Detecting drivers and stressors causing changes in the Arctic Benthic Ecosystem

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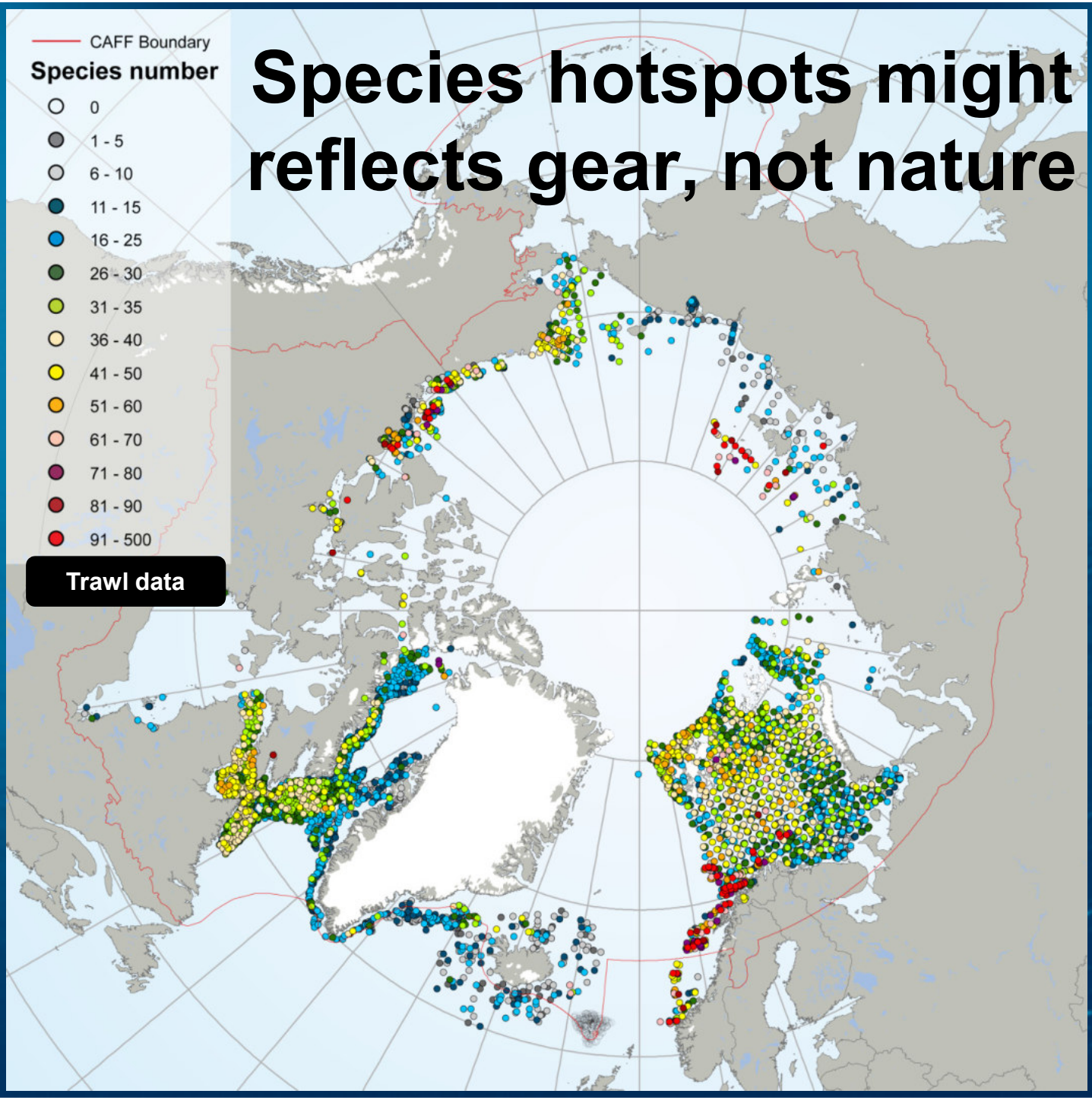
KNO4 11.10.2018 10:30-12 am

Arctic Biodiversity Congress 09-12 October 2018

How did the SAMBR challenge us?

Species hotspots might reflects gear, not nature

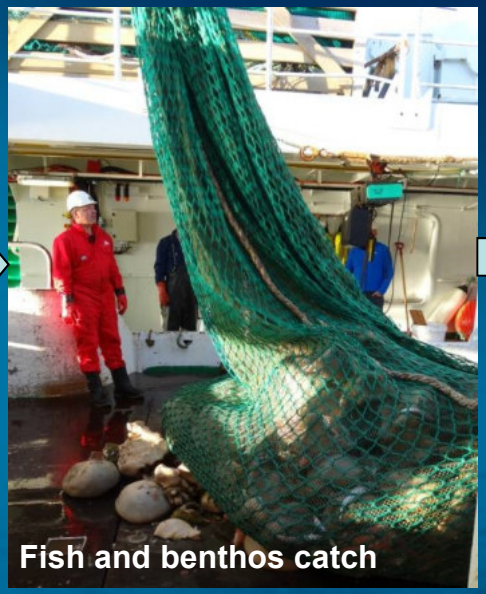


KEY FINDING:
Lack of consistency and methodological standardization

SUGGESTION:
to develop a time- and cost-effective, long-term and standardized monitoring of megabenthic communities in all Arctic regions with regular groundfish assessment surveys.

Regular groundfish assessment surveys

Make use of a already existing fish survey – time and cost efficient.



