

Activities of the ICES-PICES-PAME working group on **Integrated Ecosystem Assessment for the Central Arctic Ocean** **WGICA.**

The leads

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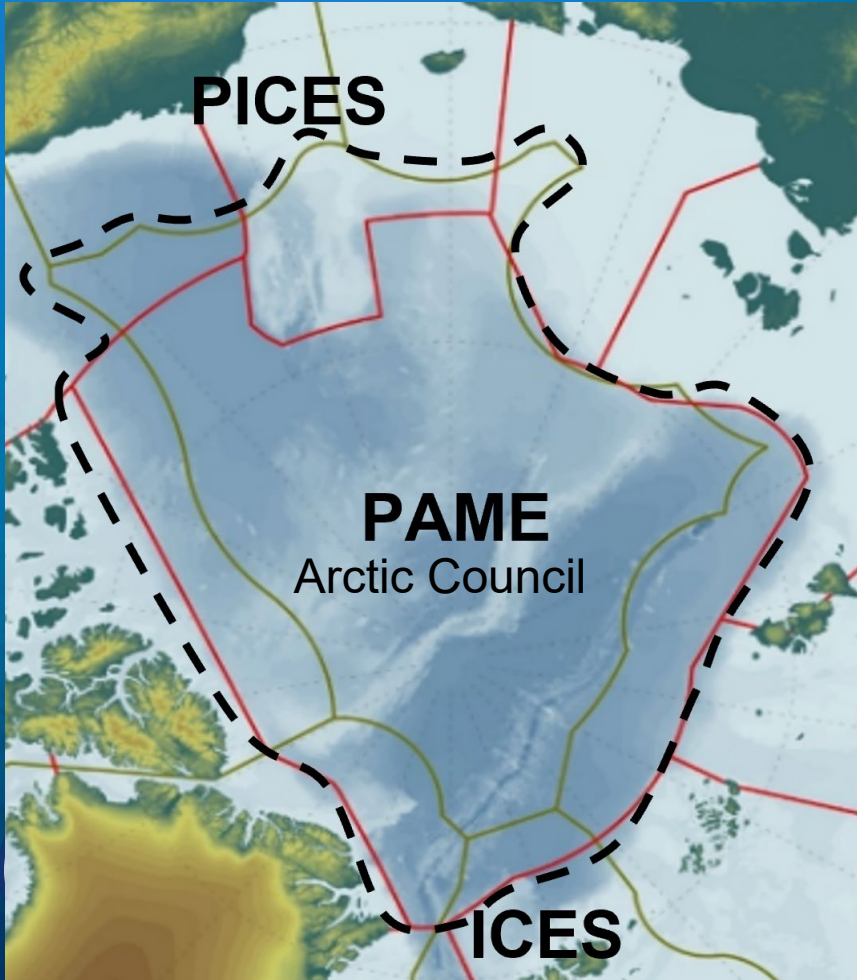
PICES 2022

IEA to understand the present and future of the CAO and NBS-CS

Paradise Hotel 09:00 am – 06:00 pm, September 25th, Busan, Korea, 2022



ICES-PICES-PAME Working Group on *Integrated Ecosystem Assessment* for the Central Arctic Ocean (WGICA)



ICES: International Council for the Exploration of the Sea (Atlantic)

PICES: The North Pacific Marine Science Organization

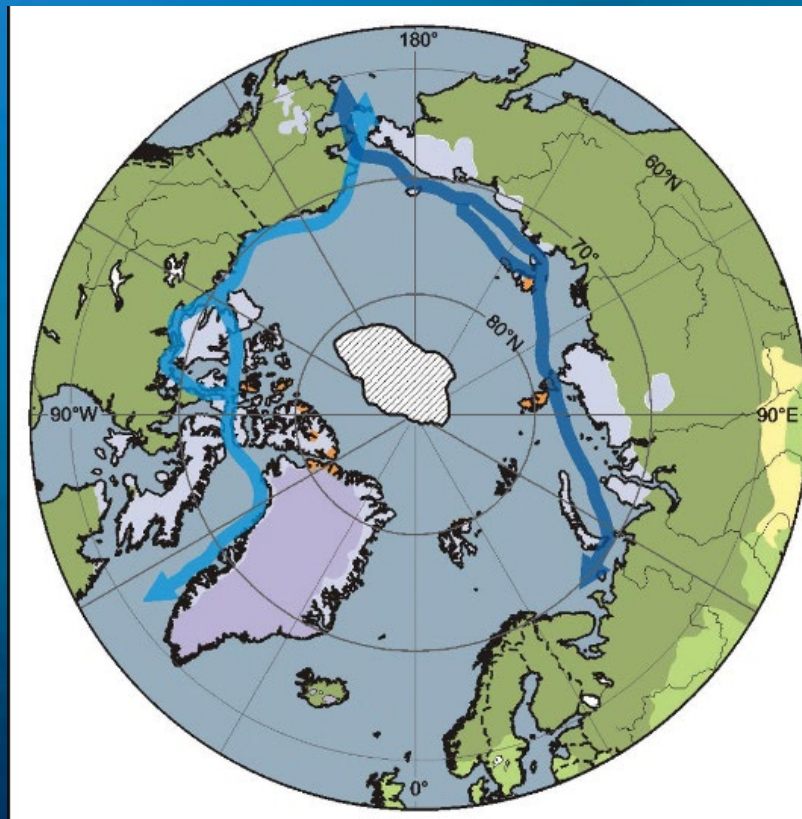
PAME (Arctic Council): Protection of the Arctic Marine Ecosystem

WGICA: 12 nations and 58 members



The Central Arctic Ocean (CAO)

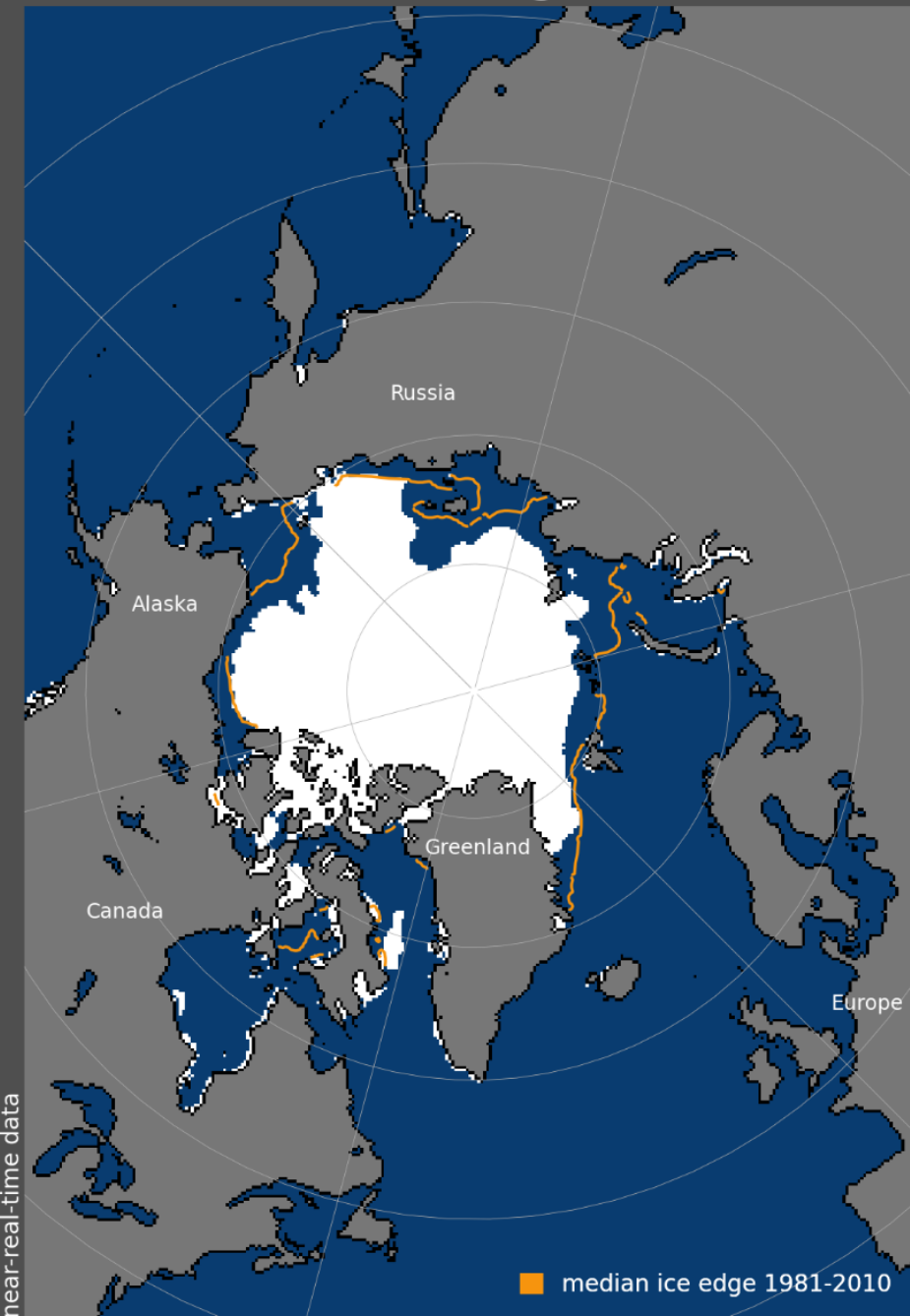
Projected ice extent 2080-2100



The Intergovernmental Panel on Climate Change (IPCC)



