CBMP/ CAFF activities

Update on work of relevance for PAME MPA work

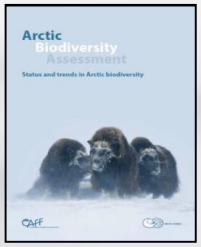
September 21. 2017 – PAME MPA workshop, Helsinki – Finland

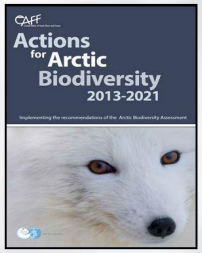
Tom Christensen, Aarhus University, Denmark
Cecilie von Quillfeldt, Norvegian Polar Institute, Norway
Lis Lindal Jørgensen, Institute of Marine Research, Norway

CAFF and the Arctic Council

CIRCUMPOLAR BIODIVERSITY MONITORING PROGRAM

- Conservation of Arctic Flora and Fauna (CAFF) biodiversity Working Group of the Arctic Council
- Mandate:
  - to address the conservation of Arctic biodiversity, and to communicate its findings to the governments and residents of the Arctic, helping to promote practices which ensure the sustainability of the Arctic's living resources
- Monitoring, assessment, data management, communication
- First assessment was the Arctic Biodiversity Assessment ABA





CAFF and Monitoring

CIRCUMPOLAR BIODIVERSITY MONITORING PROGRAM

Circumpolar Biodiversity Monitoring Program (CBMP)

- Coordinated Arctic monitoring
- International network of networks, monitoring, understanding and reporting Arctic biodiversity trends
- Focal point for current and credible Arctic biodiversity information

www.cbmp.is

www.ABDS.is

Structure CBMP September 2017

CAFF Conservation of Arctic Flora and Fauna

CAFF Board

CBMP Coordination Committee & Technical Team. (DK / GL, US, CAFF sec).

Terrestrial-SG (Iceland/ Sweden)

Expert networks

Freshwater-SG (Canada / Sweden)

Expert networks

Coastal Expert Monitoring Group (US/ Canada)

Marine SG (Russia/ US)

Plankton Expert Network

Benthos Expert Network

Fish Expert Network

Seabird Expert Network

Marine Mammal Expert Network

Sea Ice Expert Network

CBMP Marine FEC´s include

Focal Ecosystem Components: Key elements, changes in the status of which likely indicate changes in the overall marine environment.

Sea Ice Biota:
- Microbes
- Ice algae
- Ice meiofauna
- Ice macrofauna

Plankton:
- Phytoplankton and larger protists
- Microbial Eukaryotes
- Bacteria and Archaea
- Zooplankton

Benthos:
- Macrofauna (organisms larger than 1 mm)
- Megafauna (organisms that can be identified on photo/or caught by trawl)

Fish:
- Capelin
- Polar Cod
- Greenland halibut

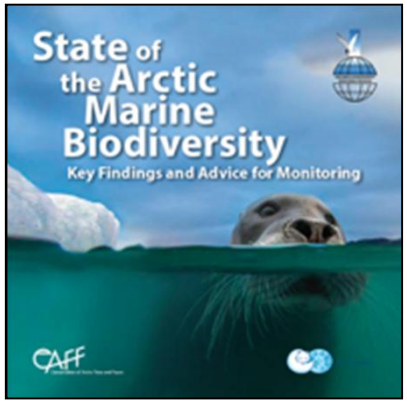
Birds:
- Black-legged kittiwake
- Common murre
- Thick-billed murre
- Ivory gull
- Common eider
- Glaucous gull
- Least auklet
- Dovekie

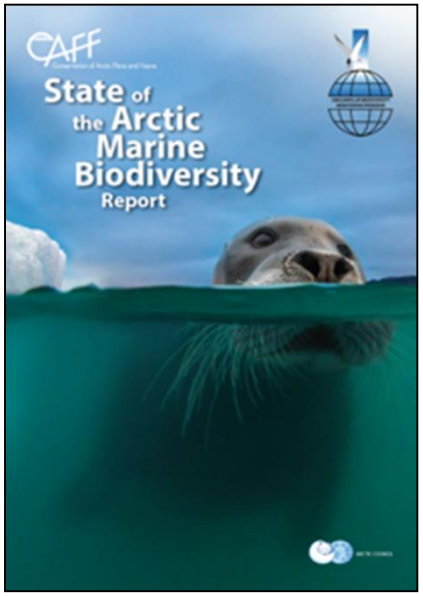
Marine mammals:
- Walrus
- Ringed seal
- Bearded seal
- Ribbon seal
- Harp seal
- Hooded seal
- Spotted seal
- Narwhal
- Beluga
- Bowhead whales
- Polar bear

First CBMP assessment:
State of the Arctic Marine Biodiversity Report

CIRCUMPOLAR BIODIVERSITY MONITORING PROGRAM

- Published May 2017
- More than 70 authors
- Tells us what existing biodiversity monitoring programs and other data are able to say about changes in Arctic biodiversity and ecosystems
- Use the ABA as platform where possible
- Provides key trends on biodiversity AND advices for future monitoring, directed towards policy and decision makers