Fish and benthos catch

Standardized procedures

Standardized knowledge

Same literature

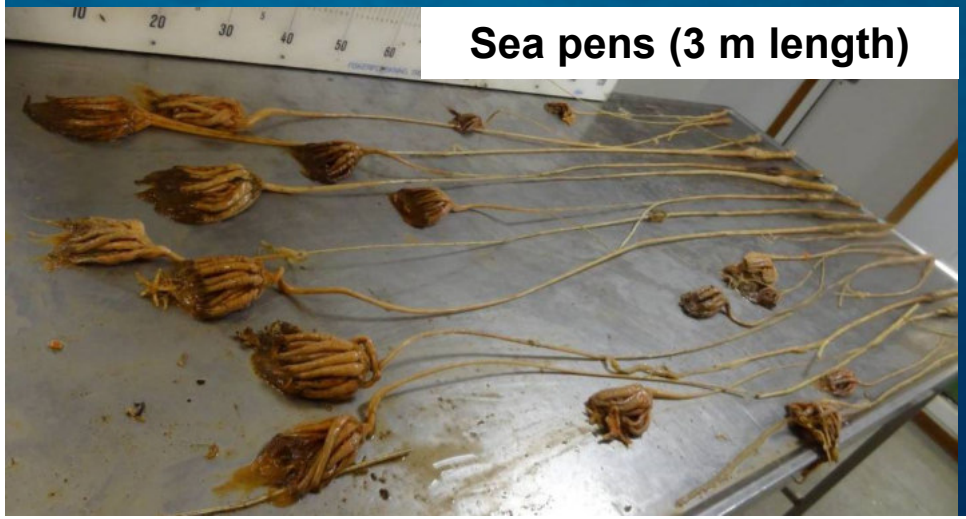
Database for temporal standardization

Example of species easily caught by trawl

Basket stars (40 cm diameter)

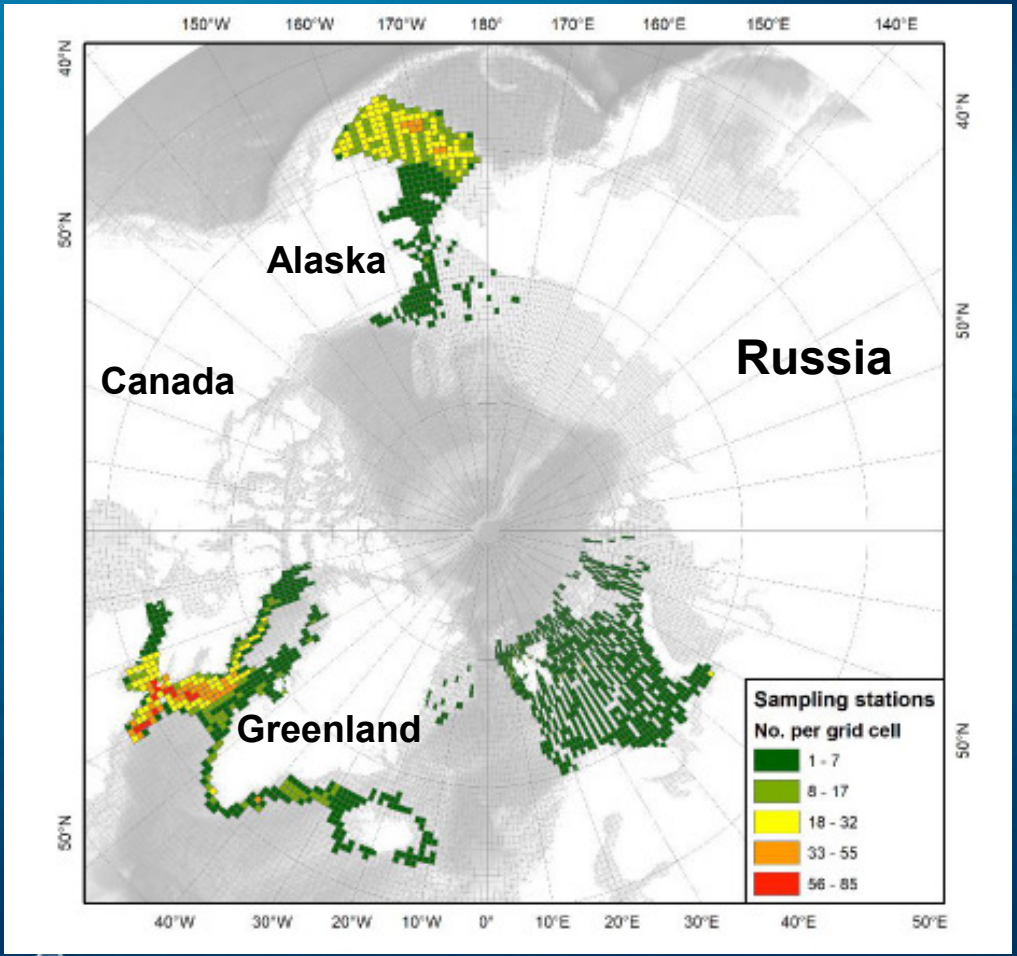
Sealilies (20 cm arms)

Sponges (15 kg)



Sea pens (3 m length)

Long-Term Benthos Monitoring network for detecting changes in the Arctic benthic ecosystem (LTM-Benthos) 2017-2020