Sea Ice Extent, 03 Aug 2022



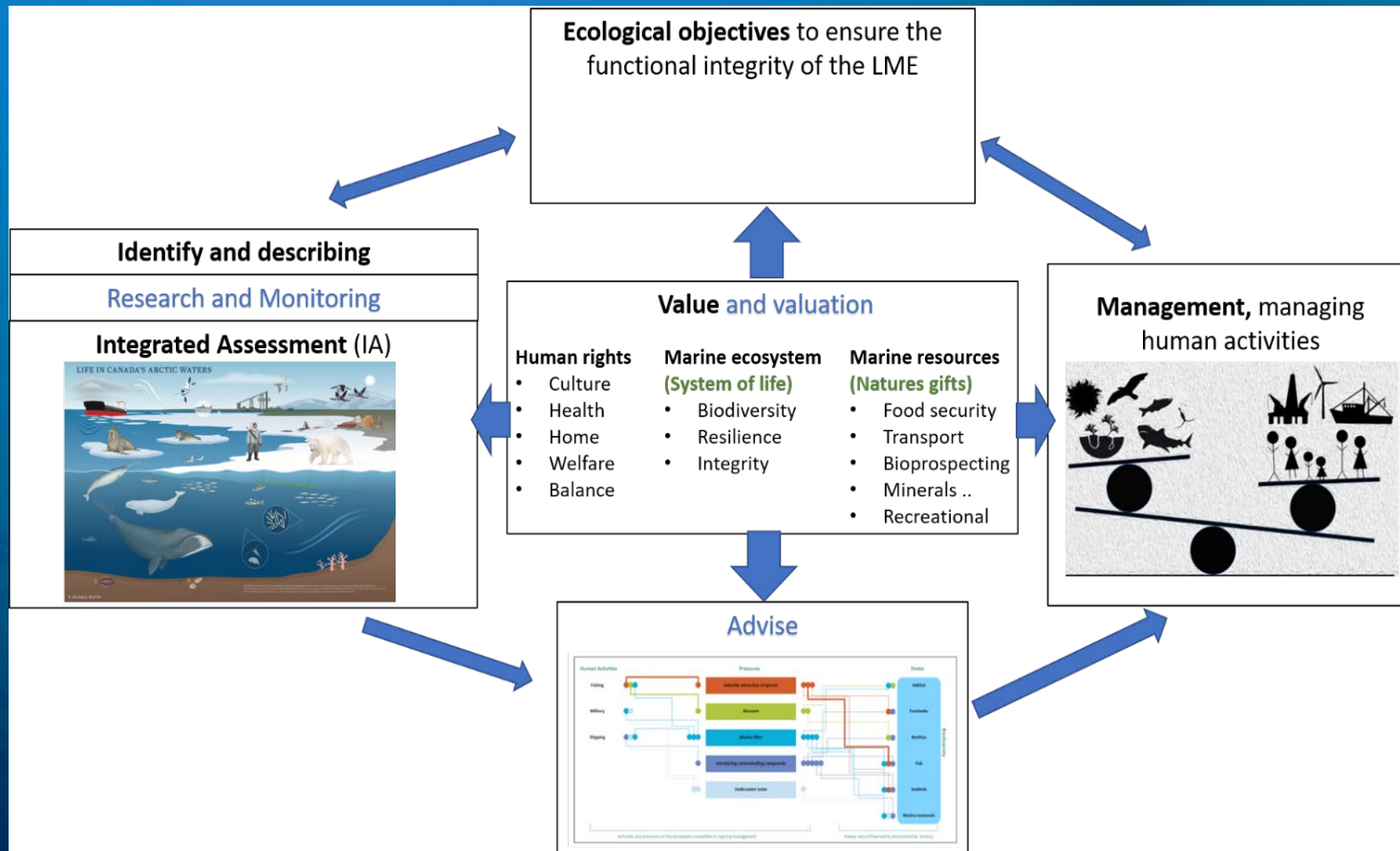
How to prepare?

How to deliver science based advise to authorities?



«Ecosystem Approach to Management» (EA)

... the importance of the ecosystem approach management for the Arctic marine environment, and welcome relevant activities in this regard, DECLARATION for the Ministerial meeting of the Arctic Council



PAME – Arctic Council
Work under development

Integrated Ecosystem Assessment for the EA

Describe the spatial and temporal distribution of the ecosystem

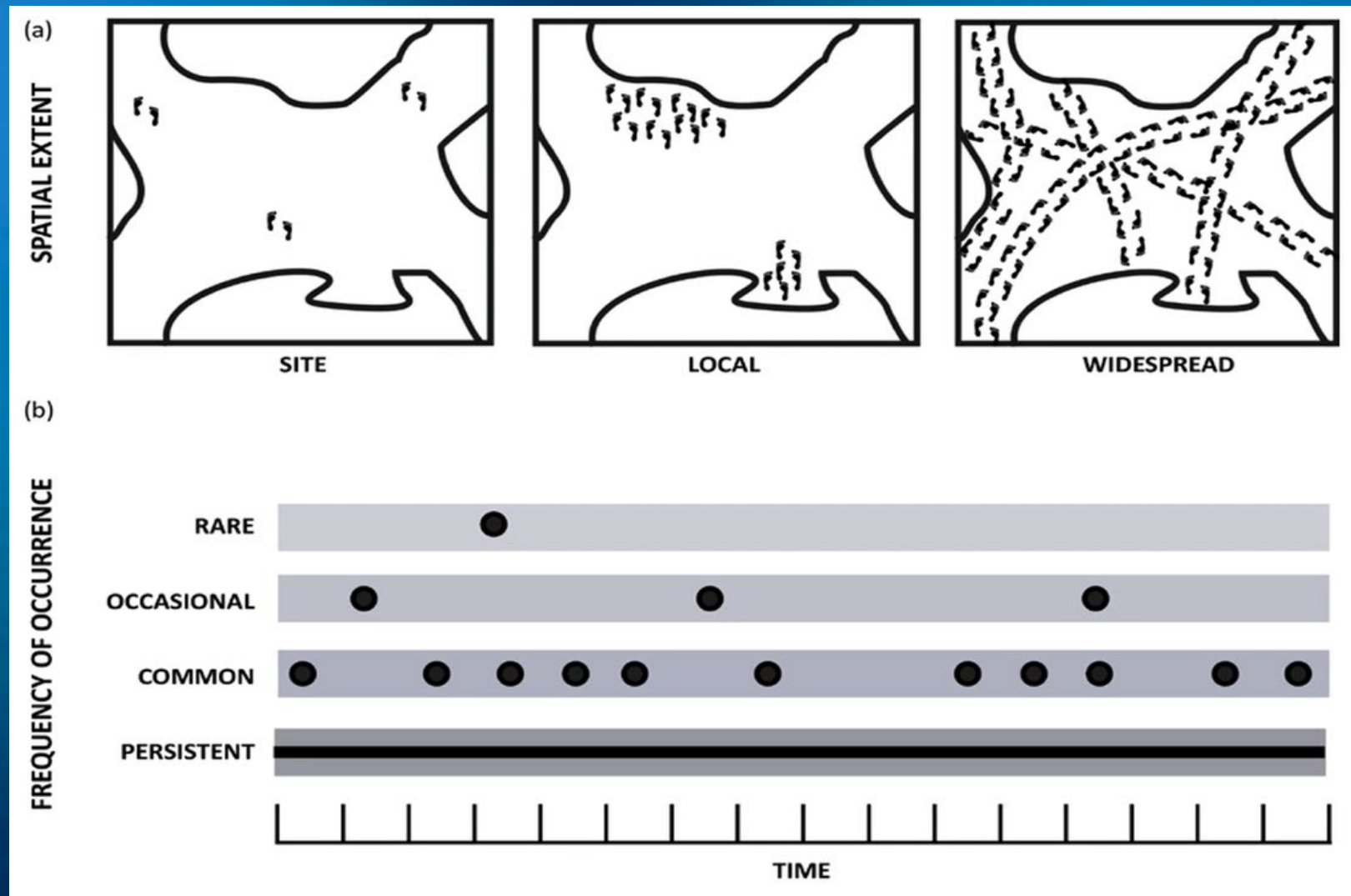
Describe the spatial and temporal distribution of the human activities and its pressure