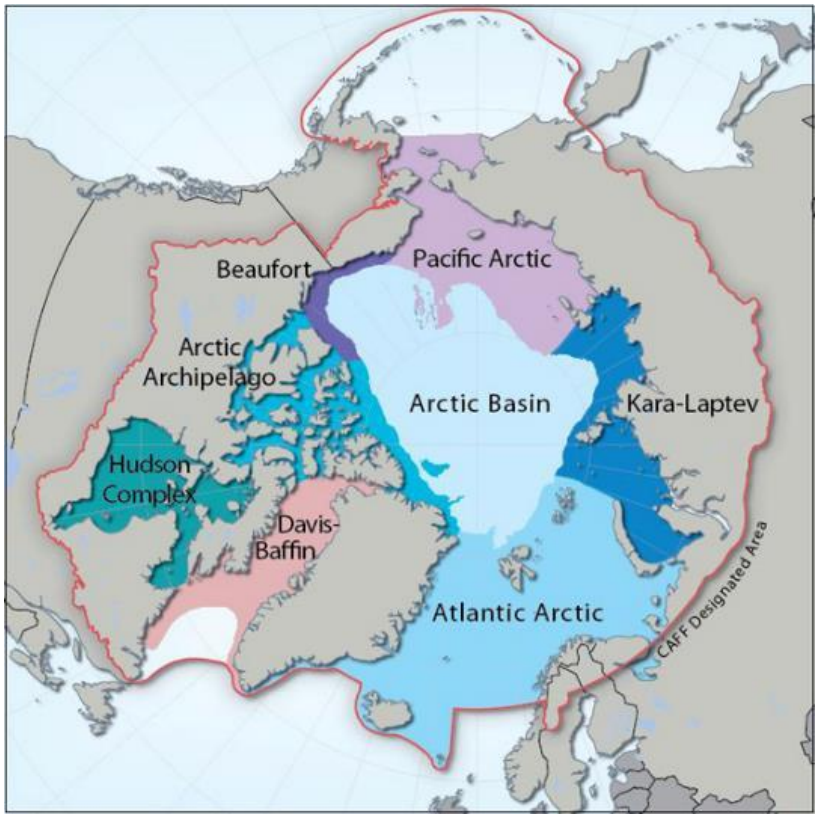
Subchapters about each FEC group

CIRCUMPOLAR BIODIVERSITY MONITORING PROGRAM

6 sub-chapters (Sea Ice Biota, Plankton, Benthos, Fish, Seabirds, Marine Mammals) include information about:

- Baselines/ trends on FEC´s (if possible)
- Drivers of observed trends
- Comparisons between the AMA´s (if possible)
- Current monitoring and advise for future monitoring
- Figures and tables on FEC´s that are relatively easy to update

SAMBR: Arctic Marine Areas



Foodweb in the Arctic

CIRCUMPOLAR BIODIVERSITY MONITORING PROGRAM

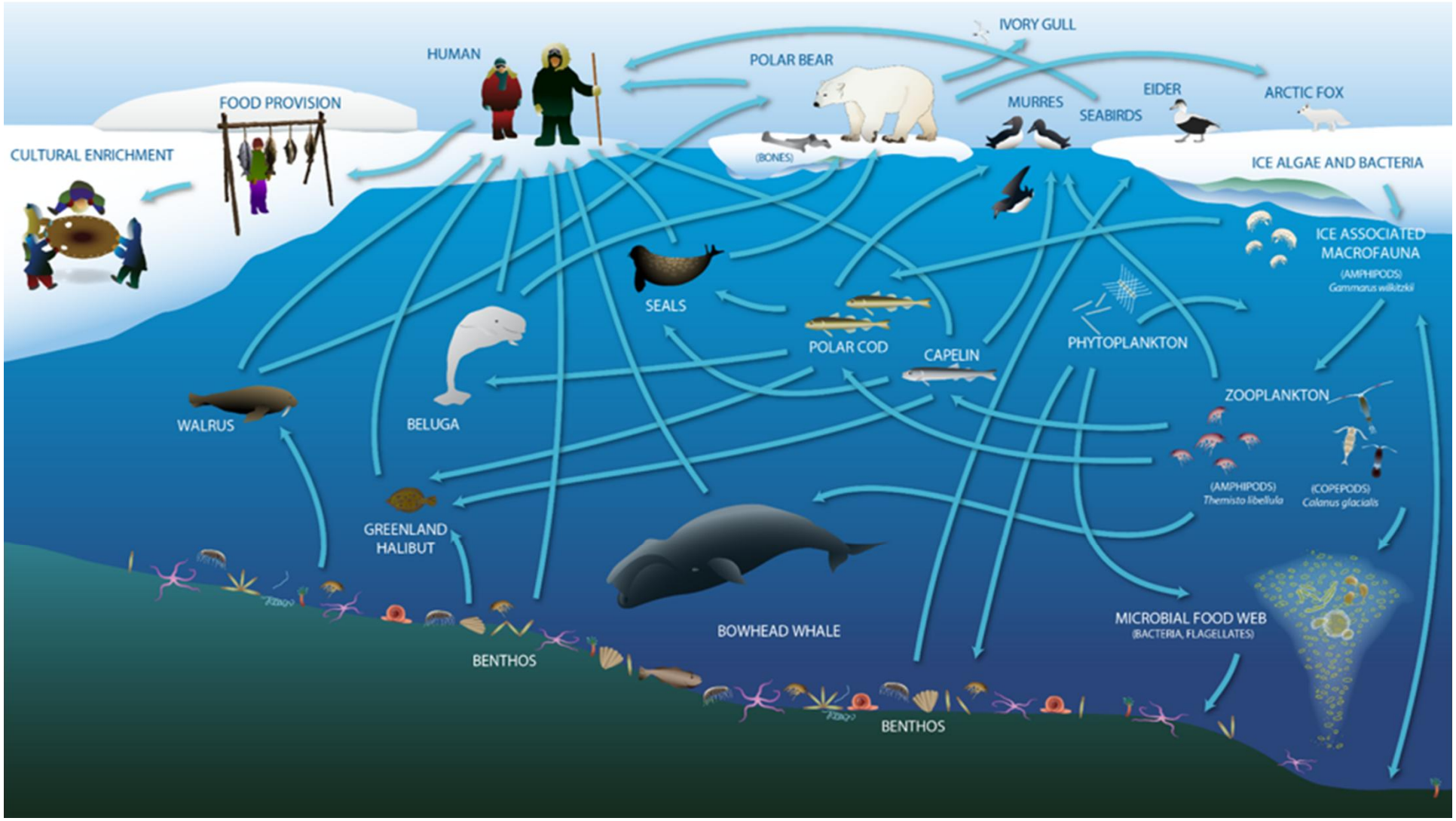


Figure from CAFF, 2017, adapted from Darnis et al 2012 and Inuit Circumpolar Council – Alaska (2015).