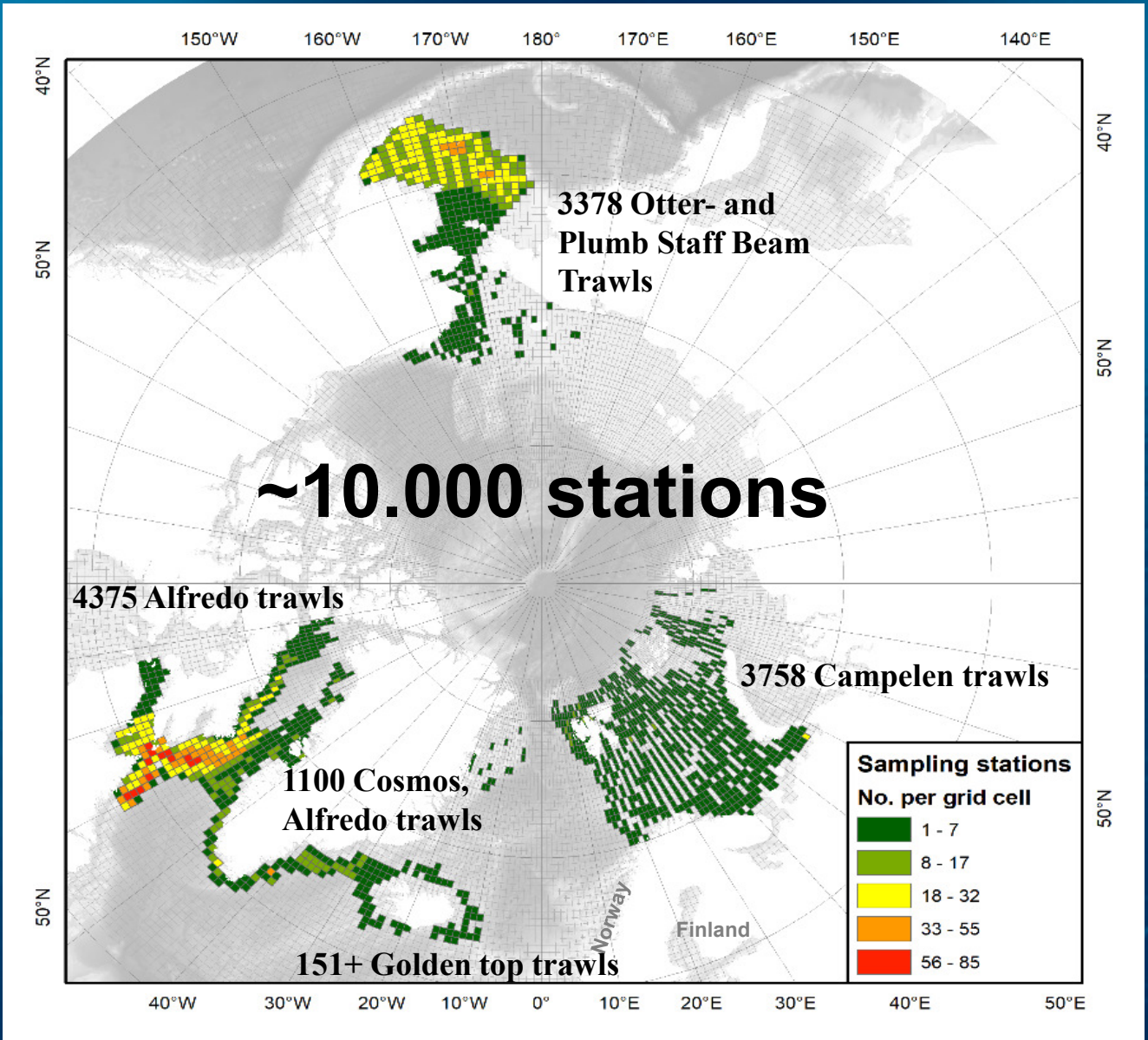
2017 Copenhagen workshop

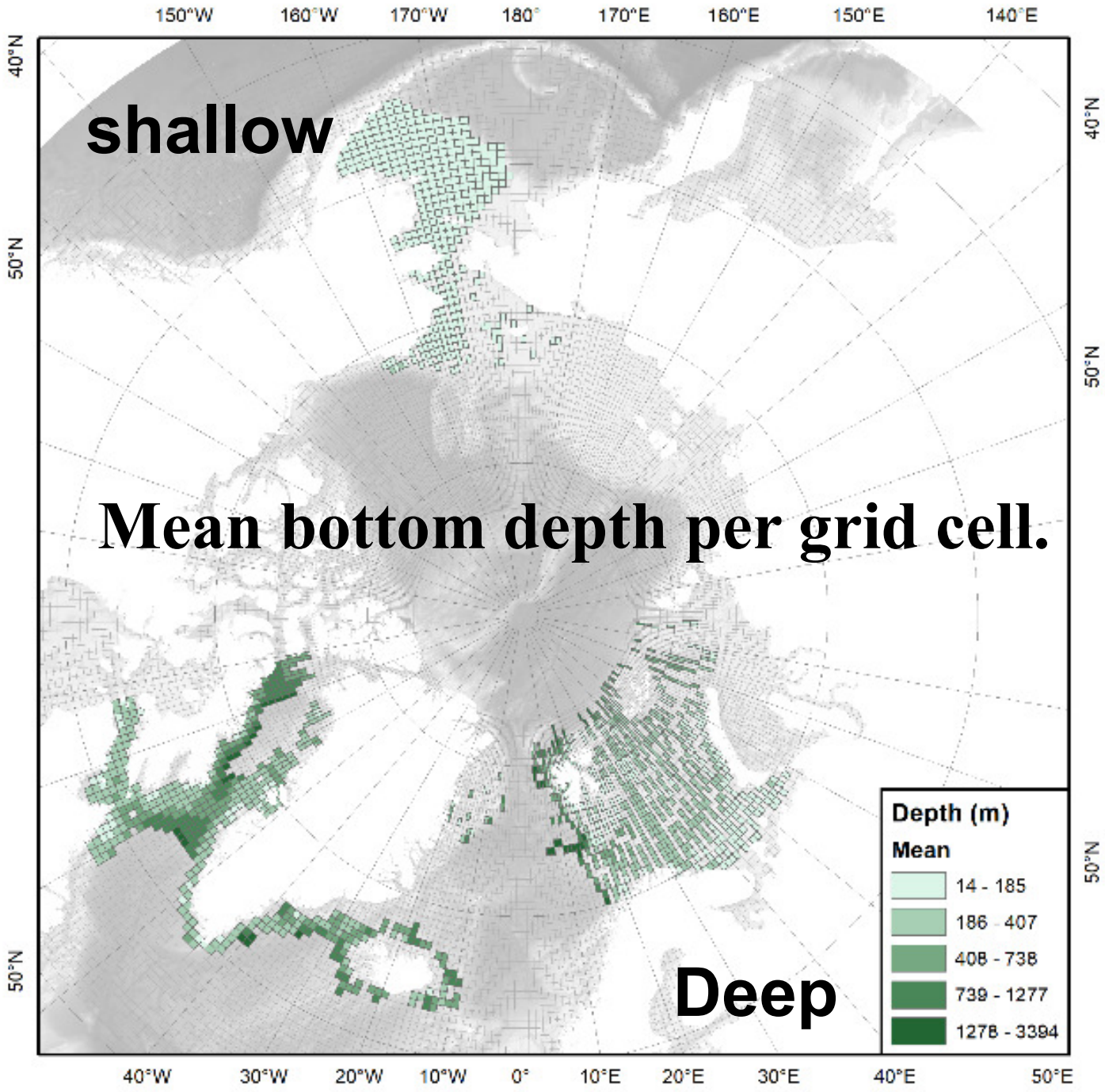
Funded by the Nordic Councill

MAIN GOAL

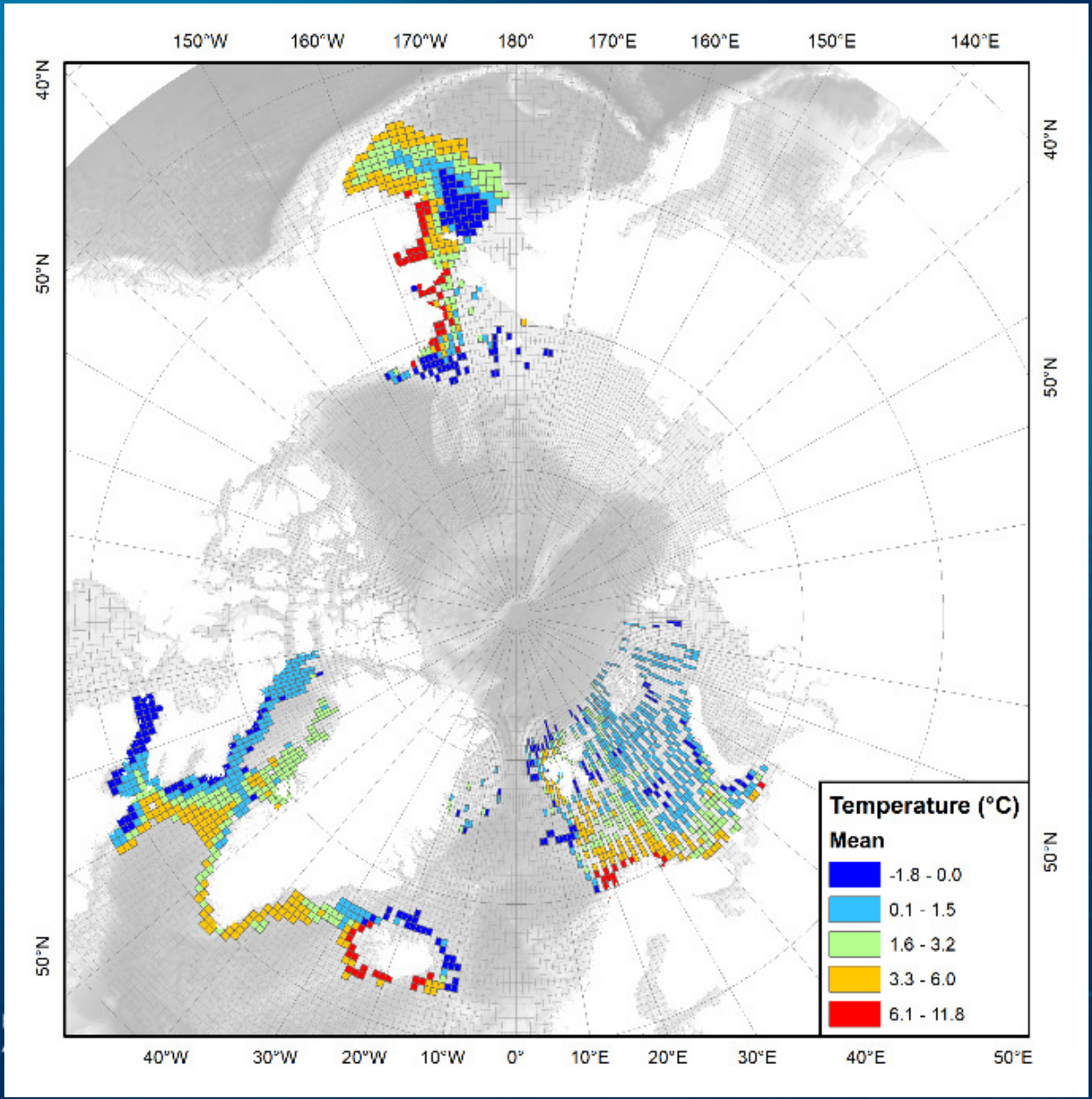
Explore how national groundfish