Describe the sensitivity of the ecosystem to pressures

Evaluate the RISK of OVERLAPPING (SPACE and TIME) human activities and pressures with ecosystem component



The spatial and temporal distribution



Zooplankton “blooms” up to 6 summer-months

Spatial coverage

Site (> 0–5%)

Local (5–50%)

Widespread, patchy (> 50%)

Widespread, even (> 50%)

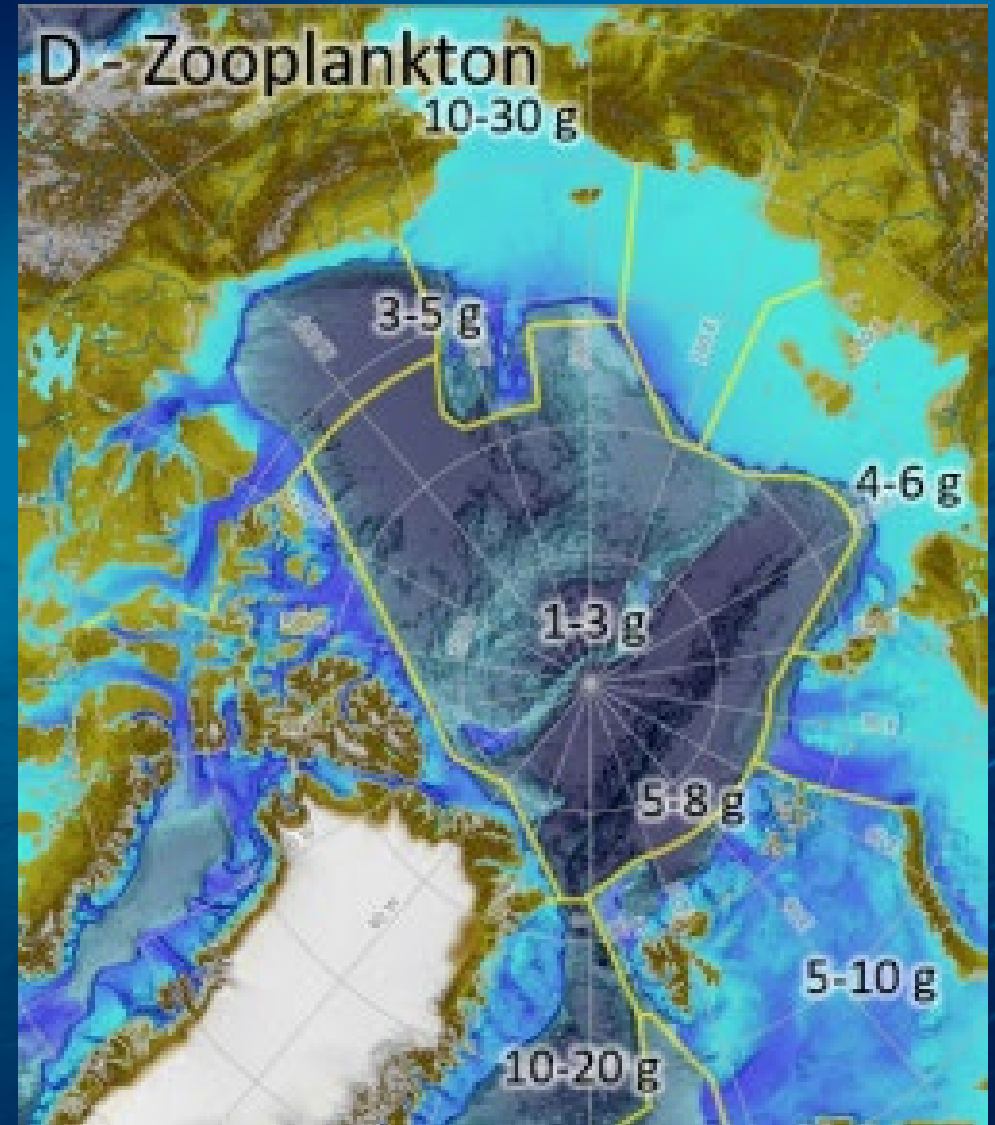
Temporal occurrence

Rare occurs up to one month per year

Occasional occurs up to four months per year

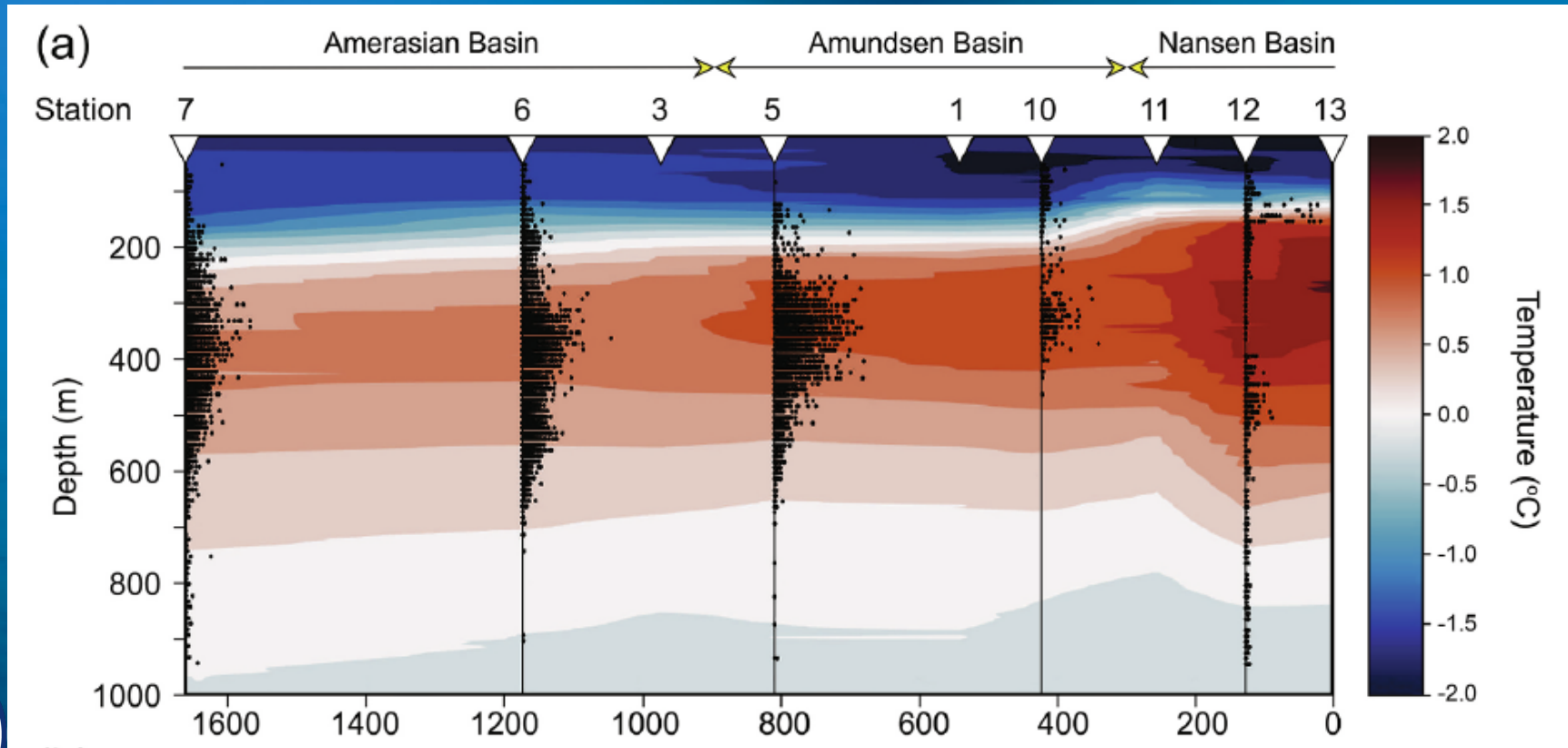
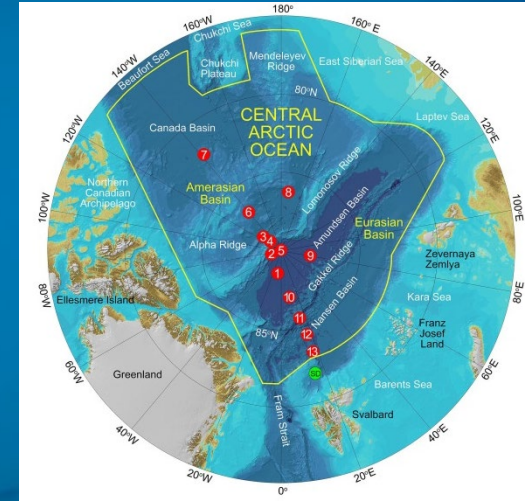
Common occurs up to eight months per year

Persistent occurs every month of the year



Skjoldal, H. R. (Ed.). 2022. Ecosystem assessment of the Central Arctic Ocean: Description of the ecosystem. ICES Cooperative Research Reports Vol. 355. 341 pp.