Possible future foodweb

CIRCUMPOLAR BIODIVERSITY MONITORING PROGRAM

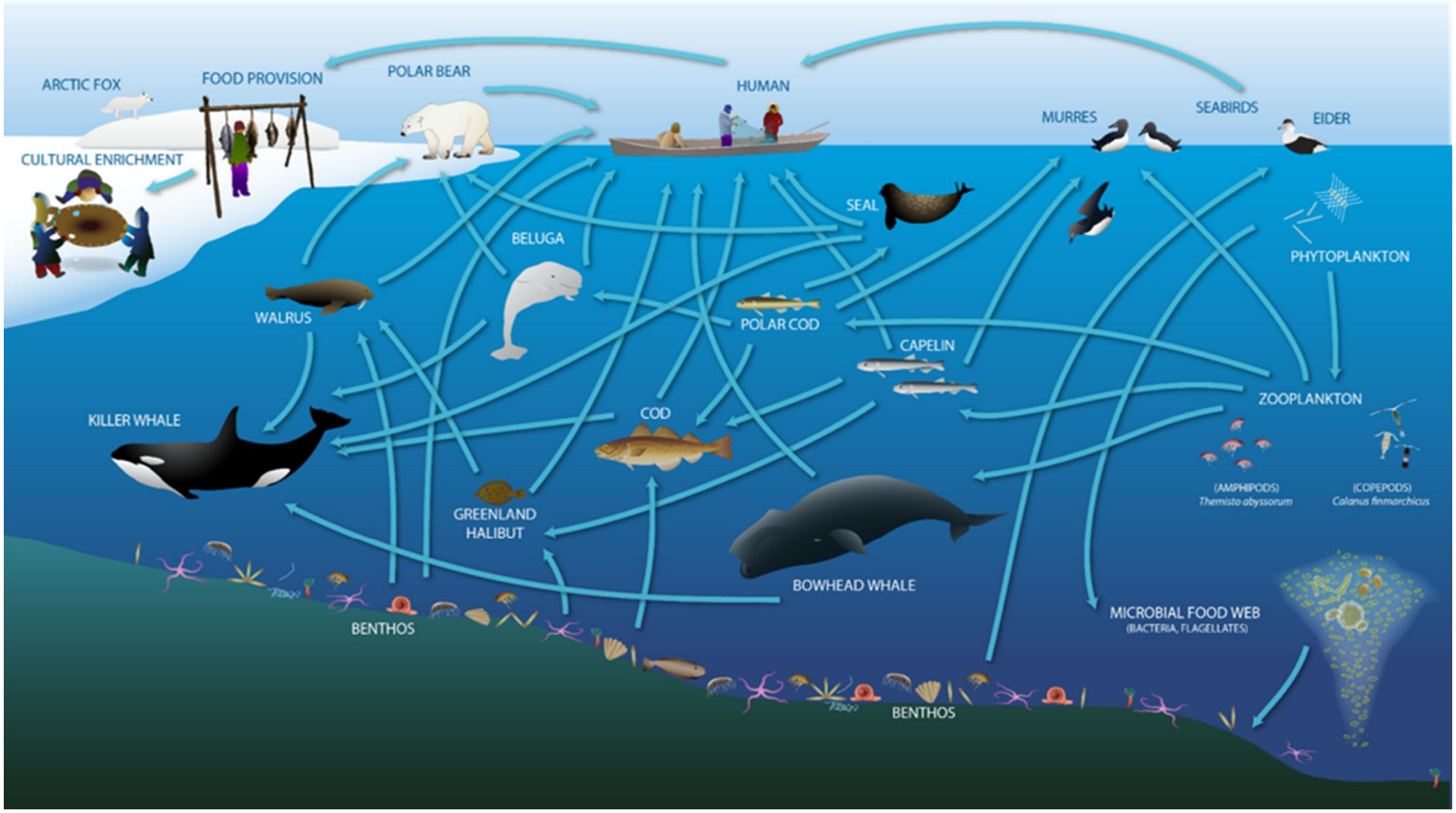
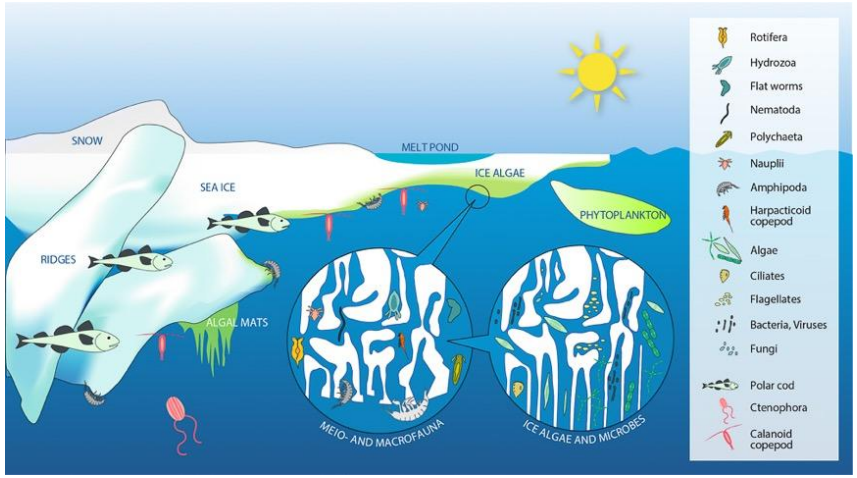