surveys including bycatches can provide relevant data for evaluating the state of benthic communities.

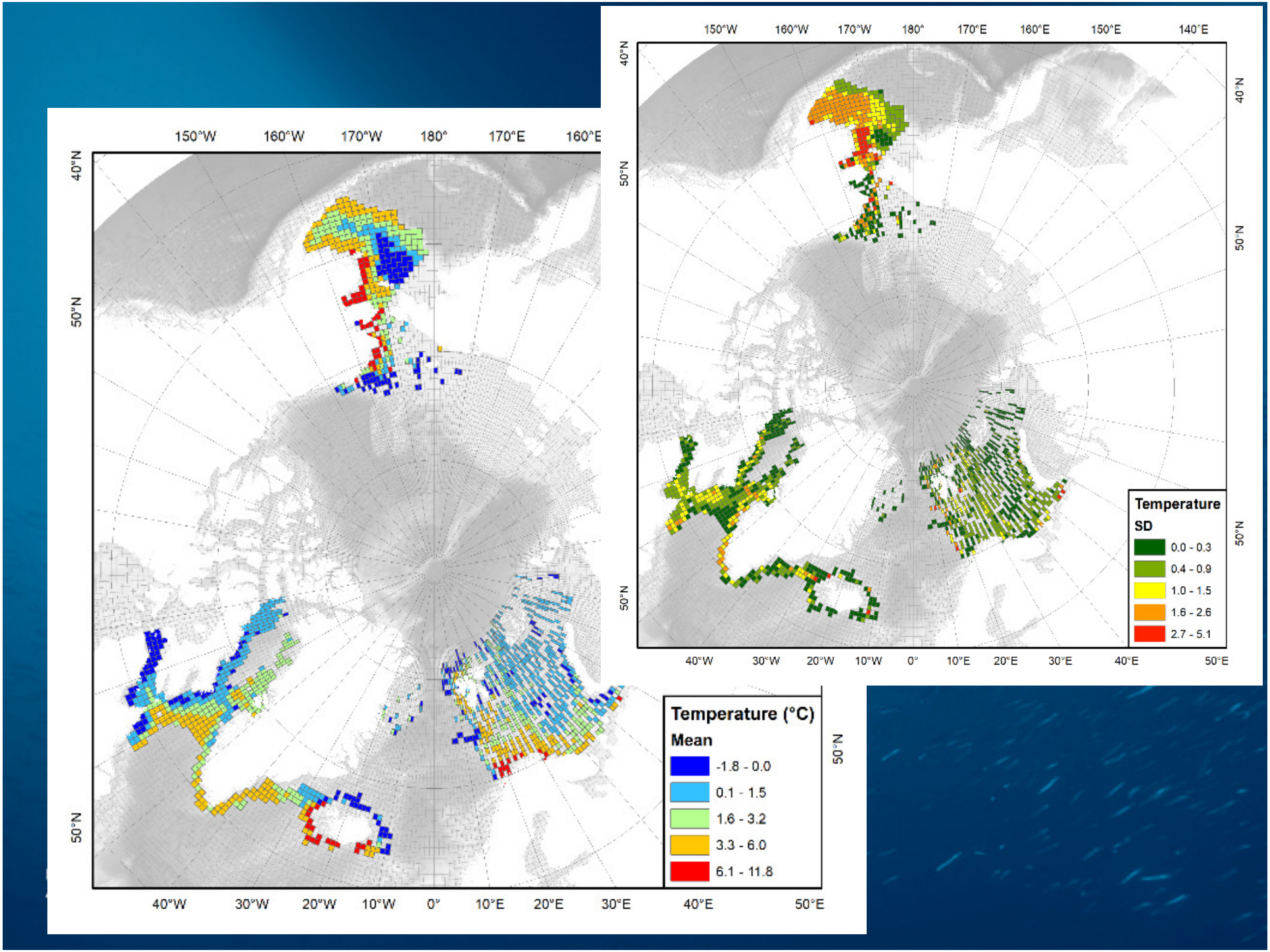
Counts per grid are the number of station samples summed over all survey years.