A zooplankton and fish layer in the Atlantic water (100-500 m)



Fish abundance and biomass very low

ca. 2,000 individuals km^{-2}

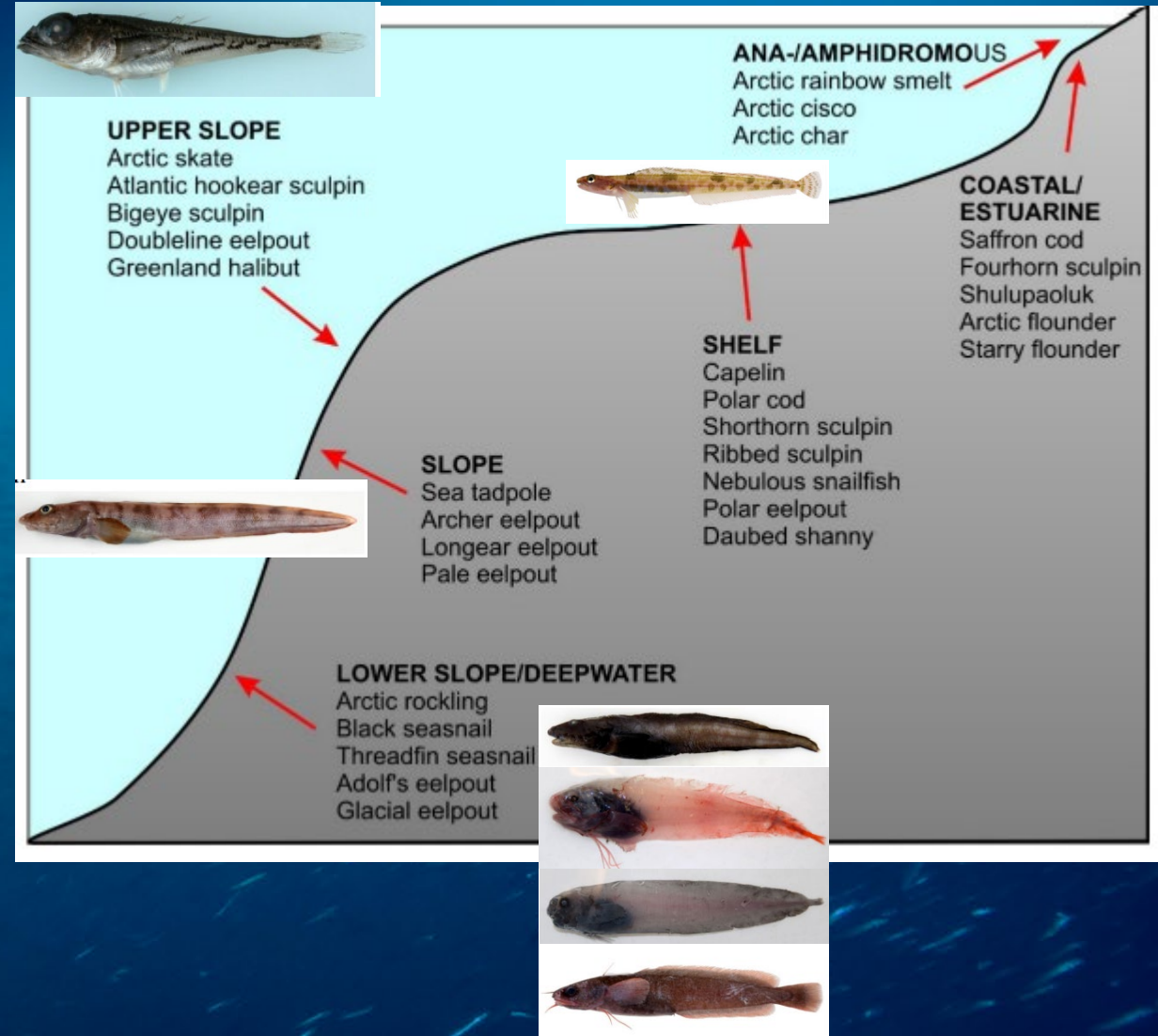
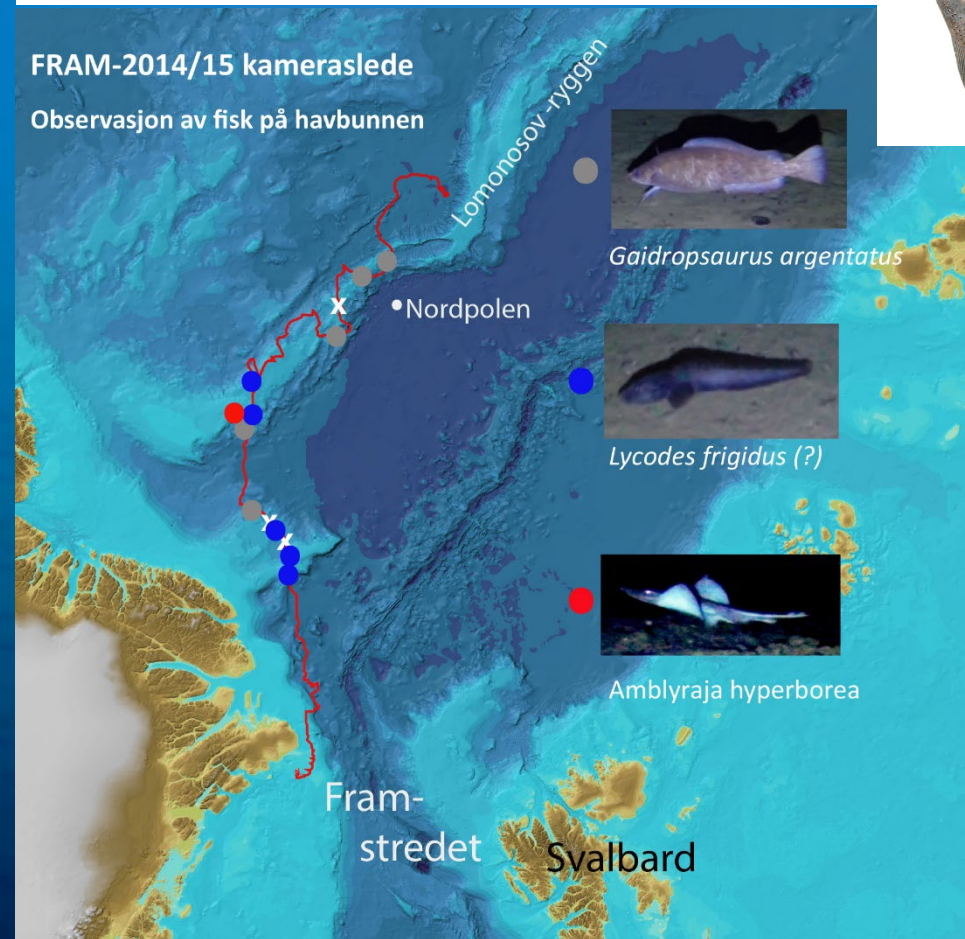
ca. 50 kg km^{-2}



Depth transition of demersal fish



FRAM-2014/15 kameraslede
Observasjon av fisk på havbunnen



Fish

Pelagic



Spatial coverage

Temporal occurrence

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Local (5–50%)

Widespread, patchy (> 50%)

Widespread, even (> 50%)

Rare occurs up to one month per year

Occasional occurs up to four months per year

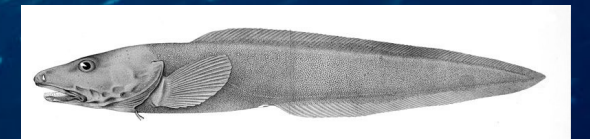
Common occurs up to eight months per year