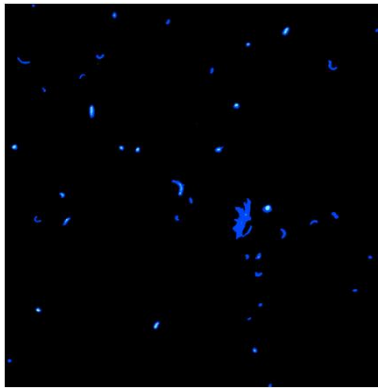
Figure from CAFF, 2017,adapted from Darnis et al 2012 and Inuit Circumpolar Council – Alaska (2015).

Examples: Sea Ice biota

CIRCUMPOLAR BIODIVERSITY MONITORING PROGRAM



The Focal Ecosystem Components (FECs) (circles) in sea ice. Sea ice provides a wide range of microhabitats for diverse biota including ***microbes****, single-celled eukaryotes (****Ice algae****), multicellular* ***meiofauna,*** *larger under-ice fauna (***Ice macrofauna** *represented by amphipods), as well as polar cod (Boreogadus saida). Modified from Bluhm et al. (2017).*

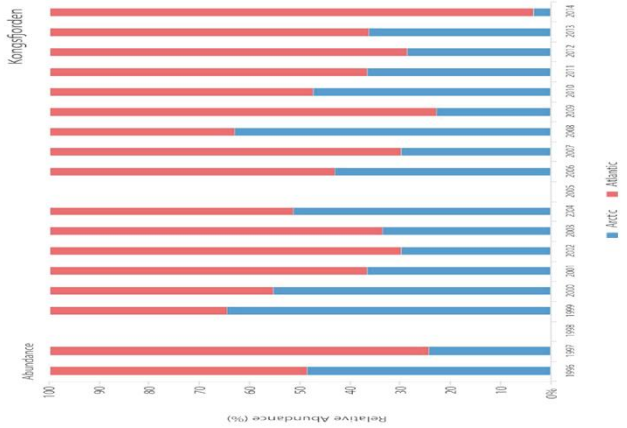


- Sea ice is a species-rich habitat
- Sea ice houses species endemic to the Arctic. Other taxa also occur
- Sea ice algal community structure has possibly changed in the central Arctic between the 1980s and 2010s
- Ice amphipod abundance and biomass have declined in the Svalbard area since the 1980s. Amphipods appear to have been more abundant in the late 1970´s to mid-1990s than afterwards
- Drivers include changes in Sea ice (duration, thickness, structure, snow on the ice etc), salinity and more.

Examples: Plankton

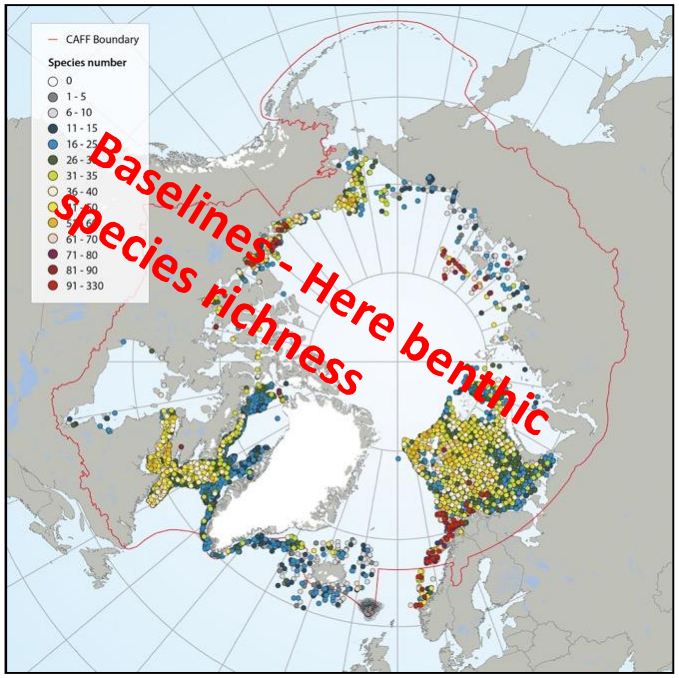
CIRCUMPOLAR BIODIVERSITY MONITORING PROGRAM

- The functional and taxonomic diversity of microbes in the Arctic is vast and a scientifically underappreciated source of biodiversity.
- More than 2000 phytoplankton species are reported from the Arctic marine environment. Some species likely restricted to Arctic waters.
- General fewer Arctic species, but warming can have contradictory and surprising effects on plankton.
- Climate is the most important driver (including changes in temperature, currents, changes in duration of open water versus sea ice, Wind-driven mixing, increased freshwater etc.)