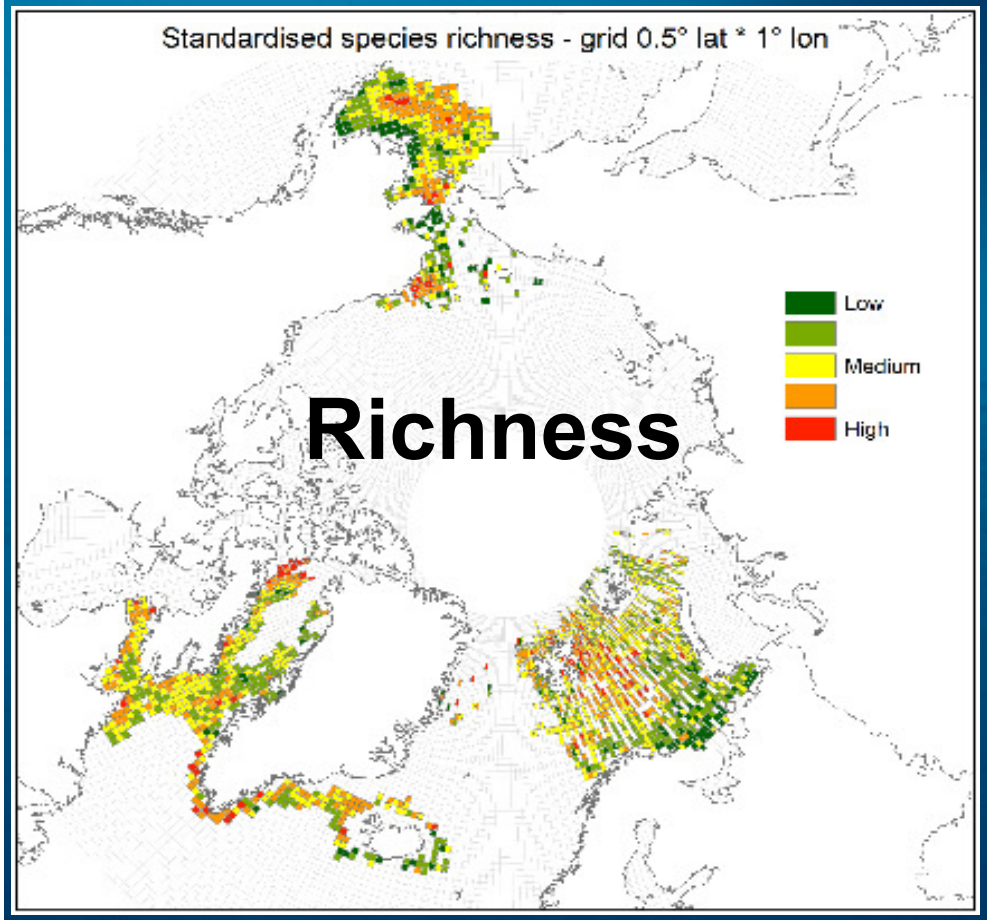

shallow
Mean bottom depth per grid cell.
Deep
Depth (m)
Mean
14 - 185
186 - 407
408 - 738
739 - 1277
1278 - 3394
150°W
160°W
170°W
180°
170°E
160°E
150°E
140°E
40°N
50°N
40°W
30°W
20°W
10°W
0°
10°E
20°E
30°E
40°E
50°E

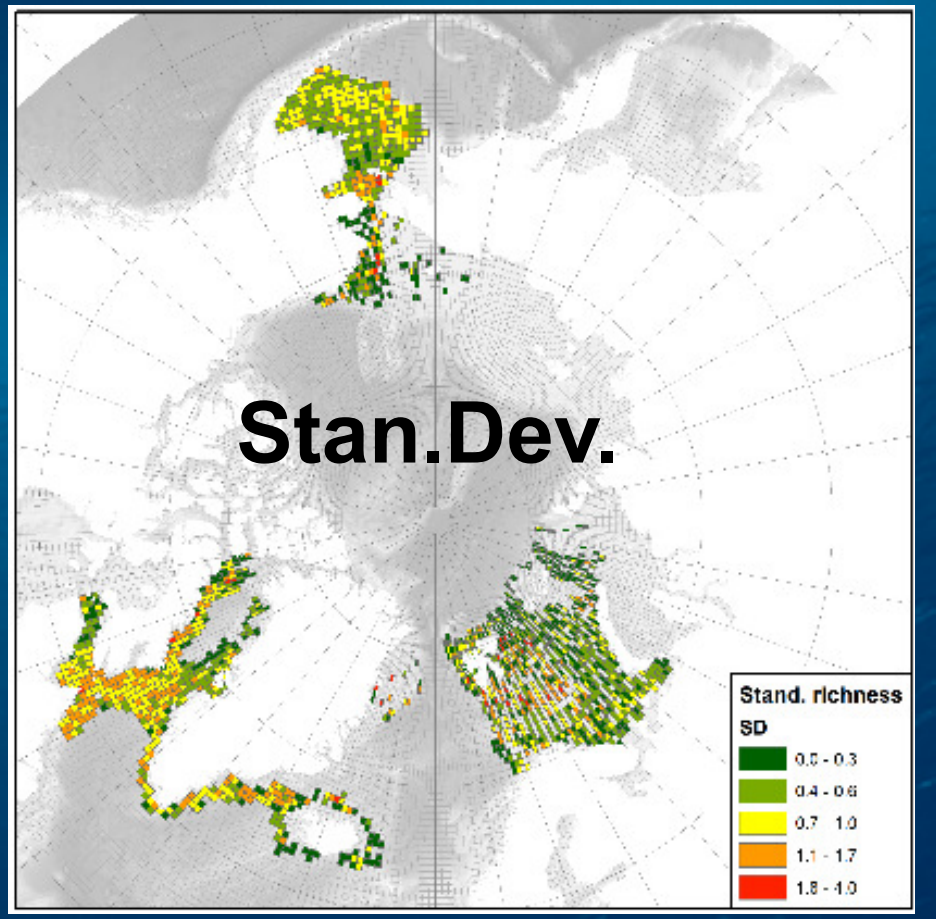
Mean bottom temp. per grid cell.



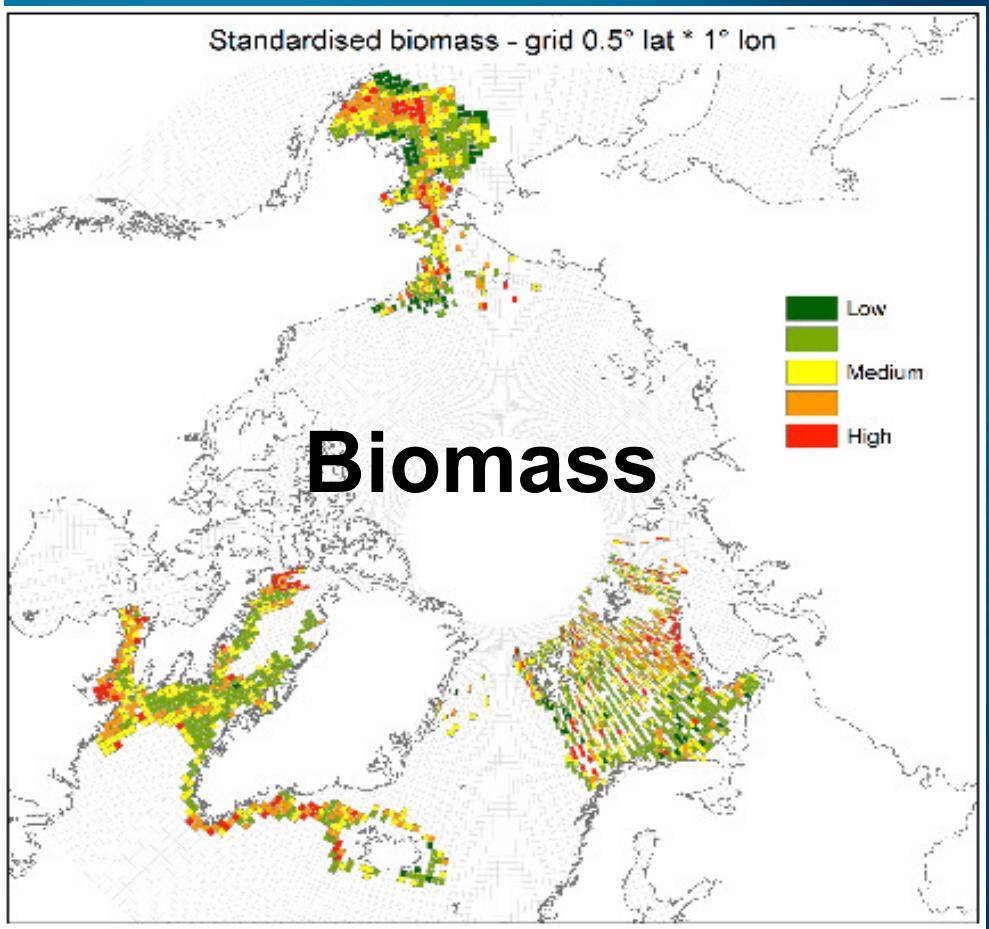

150°W
160°W
170°W
180°
170°E
160°E
150°E
140°E
40°N
50°N
40°W
30°W
20°W
10°W
0°
10°E
20°E
30°E
40°E
50°E
Temperature
SD
0.0 - 0.3
0.4 - 0.9
1.0 - 1.5
1.6 - 2.6
2.7 - 5.1
Temperature (°C)
Mean
-1.8 - 0.0
0.1 - 1.5
1.6 - 3.2
3.3 - 6.0
6.1 - 11.8