Persistent occurs every month of the year

Mesopelagic

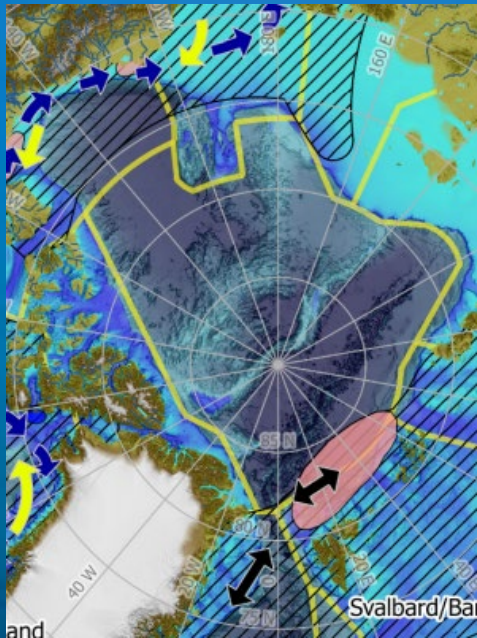


Abyssal

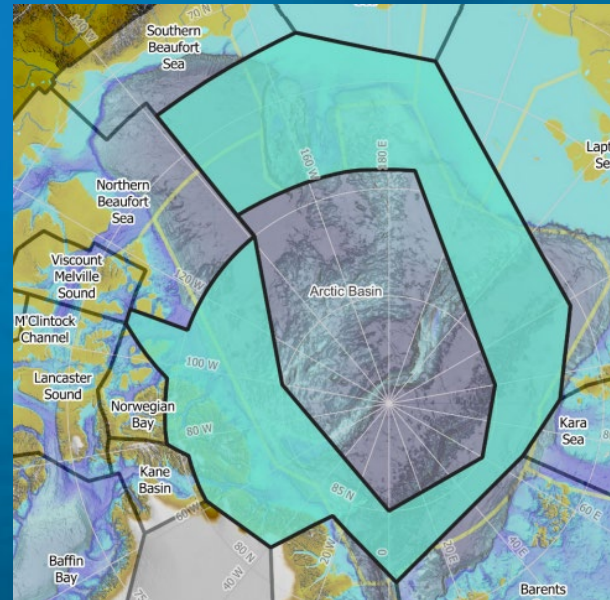


Distribution of ice-edge fauna

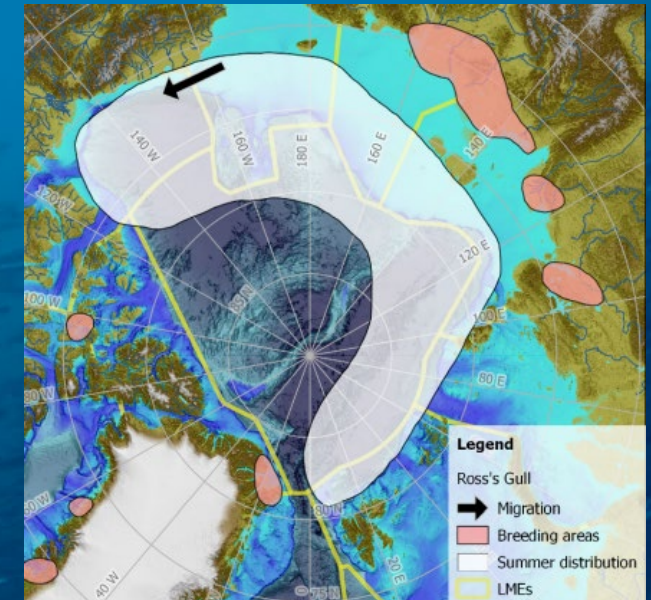
Sea mammals
(Bowhead whales)
Site-Rare



Polar bears
Site-Persistent



Seabird (Ross gull)
Local(?) - Occasional (->4M)
Local(?) - Common (->8M)



Skjoldal, H. R. (Ed.). 2022. Ecosystem assessment of the Central Arctic Ocean: Description of the ecosystem. ICES Cooperative Research Reports Vol. 355. 341 pp.

The deep-sea benthic communities more heterogenous and biodiverse than expected.

Pristine vent fauna, seamounts and ridges with rich sponges and associated benthic biota, including chemoautotrophic biota.

Spatial coverage

Temporal occurrence

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Local (5–50%)

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Widespread, even (> 50%)

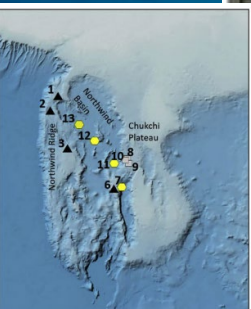
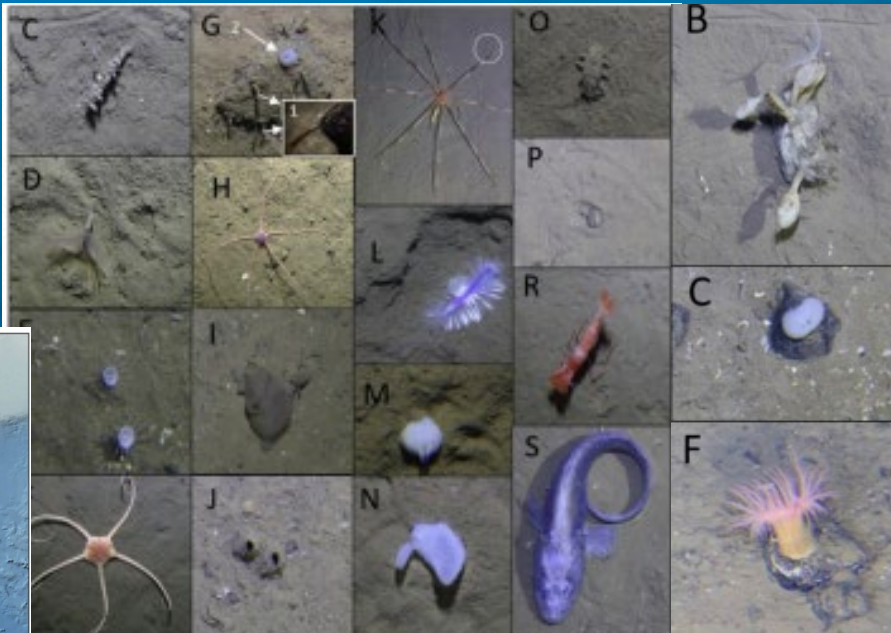
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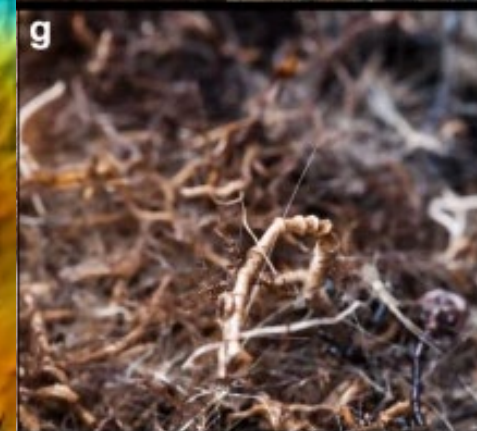
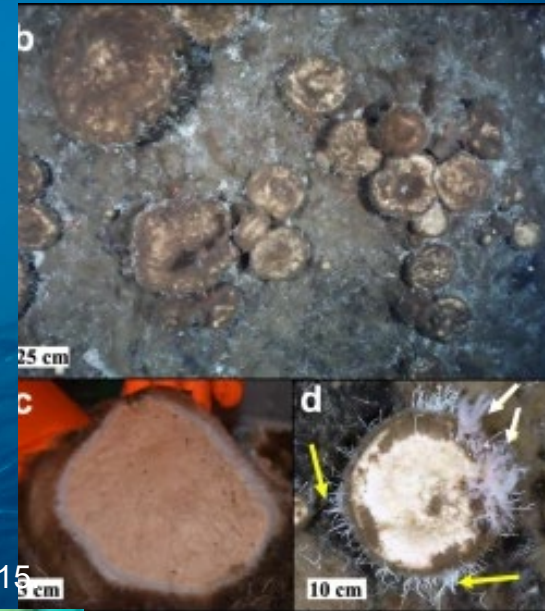
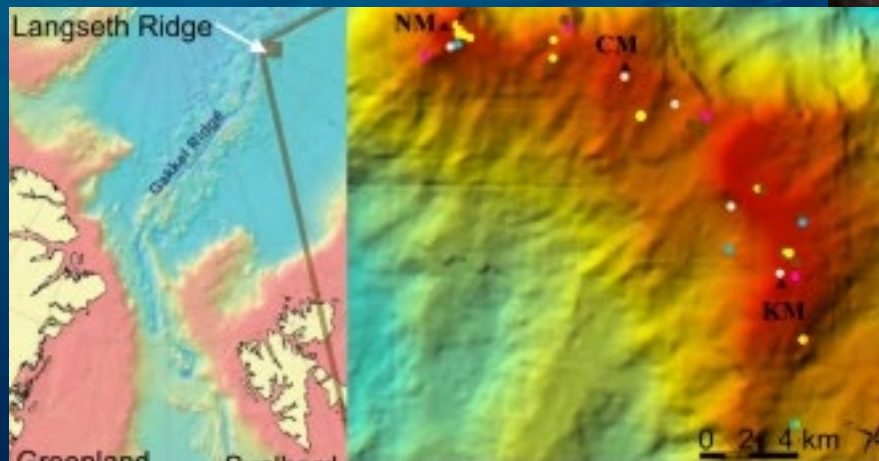
Persistent occurs every month of the year

Deep Chukchi Borderland. Zhulaya et al 2019



Giant sponge grounds of Central Arctic seamounts are associated with extinct seep life.