Examples: Benthos multiple impacts

CIRCUMPOLAR BIODIVERSITY MONITORING PROGRAM

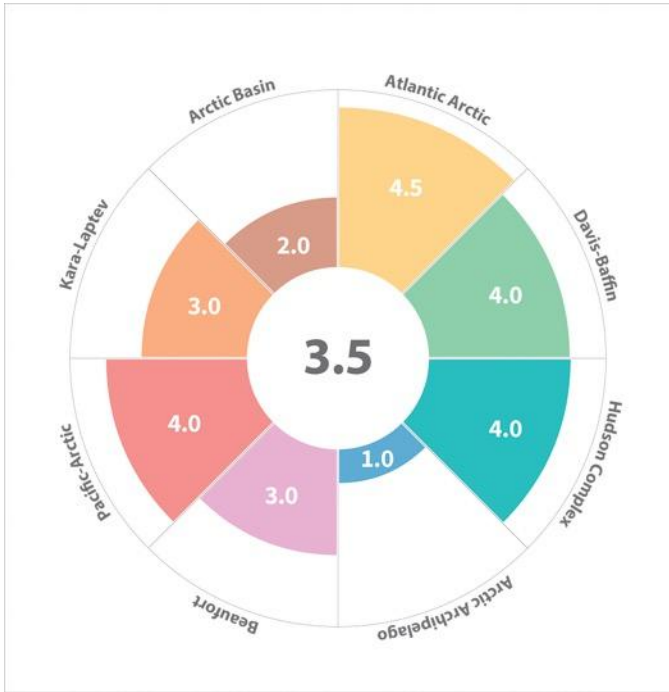


Number of megafauna species/taxa in the Arctic (7,322 stations in total), based on recent trawl investigations.

- > 4,000 known Arctic macro- and megabenthic species
- Increasing numbers of species are moving into, or shifting, their distributions in Arctic waters. These species will outcompete, prey on or offer less nutritious value as prey for Arctic species
- Benthic species are important food sources for other species (marine mammals, seabirds).
- Major drivers of changes:
  - Sea-ice dynamics
  - Ocean mixing
  - Bottom-water temperature change
  - Commercial bottom trawling
  - Ocean acidification
  - River/glacier freshwater discharge and
  - Introduction of non-indigenous species

Examples: Benthos multiple impacts

CIRCUMPOLAR BIODIVERSITY MONITORING PROGRAM

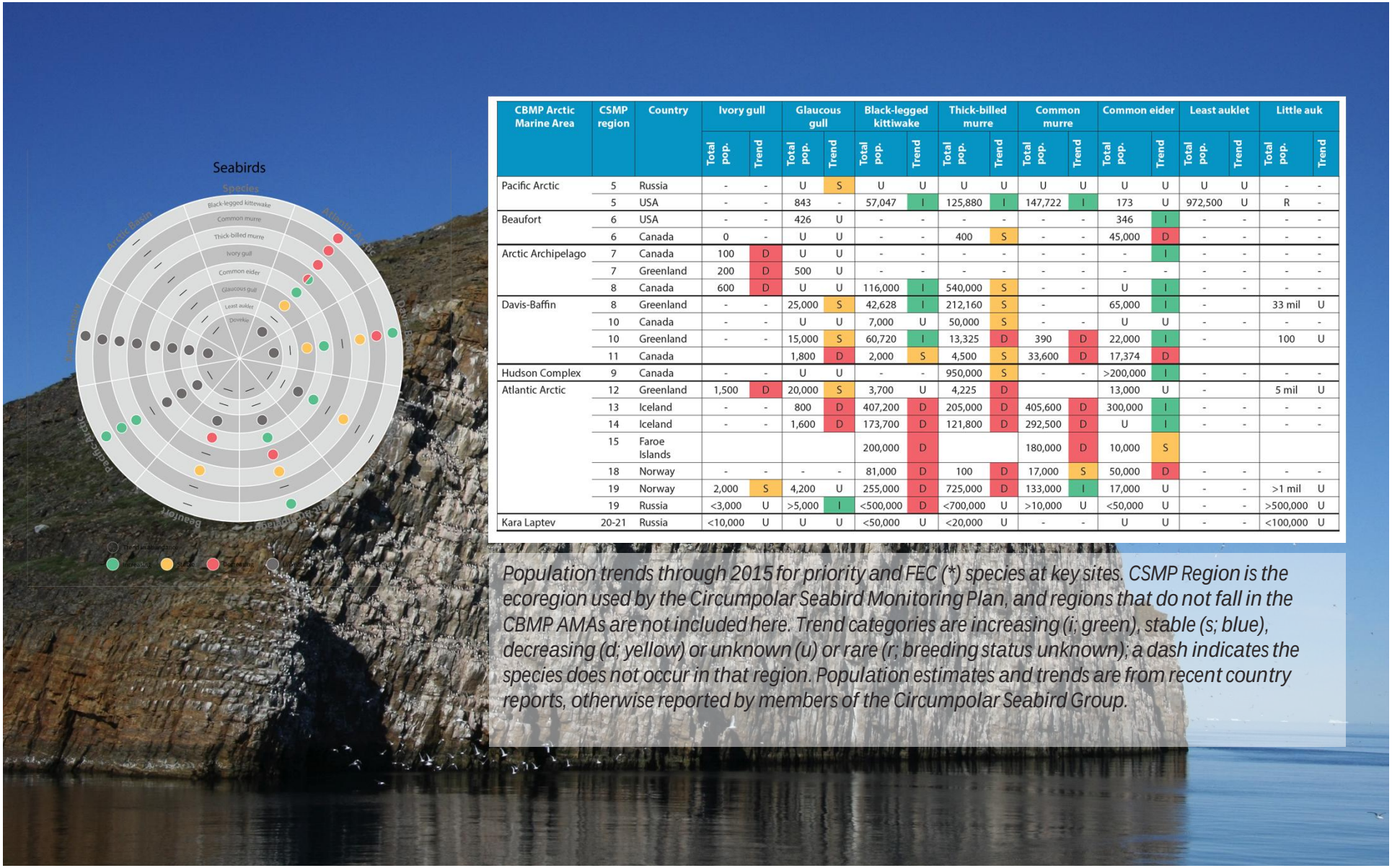


Cumulative scores of various environmental and anthropogenic drivers of change of the benthic ecosystem across the eight Arctic Marine Areas (AMA). A cumulative score is the median score of sub-regions per AMA (Table 3.3.1). Median score for the whole Arctic is given in the centre.

