Generally, many fewer species of seabirds and smaller numbers of individuals utilise the Kara Sea in the summer compared to the Barents Sea. About 15 species of seabirds breed at the Kara Sea coasts. Breeding colonies of true seabirds (auks and seagulls) are mainly found in the northern and eastern part of the region. This reflects the distribution of suitable breeding habitats, in particular cliffs and hard rock outcrops facing the sea along the eastern Novaya Zemlya and western Severnaya Zemlya archipelagos and to lesser extent on the northwest Taimyr Peninsula and on some of the smaller Kara Sea offshore. Adjacent sea areas are considered to be of importance as feeding grounds for seabirds from the breeding colonies.

River estuaries, numerous sand isles, spits, and skerries attract breeding gulls and terns, as well as non-breeding ducks, geese, and waders. Recurrent polynyas west of Yamal and north of Yamal and Gydan Peninsulas are believed to be of importance for migrating seabirds and seaducks in spring. Due to severe climatic conditions, the Kara Sea does not support any significant wintering bird populations. Generally, all marine birds leave the area towards wintering grounds located in more favourable climates.



## WATERFOWL

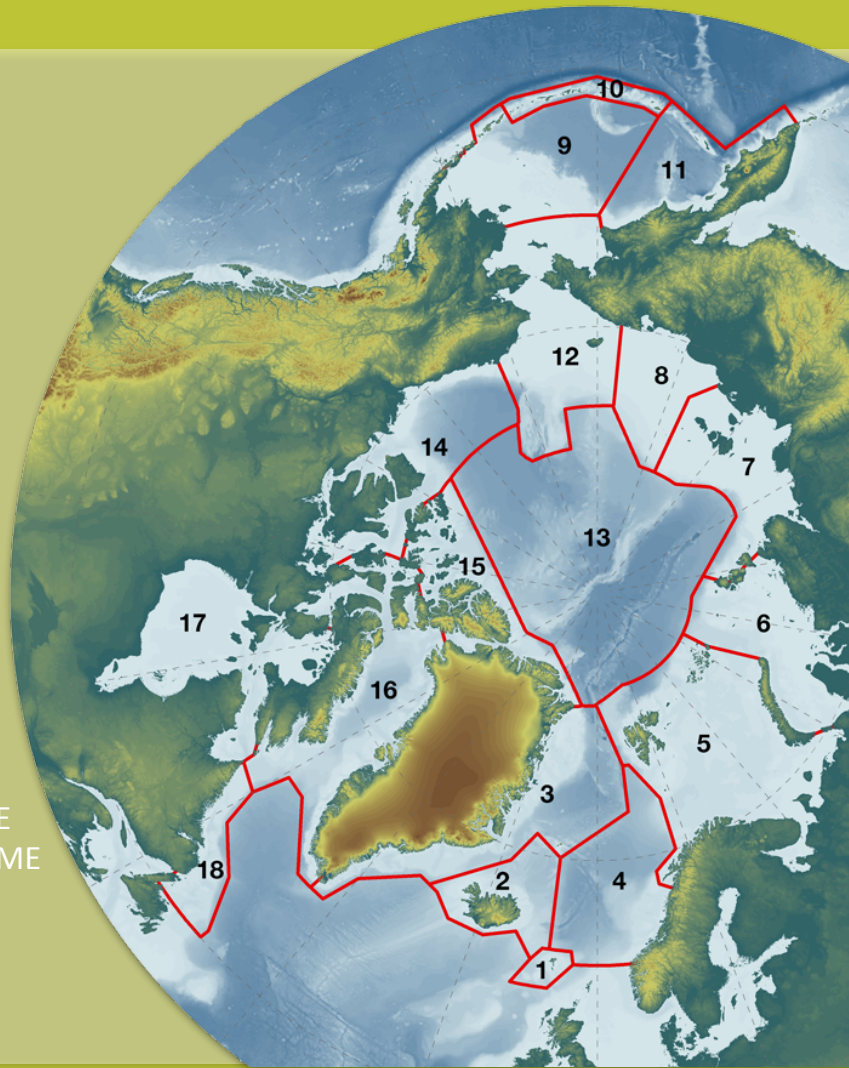
The low-lying coasts, estuaries and coastal waters of the Kara Sea are important habitats for ducks, geese and divers. This is particularly the case for the southwestern part of the area with Vaigach Island, Yugor Peninsula, Baidaratskaya Bay, and the Yamal and Gydan peninsulas and the estuaries of Ob and Yenisei rivers. The adjacent tundras of western Siberia are important breeding grounds for waterfowl that use coastal habitats during spring migration and in the post-breeding period with molting, staging and fall migration. Ducks and geese may gather in wetlands of river estuaries in great numbers in autumn, with several million of them in the Ob estuary system in late summer.

About 20 species of ducks are recorded at Yamal and Gydan, with 16 of them known to breed at Yamal and 8 at Gydan. The eastern part of the Kara Sea is less important for waterfowl, with 12 duck species recorded on the Taimyr Peninsula and only 2-3 seaducks breeding at Severnaya Zemlya. Ten species of seaducks are found in the Kara Sea, including 3 eider species (common, king and Steller's), 2 scoters (black and white-winged), 3 mergansers (red-breasted, goosander and smew), long-tailed duck, and common goldeneye. Greater scaup and tufted duck are the most common diving ducks or poachers, while northern pintail, common teal, Eurasian wigeon, and northern shoveler are the more common dabbling ducks.



## 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)*

## Acknowledgements

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



Text: David J. Prieto

PAME INTERNATIONAL SECRETARIAT  
BORGIR  
NORDURSLÓÐ  
600 AKUREYRI  
ICELAND

TEL.: +354 4611355  
EMAIL: [PAME@PAME.IS](mailto:PAME@PAME.IS)  
[WWW.PAME.IS](http://WWW.PAME.IS)