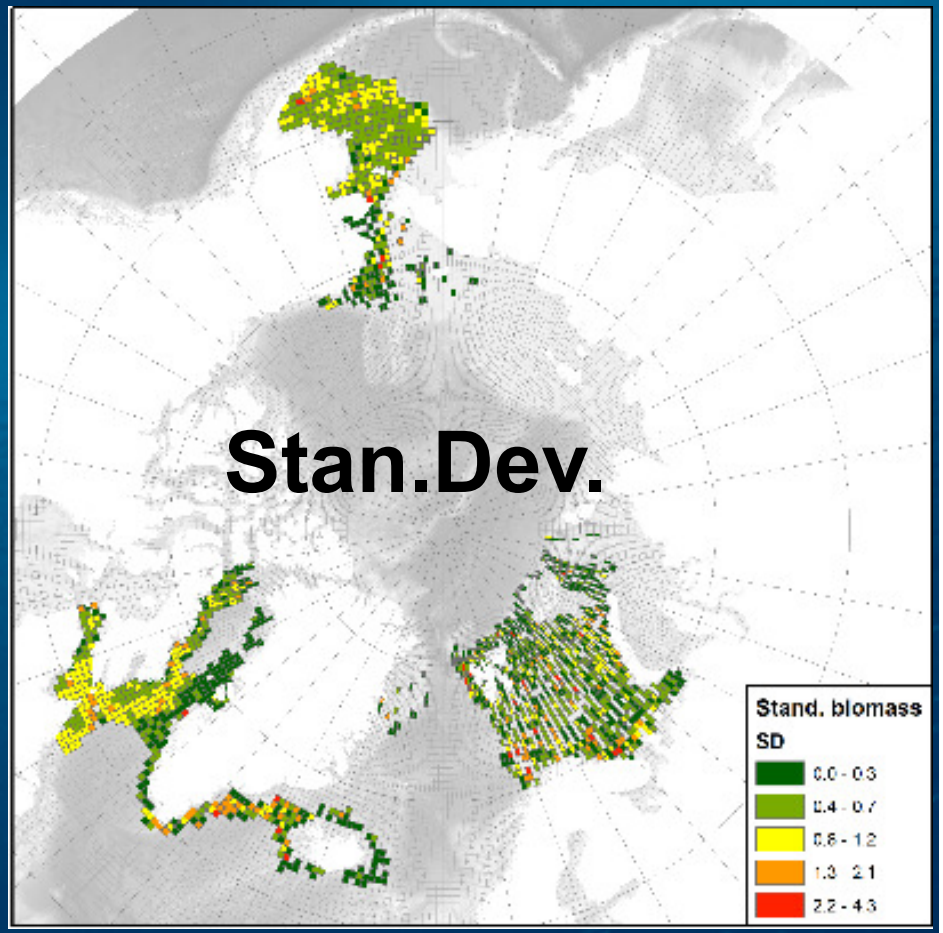
Species richness *standardized*



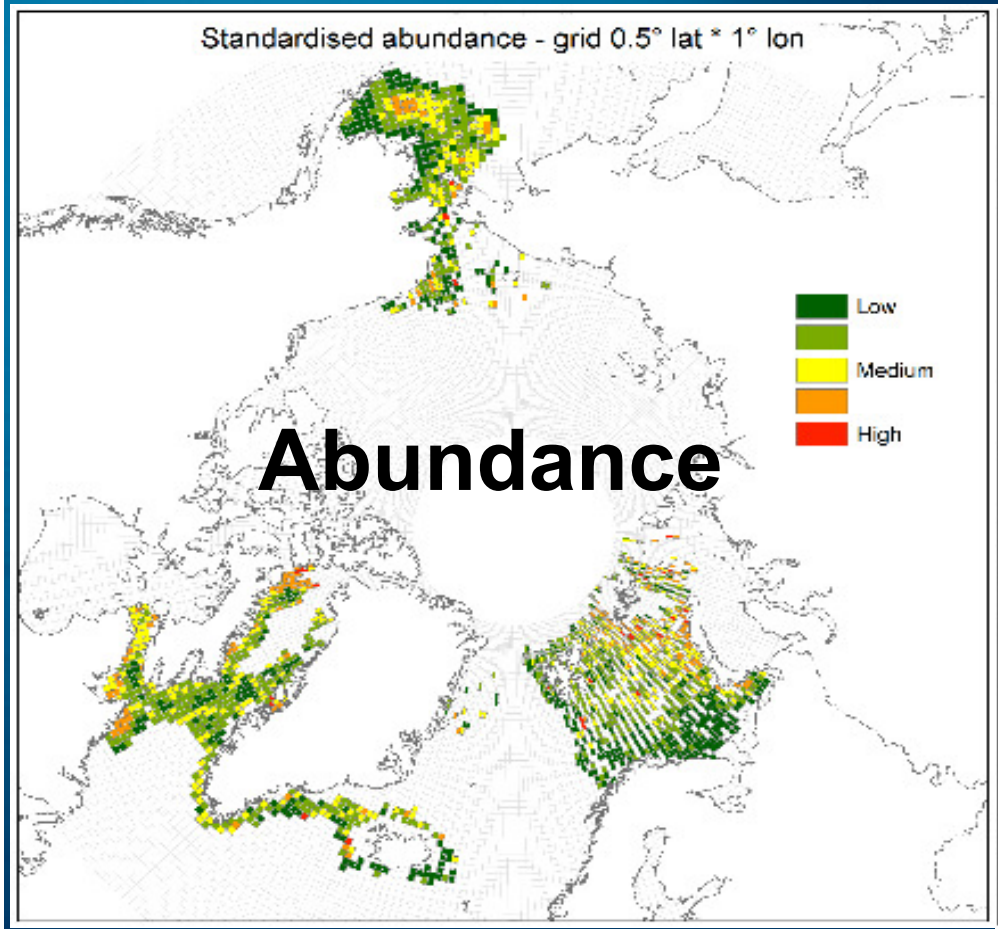


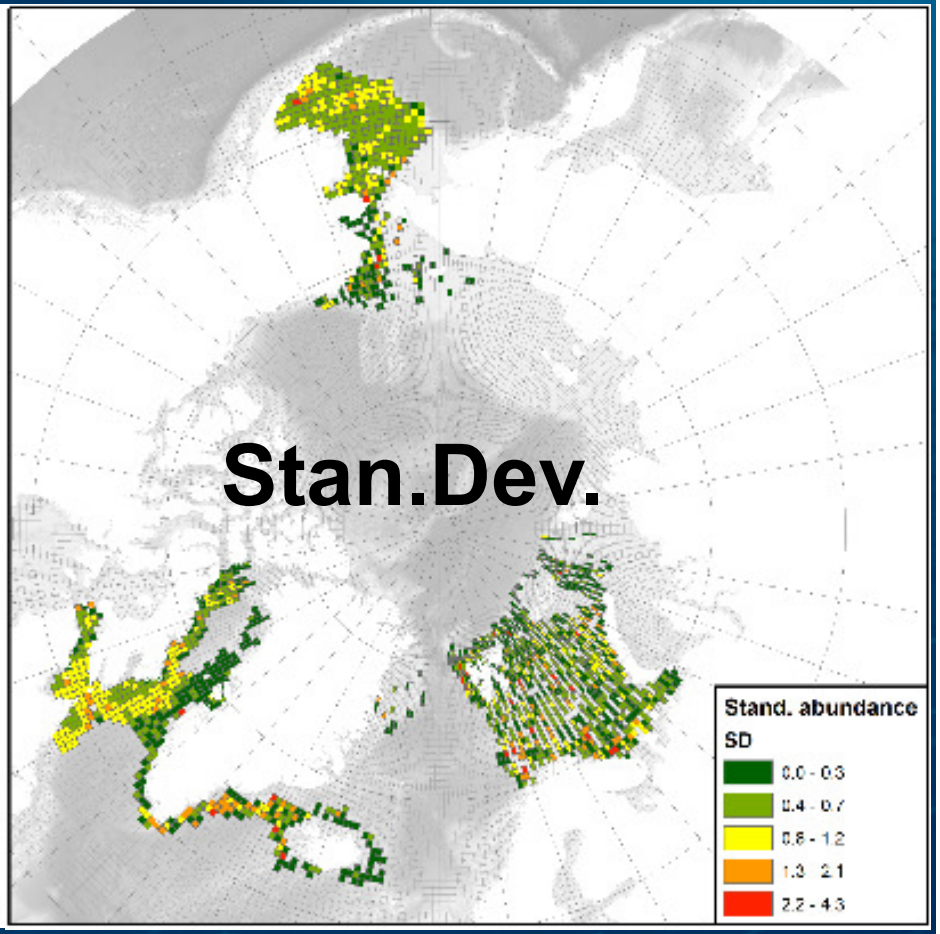
Biomass - standardized





Mean species richness, biomass and abundance per grid cell of standardized megafauna data.