- > 4,000 known Arctic macro- and megabenthic species
- Increasing numbers of species are moving into, or shifting, their distributions in Arctic waters. These species will outcompete, prey on or offer less nutritious value as prey for Arctic species.
- Benthic species are important food sources for indigenous people and marine mammals and seabirds.
- Major drivers of changes:
  - Sea-ice dynamics
  - Ocean mixing
  - Bottom-water temperature change
  - Commercial bottom trawling
  - Ocean acidification
  - River/glacier freshwater discharge and
  - Introduction of non-indigenous species

Examples: Seabirds

CIRCUMPOLAR BIODIVERSITY MONITORING PROGRAM



CBMP Arctic Marine Area	CSMP region	Country	Ivory gull		Glaucous gull		Black-legged kittiwake		Thick-billed murre		Common murre		Common eider		Least auklet		Little auk	
			Total pop.	Trend	Total pop.	Trend	Total pop.	Trend	Total pop.	Trend	Total pop.	Trend	Total pop.	Trend	Total pop.	Trend	Total pop.	Trend
Pacific Arctic	5	Russia	-	-	U	S	U	U	U	U	U	U	U	U	U	U	-	-
	5	USA	-	-	843	-	57,047	I	125,880	I	147,722	I	173	U	972,500	U	R	-
Beaufort	6	USA	-	-	426	U	-	-	-	-	-	-	346	I	-	-	-	-
	6	Canada	0	-	U	U	-	-	400	S	-	-	45,000	D	-	-	-	-
Arctic Archipelago	7	Canada	100	D	U	U	-	-	-	-	-	-	-	I	-	-	-	-
	7	Greenland	200	D	500	U	-	-	-	-	-	-	-	-	-	-	-	-
	8	Canada	600	D	U	U	116,000	I	540,000	S	-	-	U	I	-	-	-	-
Davis-Baffin	8	Greenland	-	-	25,000	S	42,628	I	212,160	S	-		65,000	I	-		33 mil	U
	10	Canada	-	-	U	U	7,000	U	50,000	S	-	-	U	U	-	-	-	-
	10	Greenland	-	-	15,000	S	60,720	I	13,325	D	390	D	22,000	I	-		100	U
	11	Canada			1,800	D	2,000	S	4,500	S	33,600	D	17,374	D				
Hudson Complex	9	Canada	-	-	U	U	-	-	950,000	S	-	-	>200,000	I	-	-	-	-
Atlantic Arctic	12	Greenland	1,500	D	20,000	S	3,700	U	4,225	D			13,000	U	-		5 mil	U
	13	Iceland	-	-	800	D	407,200	D	205,000	D	405,600	D	300,000	I	-	-	-	-
	14	Iceland	-	-	1,600	D	173,700	D	121,800	D	292,500	D	U	I	-	-	-	-
	15	Faroe Islands					200,000	D			180,000	D	10,000	S				
	18	Norway	-	-	-	-	81,000	D	100	D	17,000	S	50,000	D	-	-	-	-
	19	Norway	2,000	S	4,200	U	255,000	D	725,000	D	133,000	I	17,000	U	-	-	>1 mil	U
	19	Russia	<3,000	U	>5,000	I	<500,000	D	<700,000	U	>10,000	U	<50,000	U	-	-	>500,000	U
Kara Laptev	20-21	Russia	<10,000	U	U	U	<50,000	U	<20,000	U	-	-	U	U	-	-	<100,000	U

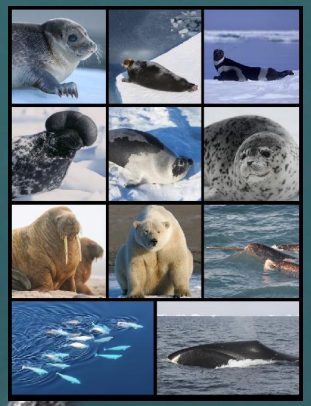
Population trends through 2015 for priority and FEC (*) species at key sites. CSMP Region is the ecoregion used by the Circumpolar Seabird Monitoring Plan, and regions that do not fall in the CBMP AMAs are not included here. Trend categories are increasing (i; green), stable (s; blue), decreasing (d; yellow) or unknown (u) or rare (r; breeding status unknown); a dash indicates the species does not occur in that region. Population estimates and trends are from recent country reports, otherwise reported by members of the Circumpolar Seabird Group.

Examples: Marine Mammals

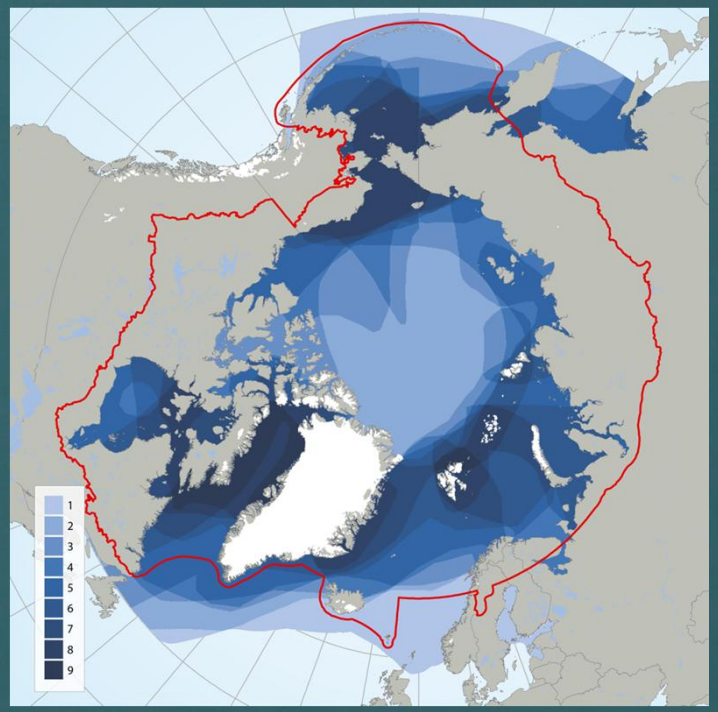
CIRCUMPOLAR BIODIVERSITY MONITORING PROGRAM