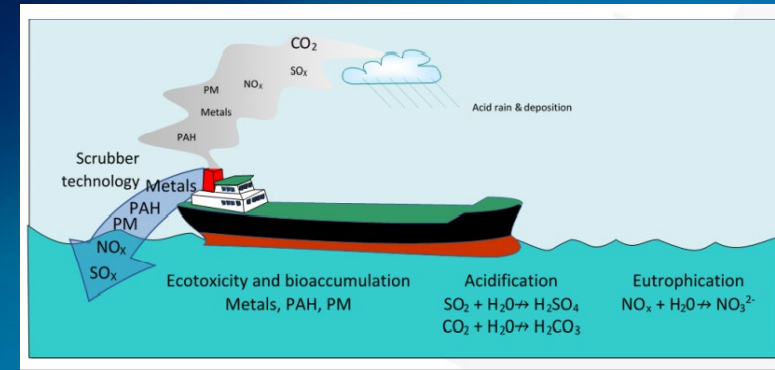
Morganti et al (2022) *Nature communications*, 13(1), 1-15



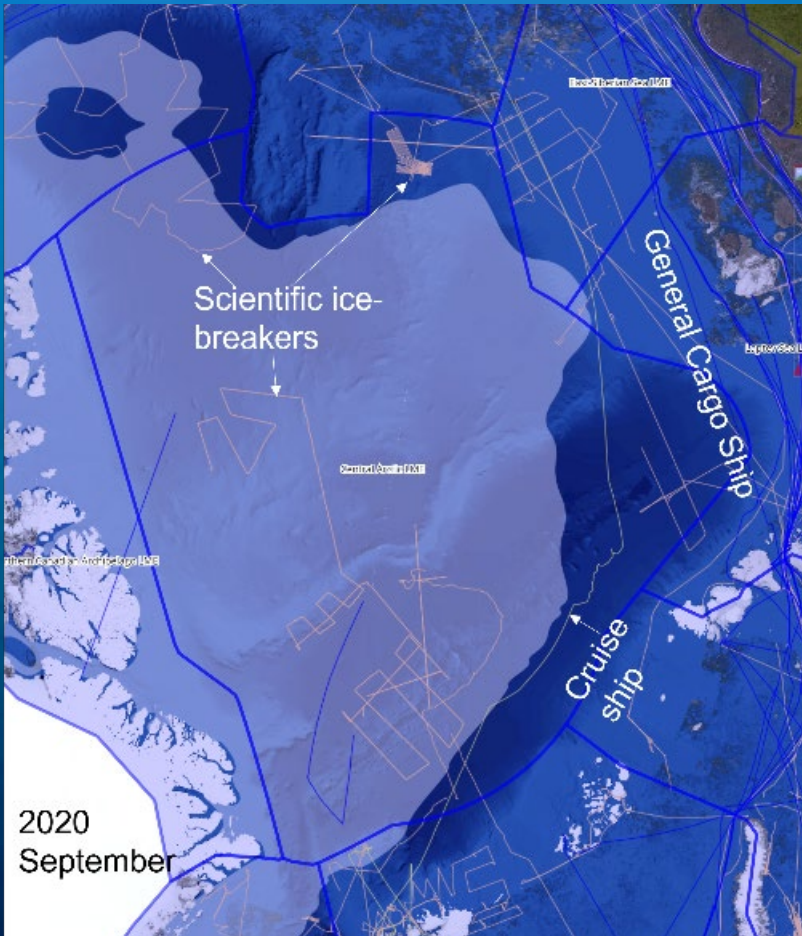
Human sectors and the pressures



Ship traffic: garbage, pollution, physical, NIS, noise, disturbance.



<https://map.astd.is/>



	1	2	3	4	5	6	7	8	9	0	1	1	1
1													
3													
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Spatial coverage

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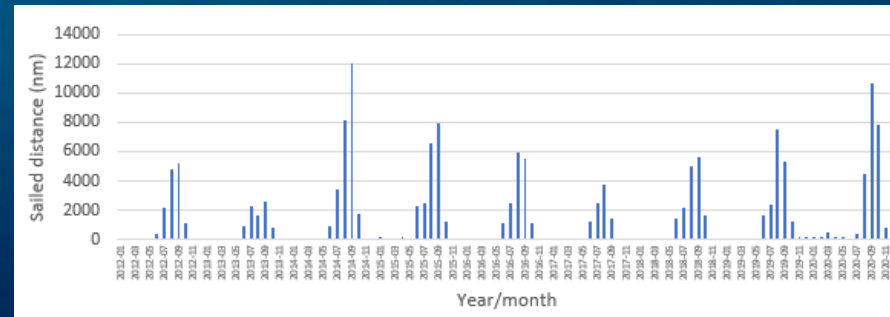
Widespread, even (> 50%)

Rare occurs up to one month per year

Occasional occurs up to four months per year

Common occurs up to eight months per year

Persistent occurs every month of the year



Le Commandant Charcot

Tourism (other than ships): *disturbance, garbage, pollution, physical disturbance, nutrients, noise*



Spatial coverage

Temporal occurrence

Site (> 0–5%)

Local (5–50%)

Widespread, patchy (> 50%)

Widespread, even (> 50%)

Rare occurs up to one month per year

Occasional occurs up to four months per year

Common occurs up to eight months per year

Persistent occurs every month of the year



Up to 1000 people



Science (other than ships): *bycatch, disturbance, garbage, pollution, physical disturbance, NIS, nutrients, sedimentation, noise, light, extraction of biomass, extraction of non-living material*



Spatial coverage

Temporal occurrence

Site (> 0–5%)

Rare occurs up to one month per year

Local (5–50%)

Occasional occurs up to four months per year

Widespread, patchy (> 50%)

Common occurs up to eight months per year

Widespread, even (> 50%)

Persistent occurs every month of the year



Military activities - *electromagnetic field, garbage, pollution, physical disturbance, NIS, nutrients, noise*



Spatial coverage

Temporal occurrence

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Local (5–50%)

Widespread, patchy (> 50%)

Widespread, even (> 50%)

Rare occurs up to one month per year

Occasional occurs up to four months per year

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Operationally military – very little info

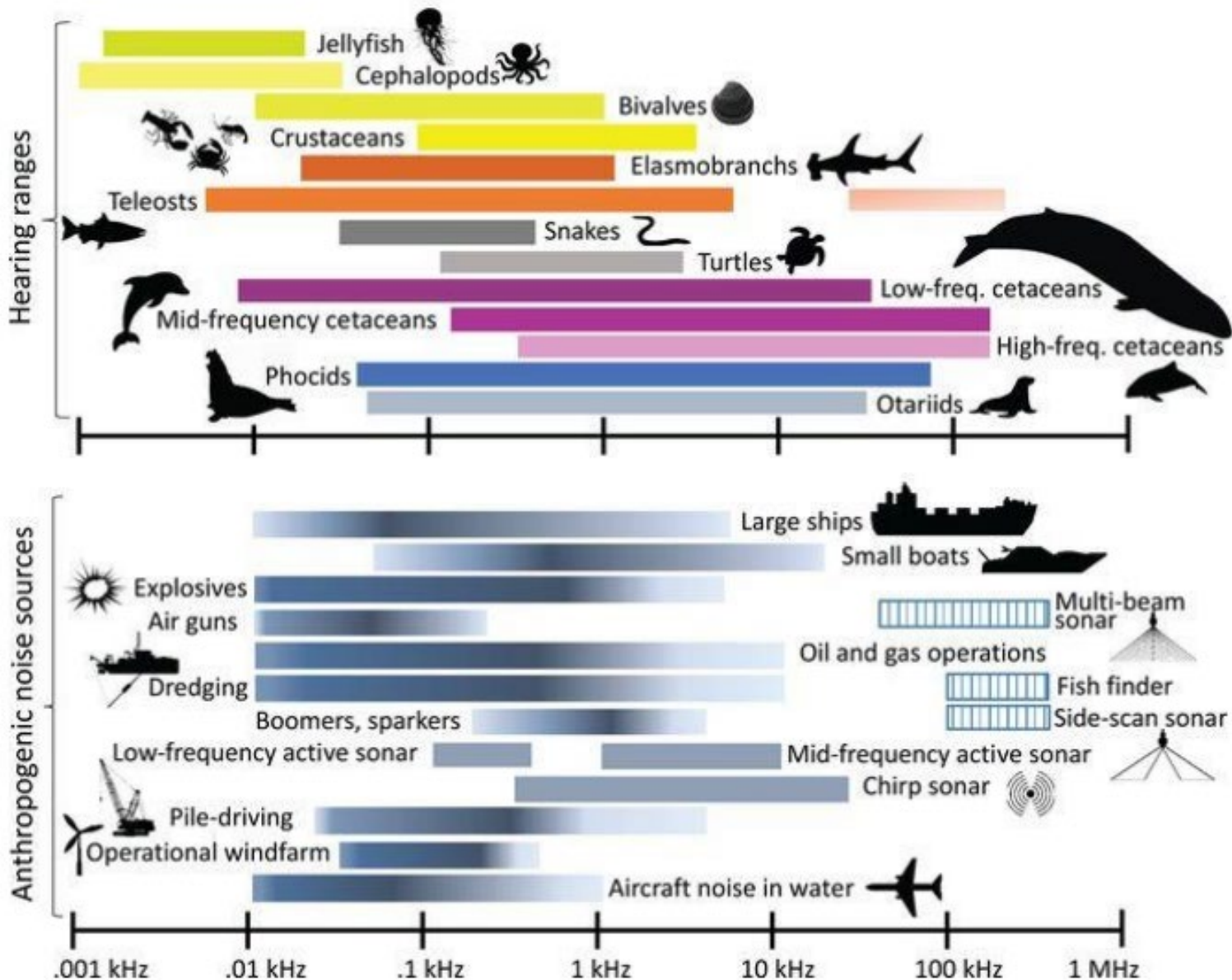
Submarines under the ice without noise and any trace and “environmental friendly”