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SAMBR - *Environmental and anthropogenic drivers of change of the benthic ecosystem*

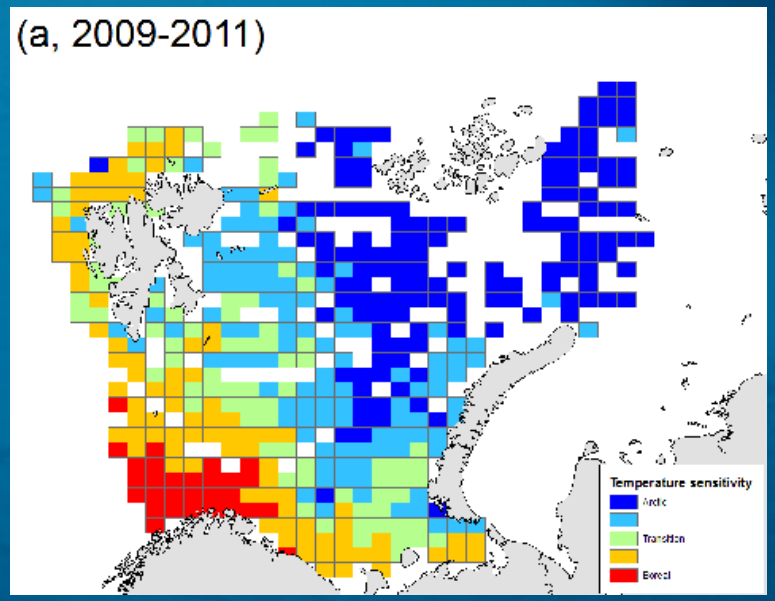
Arctic Region Sub-Region	Sea-ice Dynamics	River or Glacier Influence	Bottom Water Temperature Change	Ocean Acidification	Commercial Bottom Trawling	Risk of Introduction of NIS	Cumulative Score
Atlantic Arctic	0	1	1	0.5	1	1	4.5
Greenland (northeast)	1	1	na	na	0	na	2
Greenland (southeast)	1	1	na	na	1	na	3
Iceland (north)	0	1	1	1	1	na	4
Iceland (south)	0	1	1	0	1	na	3
Faroe Islands (shallow)	0	0	1	na	1	1	3
Faroe Islands (deep)	0	0	0	na	1	1	2
Norwegian Shelf (northwest)	0	0	1	na	1	na	2
Barents Sea (northwest)	1	1	1	na	1	1	5
Barents Sea (southwest)	0	0	1	na	1	1	3
Barents Sea (northeast)	1	0	1	na	0	1	3
Barents Sea (southeast)	1	1	1	na	1	1	5
Kara-Laptev	1	1	1	na	0	na	3
Kara Sea	1	1	1	na	0	na	3
Laptev Sea	1	1	na	na	0	na	2
Pacific Arctic	1	0	1	1	0	1	4
East Siberian Sea	1	0	1	na	0	na	2
Chukchi Sea (Russia)	1	0	1	na	0	1	3
Chukchi Sea (USA)	1	0	1	1	0	1	4
Northern Bering Sea	1	1	1	1	1	1	6
Beaufort Sea	1	1	na	1	0	na	3
Beaufort Sea (USA)	1	1	na	1	0	na	3
Beaufort Sea (Canada)	1	1	na	na	0	na	2
Canadian Arctic Archipelago	1	0	na	na	0	0	1
Hudson Bay Complex	1	1	na	na	1	1	4
Davis-Baffin	1	1	na	na	1	1	4
Canada (west)	1	1	na	na	1	1	4
Greenland (northwest)	1	1	na	na	1	na	3
Greenland (southwest)	0	1	na	na	1	na	2

Next step

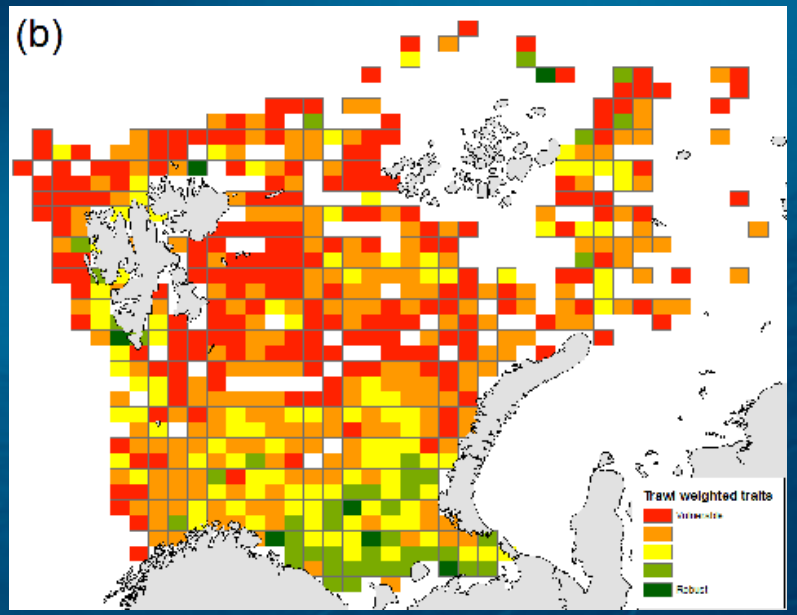
Anthropogenic stressors

Using species trait analyses to identify where we find vulnerable areas

Example from the Barents Sea



Mean "*species temperature sensitivity*"



Mean "*species trawl-impact sensitivity*"

Jørgensen LL, Primicerio R, Ingvaldsen RB, Fossheim M, Strelkova N, Thangstad TH, Manushin I, Zakharov D (accepted 28 Aug 2018) Impact of multiple stressors on sea bed fauna in a warming Arctic. Marine Ecology Progress Series.

How do include benthos in scientific long term monitoring

-Educate field benthos taxonomists
-Develop multi-task surveys
-Develop a post-cruise systems for fast and easy data-availability
-Develop methods to show status and trends
-Bring relevant scientific information to management and stakeholders

Thanks to:

Renovation species

O2-healtcare species

Organic enrichment species

3D structuring species for nursery and feeding,

The species that is food for humans and animals