Species	Subpopulation/ Stock	CBMP Arctic Marine Area	Abundance (with 95% confidence interval (CI) or coefficient of variation (CV) if available)	Year	Status: Unknown (U), Reduced (R) or Not Reduced (N)	Trend: Unknown(U), Increasing(I), Stable (S), Declining(D)	Harvest: harvested without quota (H), harvested with quota (HQ), currently protected (P)	Survey/trend reference from Laidre et al. unless noted
Bearded seal	*E. nauticus* subspecies		Unknown total					
	-Bering Sea	Pacific Arctic	>299,000	2012	Unknown	Unknown	HQ (Russia), H (USA)	Conn et al 2014
	-Chukchi Sea	Pacific Arctic	27,000	2000	Unknown	Unknown	HQ (Russia), H (USA)	Cameron et al 2010
	-Beaufort Sea	Beaufort	Unknown		Unknown	Unknown	H	
	-East Siberian Sea	Pacific Arctic	Unknown		Unknown	Unknown	HQ (Russia), H (USA)	
	E. barbatus subspecies		Unknown total				H	
	- Eastern Canada and West Greenland	Arctic Archipelago, Da... Baffin, Hudson Bay			Unknown	Unknown	H	
	"-Canadian waters component"	*Arctic Archipelago, Davis-Baffin, ... Hudson Bay*	*...,000*	*1958-1979*	*Unknown*	*Unknown*	*H*	*Cleator 1996*
	- East Greenland	Atlantic Arctic	Unknown		Unknown	Unknown	H	
	- Svalbard & Barents Sea	Atlantic Arctic	Unknown		Unknown	Unknown	H	
	- White, Kara & Laptev Seas	Atlantic Arctic, Kara & Laptev	Unknown		Unknown	Unknown	HQ (Russia), H (Norway)	
Ribbon seal	Bering Sea	Pacific Arctic	143,000	20...	Unknown	Unknown	HQ (Russia), H (USA)	Boveng et al. 2013
Harp seal	Northwest Atlantic	Davis-Baffin, Atlantic Arctic	7,420,000 (95% CI 6,360,000 - 8,360,000)	2012	Not Reduced	Stable	H (Greenland), HQ (Canada)	Hammill et al. 2015
	Greenland Sea	Atlantic Arctic	627,410 (95% CI 470,540 – 784,280)	2012	Not Reduced	Increasing	H (Greenland), HQ (Norway)	ICES 2013
	White Sea	Atlantic Arctic	1,419,800 (95% CI 1,266,910-1,572,690)	2013	Reduced	Stable	HQ (Norway) P (Russia)	ICES 2013
Hooded seal	Northwest Atlantic	Davis-Baffin, Atlantic Arctic	593,500 (95% CI 404,400-728,300)	2005	Reduced	Increasing	H (Greenland), HQ (Canada)	Hammil and Stenson 2006
	Greenland Sea	Atlantic Arctic	84,020 (95% CI 68,060–99,980)	2013	Reduced	Decreasing	H (Greenland), P (Norway)	Øigård et al. 2014
Spotted seal	Bering sea	Pacific Arctic	>460,000	2012	Unknown	Unknown	H	Han et al. 2010

84 stocks!

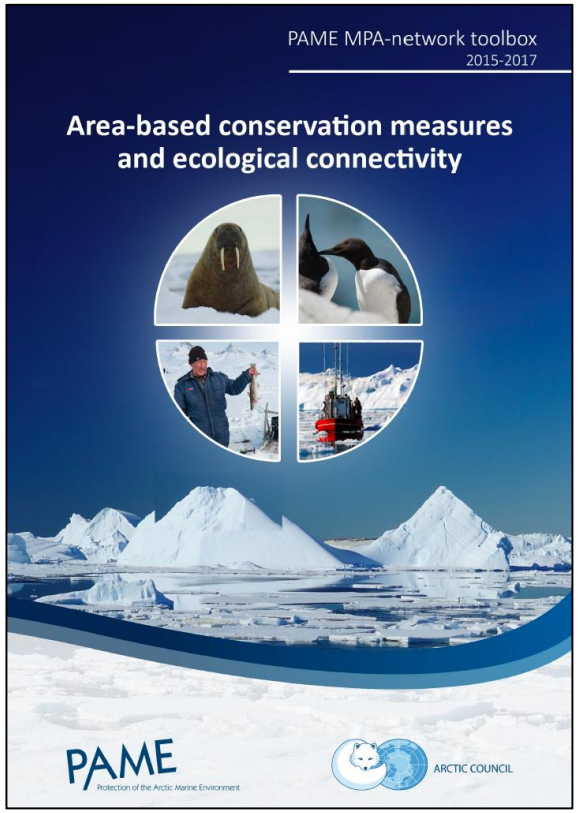


Circumpolar depiction of species richness based on the distributions of the 11 ice-associated Focal Ecosystem The Arctic gateways in both the Atlantic and Pacific regions have the highest species diversity.