Submarine-launched ballistic missile testing ongoing since 1961 (Berkman 2012)

The generic sensitivity of an ecological component to a pressure



Noise

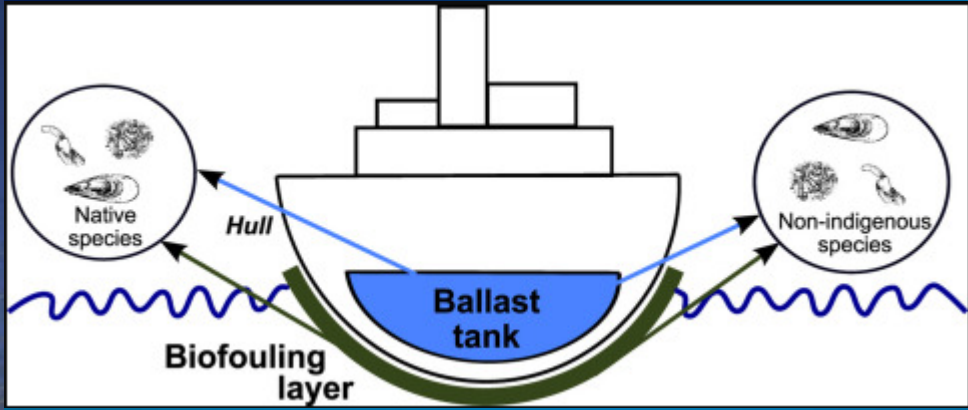


Duarte et al. (2021)

Low (severe effect not expected)

Chronic (severe effect likely after multiple occurrences)

Acute (immediate severe effect; e.g. death)



Low

Chronic

Acute



WHICH SECTORS, PRESSURES, ECOSYSTEM COMPONENTS TO INCLUDE?

Human activities

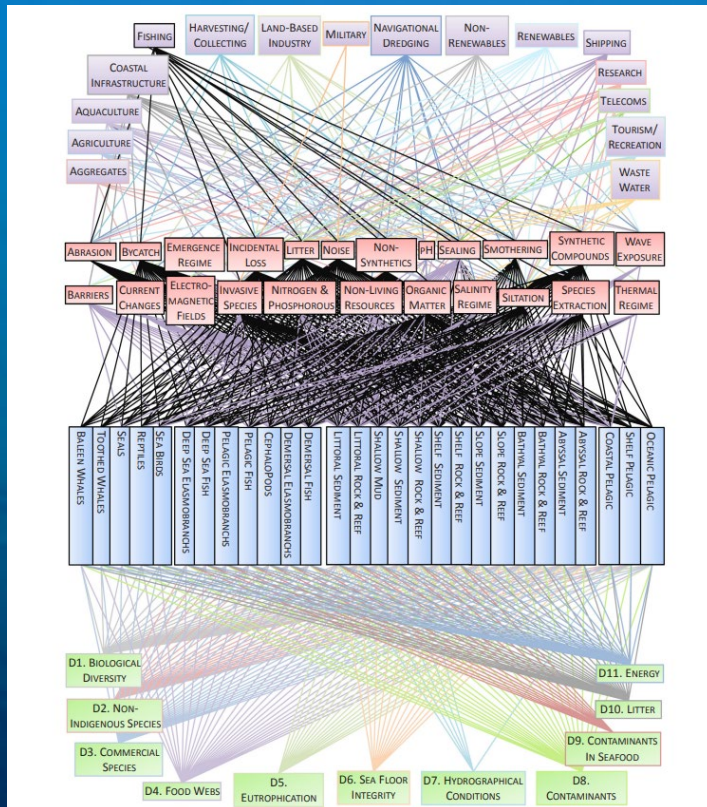
- Global sources
- Tourism transport and activities
- Military transport and activities
- Science transport and activity

Pressures

- Pollution
- Marine litter
- Noise pollution
- Light pollution
- Disturbances
- Electromagnetic field
- Nonintentional loos
- Etc.....

Ecosystem components

- Microalgae (inc. ice-biota)
- Zooplankton
- Mesopelagic zooplankton
- Pelagic fish (inc. ice-biota)
- Demersal fish
- Benthos
- Seabirds
- Whales
- Polar bears
- Seals



Semi-quantify risk of impact

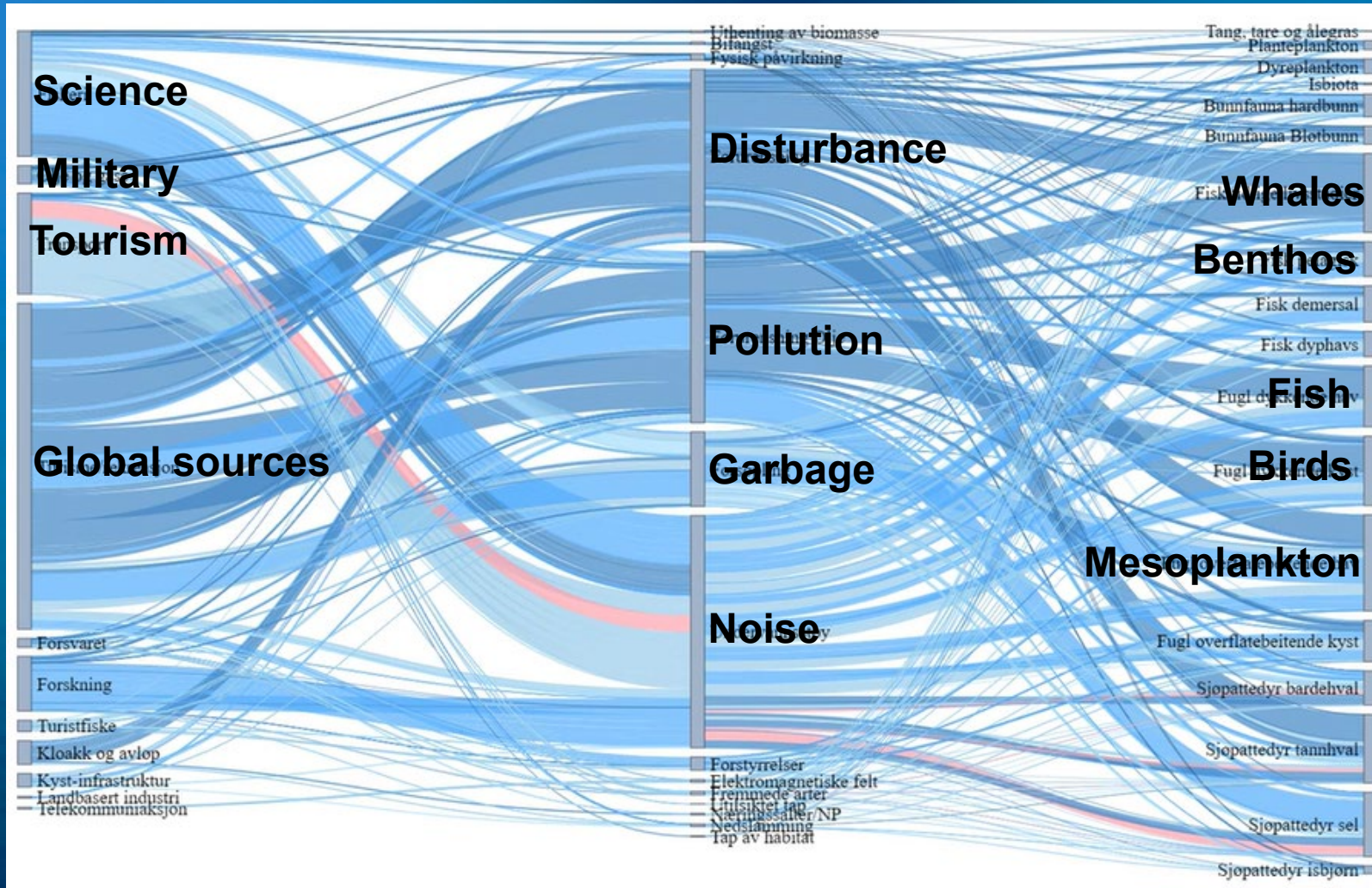
Risk of impact from each sector – pressure – ecosystem component linkage