Links to PAME-MPA work

CIRCUMPOLAR BIODIVERSITY MONITORING PROGRAM



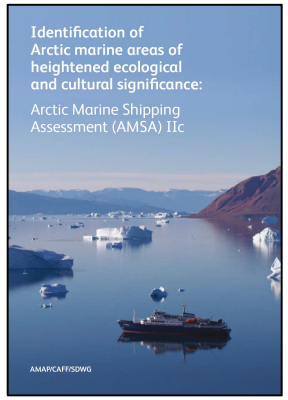
Tool #1: Aligning Area-based Conservation Measures with Important Biodiversity Categories

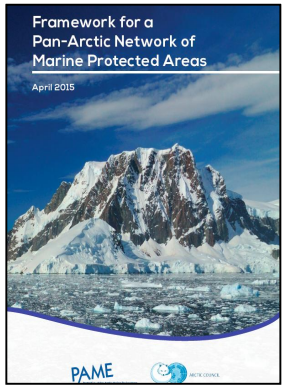
This tool lists areas important for categories of biodiversity (e.g. species, habitats, and ecosystems) and linked values and aligns them with available area-based conservation measures for addressing protection needs, in a general manner. A more detailed list of Arctic marine biodiversity categories and their potential protection needs can be found in Annex 1; a catalogue of area-based conservation measures used by Arctic countries is available in Annex 2; and Annex 3 presents anecdotal case studies of area-based conservation measures at work, analyzing their potential utility in MPA networks.

Areas important for Categories of Biodiversity[10]	Value(s)	Conservation Objective / Need	Options for Area-based Conservation Measures [11]
Areas or geophysical features with important habitats or ecosystems (e.g. coral gardens, marginal ice zone)	Sustain important ecosystem functions (e.g. productivity, diversity) or structure (e.g. food-webs, unique species).	Long-term protection of valuable and vulnerable habitat and of genetic diversity.	✓ MPAs ✓ Exclusion areas for harmful activities
Areas important for life history stages of different species (e.g. reproduction; foraging; spawning; wintering; nursery; staging areas of birds, marine mammals, fish)	Sustain populations of species important for ecosystem and/or human use values.	Long-term protection of open water, seafloor, ice-associated, and coastal features and habitats critical to key marine species and ecosystem processes. Long-term, temporary and/or impact-specific protection regimes for key areas (e.g. foraging) and/or during critical seasons (e.g. breeding, human use).	✓ MPAs ✓ Seasonal closures for take or access ✓ Year round measures preventing habitat degradation ✓ Exclusion areas for harmful activities ✓ Area regulations on impact/ disturbance
Movement corridors and migration routes of important species (e.g. marine mammals)	Connectivity for species important for ecosystem and/or human use values (e.g. food security).	Long-term, temporary and/or impact-specific protection regimes (e.g. from physical disturbance, installations) for key corridors and routes.	✓ Exclusion areas for harmful activities (seasonal) or (permanent) infrastructure ✓ Area regulations on impact/ disturbance

[10] See Annex 1 for a list of important Arctic marine biodiversity categories (such as species, habitats, ecosystems and their linkages) along with their functions, vulnerabilities, and more specific options for area-based conservation measures.
[11] See Annex 2 for concrete examples of these measure categories applied in Arctic countries.

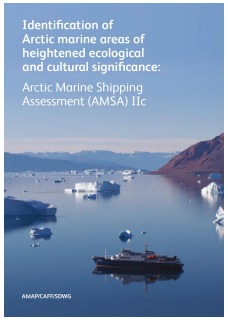
17

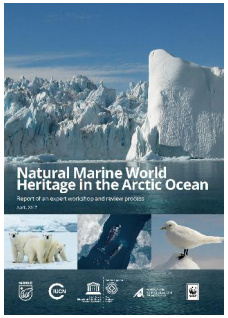


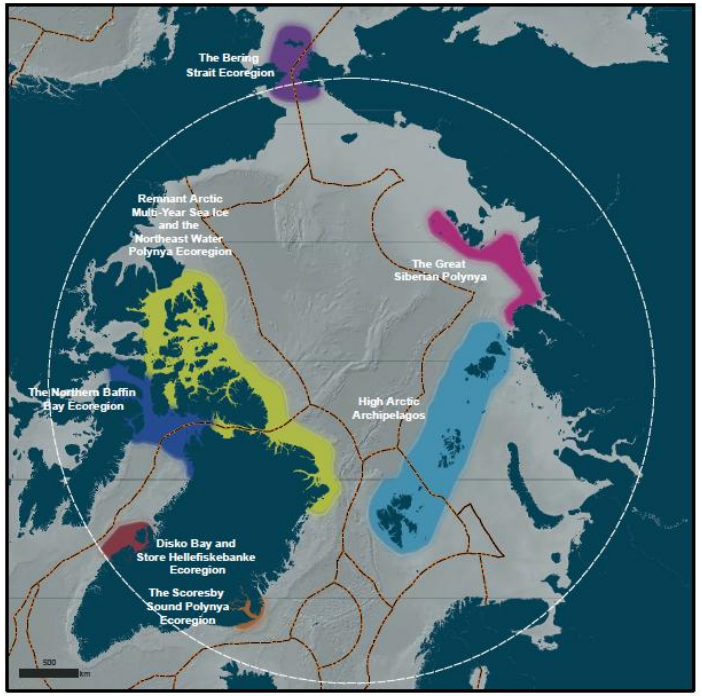


Examples on links to other processes

CIRCUMPOLAR BIODIVERSITY MONITORING PROGRAM







Illustrations of Potential OUV in the Arctic Marine Environment

—— Marine Boundary

The marine areas of potential Outstanding Universal Value represent the priorities that emerged through the workshop and review process described in this report. These are not an exclusive selection of sites. Boundaries of sites are approximate and indicative, not absolute.

Map: Marine Geospatial Ecology Lab, Duke University (2016)

For more information please visit:

www.caff.is or www.ABDS.is

SAMBR report and other materials

https://www.arcticbiodiversity.is/marine

Thank you