= vulnerability x overlap in space x overlap in time



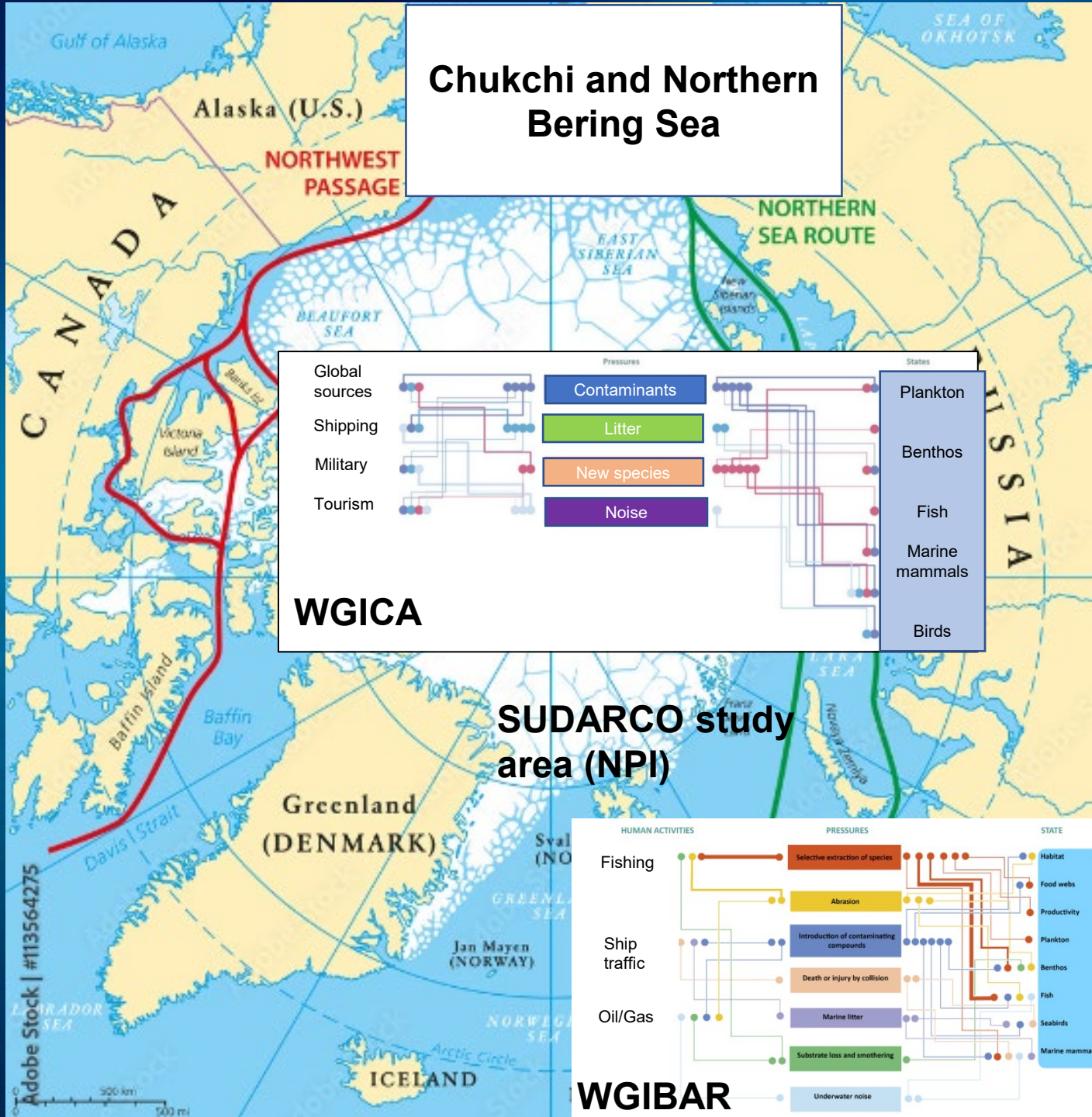
Criteria	Definition	Categories	Score
SPATIAL OVERLAP	spatial overlap between a sector/pressure and an ecosystem component – regardless of how often it occurs	NO refers to No Overlap and is of no further concern	0
		Site (>0-5% overlap)	0.03
		Local (5-50%)	0.37
		Widespread (>50%)	1
TEMPORAL IMPACT	timing of the interaction (i.e. between a given sector, pressure, ecosystem component pathway) – regardless of the magnitude of the interaction	Rare (occurs in one month per year)	0.08
		Occasional (occurs in 1- 4 months per year)	0.33
		Common (occurs in 4-8 months per year)	0.67
		Persistent (occurs in every month of the year)	1
DEGREE OF IMPACT	generic sensitivity of an ecological component to a pressure – regardless of extent or frequency	Low (severe effect not expected)	0.01
		Chronic (severe effect likely after multiple occurrences)	0.13
		Acute (immediate severe effect; e.g. death)	1

The conceptual model of the IEA



This example is based on fiction

IEA Working groups across the high arctic



ICES homepage



The screenshot shows the ICES homepage with a navigation menu at the top. The main content area features a large orange banner for 'WGICA'. Below this, the title 'ICES/PICES/PAME Working Group on Integrated Ecosystem Assessment (IEA) for the Central Arctic Ocean' is displayed. The page includes sections for 'Affiliation: IEASG', 'Chairs: Lis Lindal Jørgensen (PAME), Sei-ichi Saitoh (PICES), Martine van den Heuvel-Greve (ICES)', and a detailed description of the working group's mission. A 'LINKS' section on the right contains a list of links, with a blue arrow pointing to 'View all WGICA publications'. Social media sharing icons are also present above a photograph of icebergs.

ICES CIEM

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WGICA

ICES/PICES/PAME Working Group on Integrated Ecosystem Assessment (IEA) for the Central Arctic Ocean

Print it Send to f t in Share it

Affiliation: IEASG

Chairs: Lis Lindal Jørgensen (PAME), Sei-ichi Saitoh (PICES)
Martine van den Heuvel-Greve (ICES)

The Working Group on Integrated Ecosystem Assessment for the Central Arctic Ocean provide integrated ecosystem assessments (IEAs), including ecosystem overviews, for the Central Arctic Ocean.

Preparing an IEA for the Central Arctic Ocean (CAO) gives ICES a central role in this remote and changing ecosystem. This is a crucial step to providing scientific advice on issues such as the prospect for future fisheries in the Arctic Ocean and the sensitivity and vulnerability of the ecosystem and its components to shipping.

The working group also aims to improve the understanding of climate and ecosystem variability of the core ICES area in the North Atlantic as well as in the Bering Sea and Gulf of Alaska in the North Pacific.

WGICA will consider approaches and methodologies for the IEA in the Central Arctic Ocean, collecting data and carrying out analyses in the process. Core research areas will be identified and the outline of the CAO ecosystem will be developed.

LINKS

- > View all members of this group
- > IEASG EG RESOLUTIONS
- > View WGICA latest report
- > View all WGICA publications

CONTACT US

GO TO SHAREPOINT SITE

New link !



lislin@hi.no
ssaitoh@arc.hokudai.ac.jp

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Ecosystem assessment of the Central Arctic Ocean: Description of the ecosystem

Report published on 08.07.2022

Hein Rune Skjoldal

ICES-PICES-PAME Working Group on Integrated Ecosystem Assessment (IEA) for the Central Arctic Ocean (WGICA)

Report published on 30.01.2022

[ICES](#)

Central Arctic Ocean ecoregion – Ecosystem Overview

Report published on 09.12.2021

[ICES](#)

Possible future scenarios in the gateways to the Arctic for Subarctic and Arctic marine systems: II.

... prey resources, food web, fish and fisheries

Summary

lislin@hi.no
ssaitoh@arc.hokudai.ac.jp

The open water area in the CAO are rapidly changing with possible alarming effects from human activities on a already stressed biological system.

EA are being promoted by the Arctic Council

Use the IEA as a method to show cumulative impact on the arctic ecosystem

Together with stakeholders to streamline information into “space” and “time”

- Human activities (Global, Science, Tourism, Military....)
- Pressures (Pollution, Garbage, Disturbance....)
- Ecosystem and sensitivity (Sea mammals, Fish, Zooplankton, ice algae.....)

Semi-quantify risk of impact

Crucial to continue to work both nationally, bilateral and multi-national to optimize access to, and work on relevant information to follow the fast Arctic transition (the great melt)

Find more info om “WGICA ICES”:

