Maritime Spatial Planning Forum

Global Meets Regional

Session «Marine Green Infrastructure and Its Role in MSP and Climate Refugia»

Introduction

Anda Ruskule

Ministry of Environmental Protection and Regional Development, Latvia

20 November, 2019, Riga

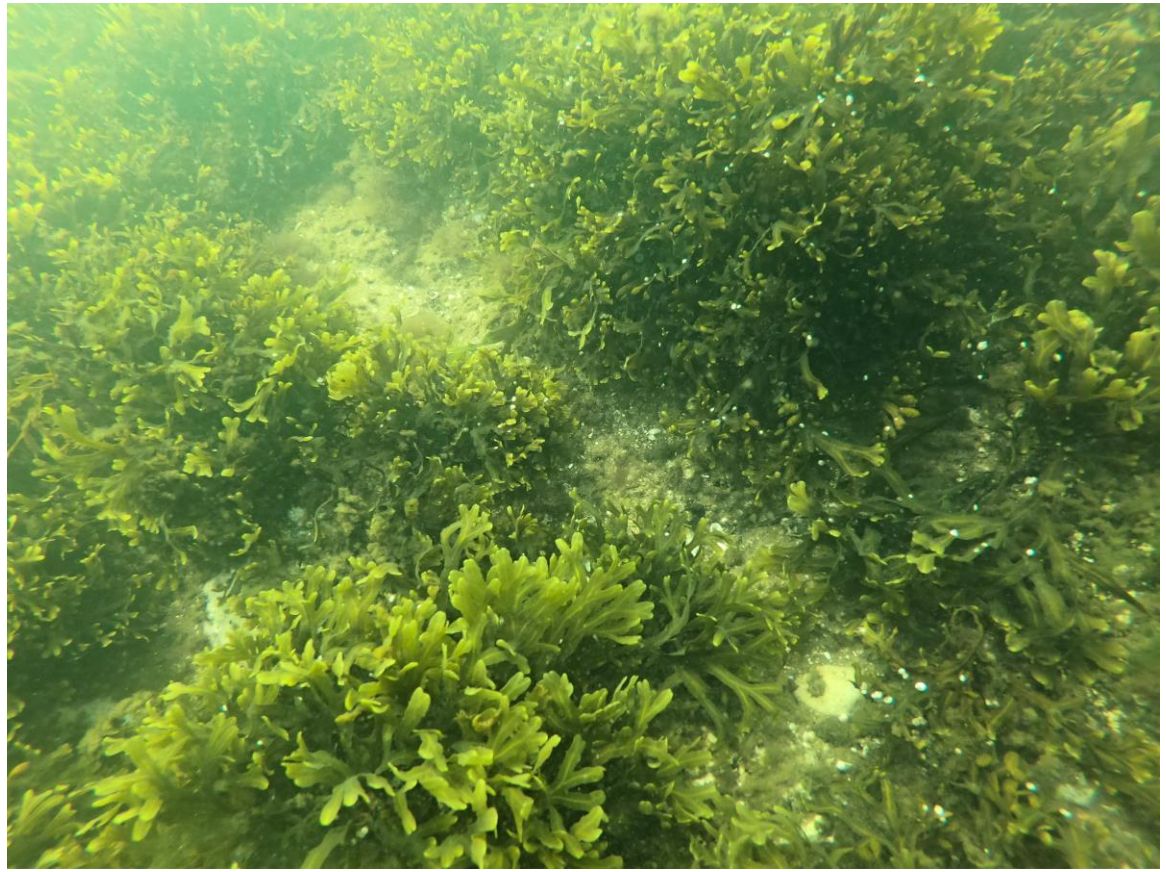
Co-funded by the European Maritime and Fisheries Fund of the European Union

Background

- The **EU Biodiversity Strategy's target 2 requires** that "by 2020, ecosystems and their services are maintained and enhanced by establishing green infrastructure and restoring at least 15% of degraded ecosystems."
- EU-wide strategy promoting investments in green infrastructure, adopted by EC in 2013, defines GI as

> "**Strategically planned network** of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of **ecosystem services**. It incorporates green spaces (or blue if aquatic ecosystems are concerned) and other physical features in terrestrial (including coastal) and **marine areas**."

What is marine GI infrastructure?



- already designated network of marine protected areas (MPAs)?
- ecologically or biologically significant marine areas (EBSAs)?
- benthic habitats of high conservation value and/or core habitats for species ?
- areas important for ecosystem service supply?

Aims of the session

- To introduce to the Pan Baltic Scope approach to mapping of marine GI – Anda Ruskule & Didzis Ustups
- To look at other examples of marine GI mapping and application cases/possibilities – Solvita Strāķe, Jan Schmidtbauer Crona, Oscar Thörnqvist
- To discuss the opportunities and current limitations for applying the GI concept in MSP
- To formulate recommendations and key actions to support application of the GI concept in MSP

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Thank you!

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Should we call it ‘green’ or ‘blue’ infrastructure?



Panel discussion:
role of green infrastructure concept in MSP

Panel discussion

Panel:

- **Cristina Cervera Núñez**, Intergovernmental Oceanographic Commission of UNESCO
- **Janica Borg**, WWF European Policy Office
- **Lena Bergström**, HELCOM/Pan Baltic Scope project
- **Magdalena Matczak**, Maritime Institute of Maritime University in Gdynia
- **Pierpaolo Campostrini**, Consortium for Managing Scientific Research on Venice Lagoon System
- **Juris Aigars**, Latvian Institute of Aquatic Ecology

Panel discussion

- What is marine GI concept good for and shall marine GI mapping become a common practice in MSP?
- What are current limitations/obstacles/reasons for not mapping marine GI?
- What actions can be taken and national and international level to support integration of the GI concept in MSP?

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Pan Baltic Scope approach to Green Infrastructure mapping

Anda Ruskule & Didzis Ustups, MoEPRD

Lena Bergström, Jan Schmidtbauer Crona, Jonne Kotta, Philipp Arndt, Solvita Strāķe, Sandra Sprukta, Ingūna Urtāne

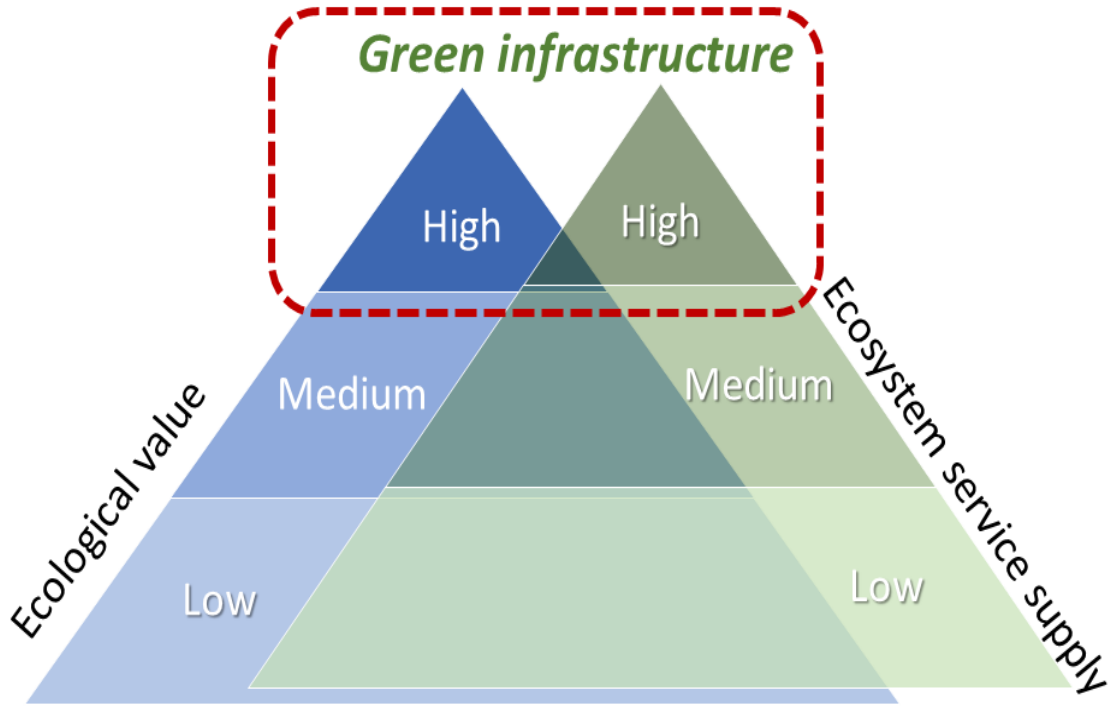
20 November, 2019, Riga

Co-funded by the European Maritime and Fisheries Fund of the European Union

Pan Baltic Scope definition of marine GI

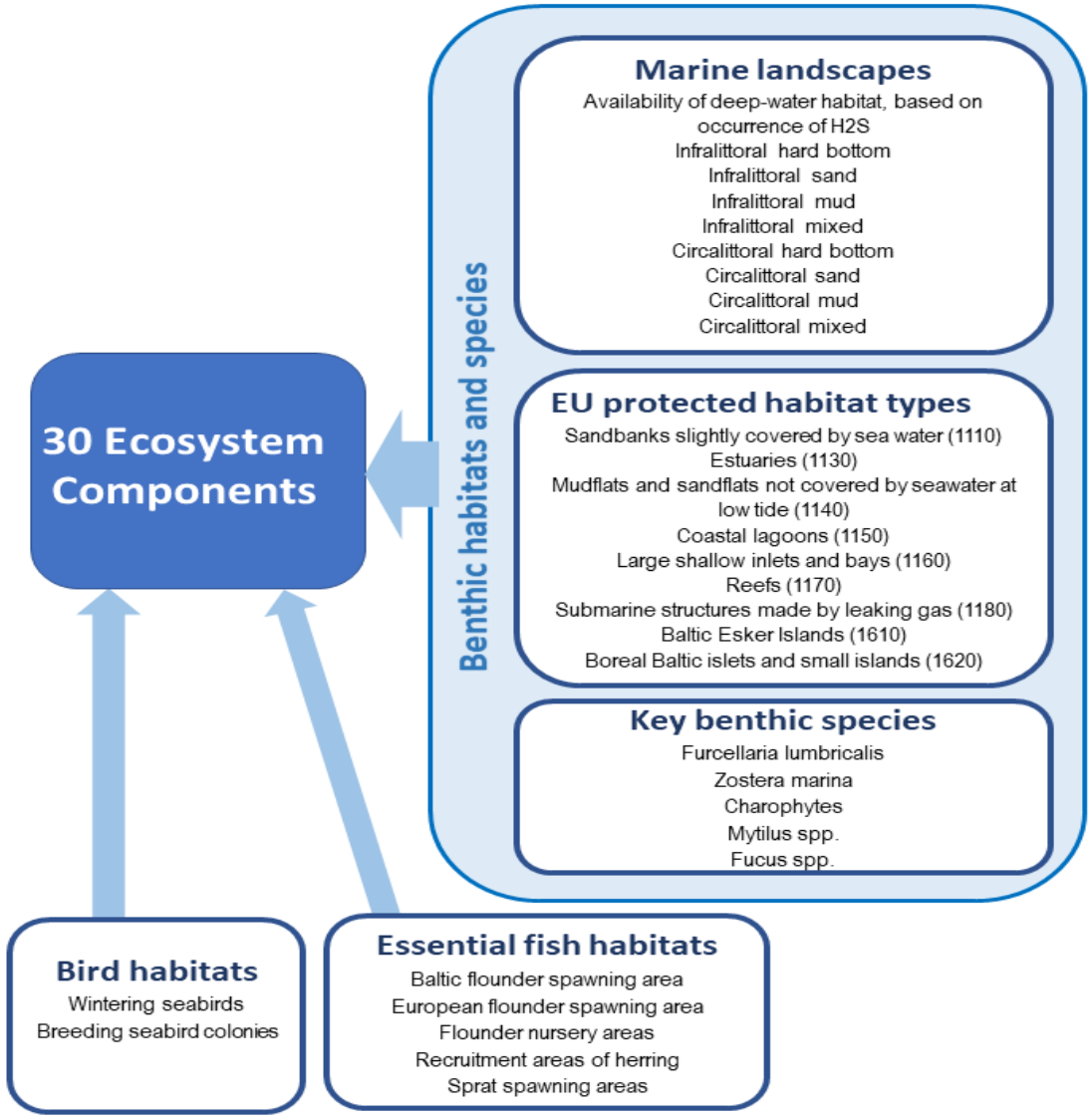
- **Obcective of the «Green Infrastructure» activity**
  - To outline a concept of marine “green infrastructure”
  - To test the concept by utilizing available data

- **Pan Baltic Scope definitions**: Marine GI is formed by a spatial network of ecologically valuable areas significant for:
  - ecosystems’ health and resilience,
  - biodiversity conservation and,
  - multiple delivery of ES essential for human well-being.



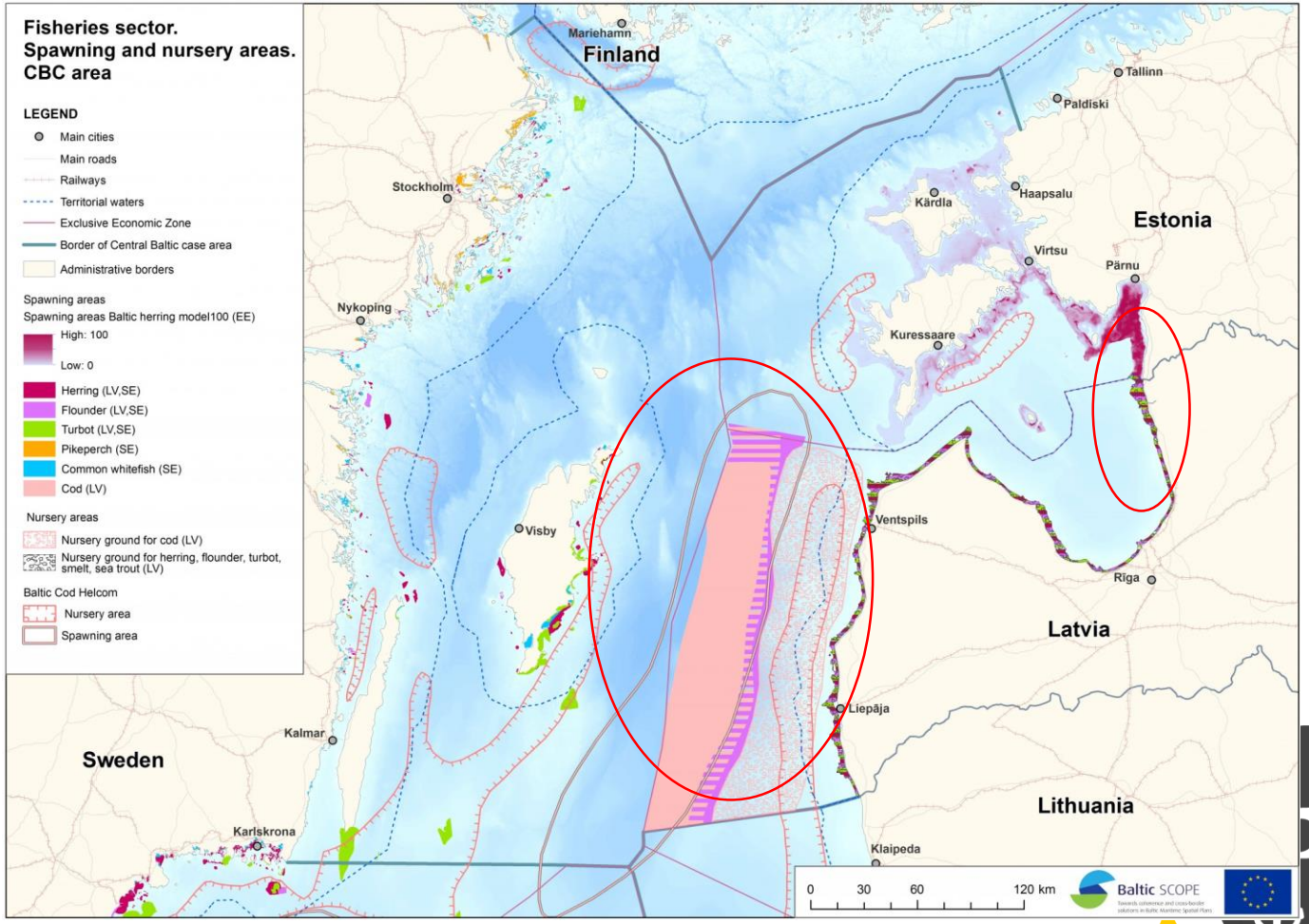
Step1: Identification of the components forming marine GI

Mapping based on available data sets:
HELCOM Maps and Data services, prepared in the HELCOM HOLAS II project



Step 2: Mapping essential fish habitats

- Starting point:
- BalticScope results
- Common stocks- different mapping approaches
- Outdated or/and regional maps



Balticscope recomendations:

Jointly identify essential fish habitat, including spawning, nursery and growth areas, for the whole Baltic Sea for species of interest to fisheries

Jointly for the whole Baltic Sea

Baltic Marine Environment Protection Commission

Regional expert workshop on essential fish habitats, organized by Pan Baltic Scope project and HELCOM
Riga, Latvia, 12-13 December 2018

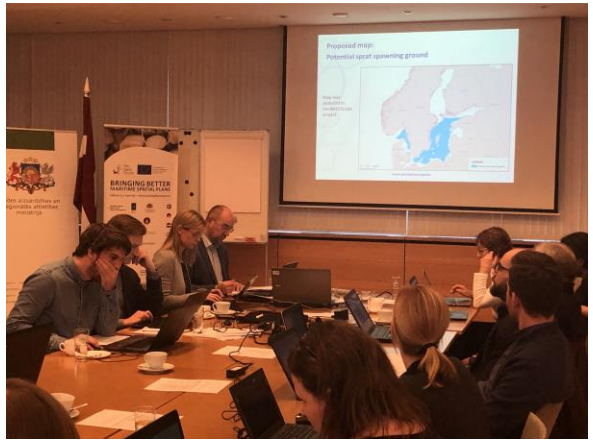
Pan Baltic Scope

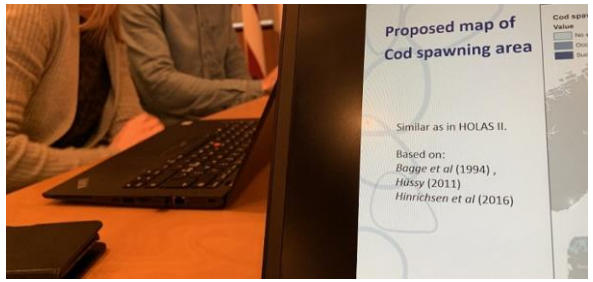
Co-funded by the European Maritime and Fisheries Fund of the European Union

Essential Fish Habitats (and Marine Spatial Planning)

HELCOM Pan Baltic Scope EFH WS 2018

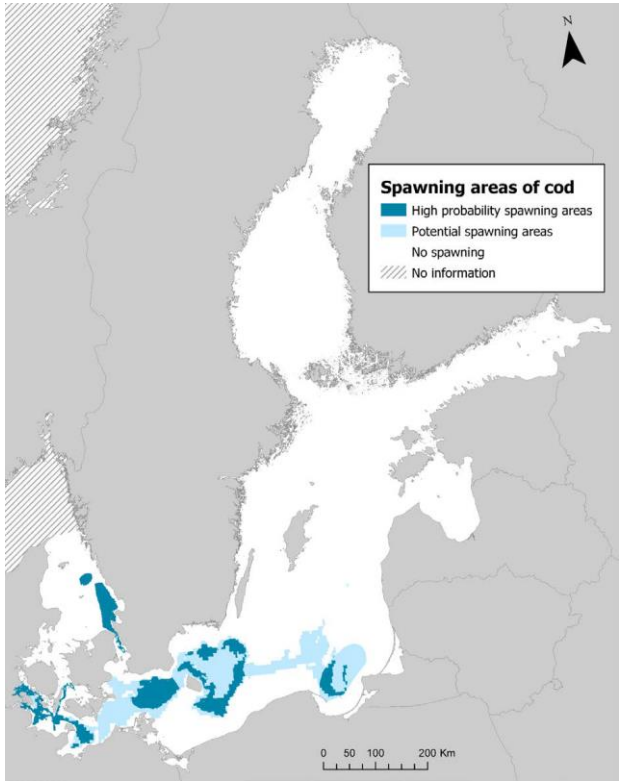
Didzis Ustups, Lena Bergstrom, Henri Jokinen

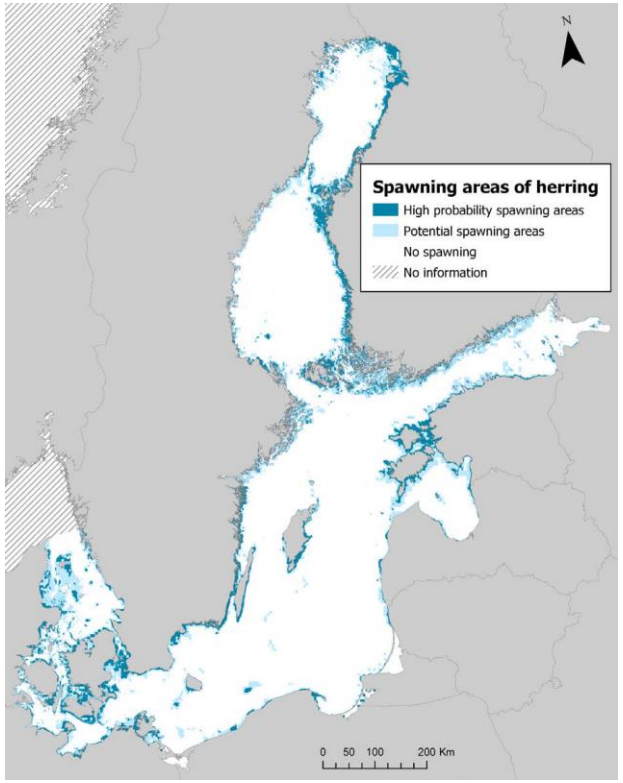


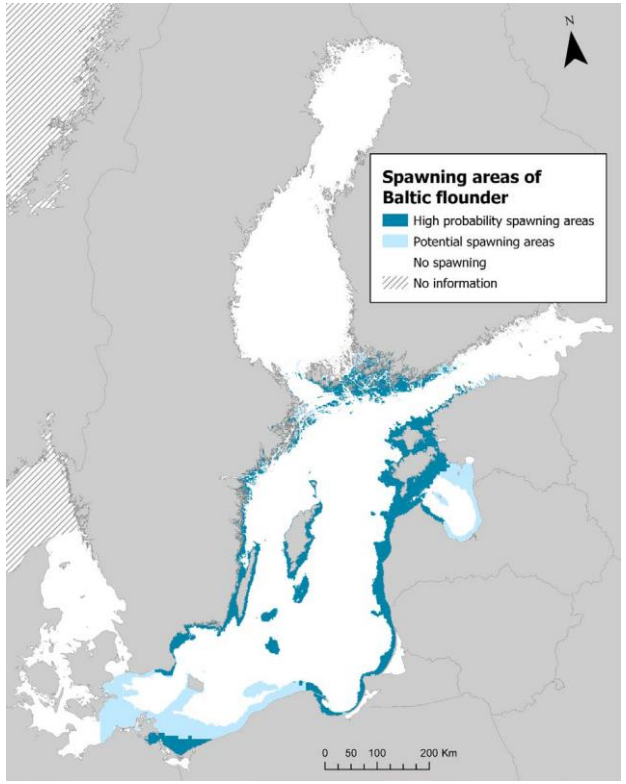


Essential fish habitat maps

- Cod
- Herring
- Baltic flounder







Important areas for spawning or recruitment

- **Map aggregated from data on:**
- Spawning areas of
  - ✓ Cod
  - ✓ herring
  - ✓ sprat
- Spawning and recruitment areas of
  - ✓ European flounder
  - ✓ Baltic flounder
- Recruitment areas of
  - ✓ perch
  - ✓ pikeperch

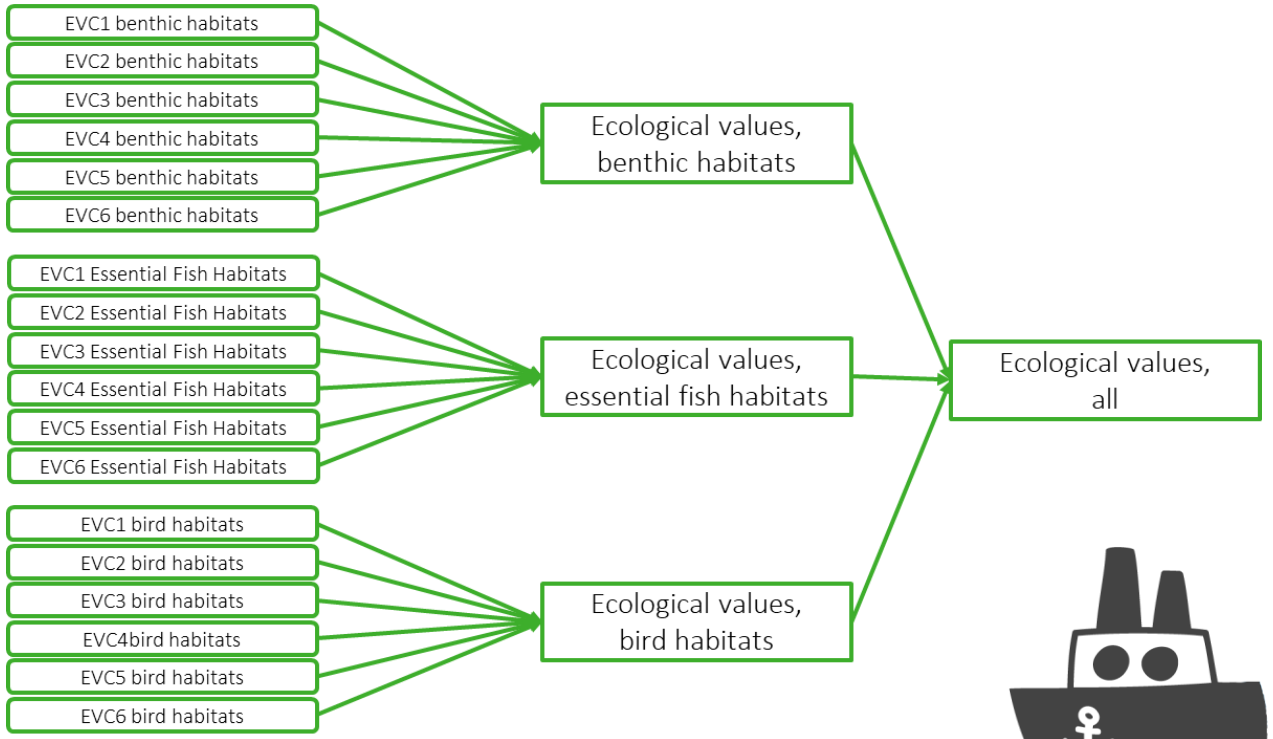
Step 3: Mapping areas of high ecological value

- **Matrix assessment (0 or 1): Ecosystem components in relation to 7 ecological value criteria:**

biological diversity; rarity; importance for threatened, endangered or declining species and/or habitats; vulnerability, fragility, sensitivity, or slow recovery; special importance for life-history stages of species; biological productivity

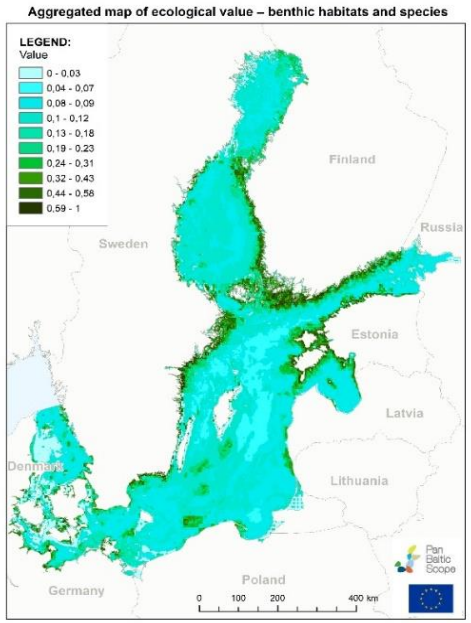
- **Hierarchical data aggregation method in GIS:**

HELCOM BSII Ecological Diversity Components	Biodiversity	Rarity	Importance for threatened, endangered or declining species and/or habitats	Vulnerability, fragility, sensitivity or slow recovery	Special importance for life-history stages of species	Biological productivity
Availability of deep water habitat, based on occurrence of H2S	0	1	0	0	0	0
Infralittoral hard bottom	0	1	0	0	0	0
Infralittoral sand	0	1	0	0	0	0
Infralittoral mud	0	1	0	0	0	0
Infralittoral mixed	0	1	0	0	0	0
Circalittoral hard bottom	1	1	1	1	1	1
Circalittoral sand	0	1	1	1	1	1
Circalittoral mud	0	1	1	1	1	1
Circalittoral mixed	1	1	1	1	1	1
Sandbanks which are slightly covered by sea water at all time (1110)	1	1	1	1	1	1
Estuaries (1130)	1	1	1	0	1	1
Mudflats and sandflats not covered by seawater at low tide (1140)	0	1	0	0	0	0
Coastal lagoons (1150)	1	1	1	0	1	1
Large shallow inlets and bays (1160)	1	1	1	1	1	1
Reefs (1170)	1	1	1	1	1	1
Submarine structures made by leaking gas (1180)	1	1	1	1	1	1
Baltic Esker Islands (UW parts, 1610)	1	1	1	1	1	1
Boreal Baltic islets and small islands (UW parts, 1620)	1	1	1	1	1	1
Furcellaria lumbricalis	1	1	1	1	1	1
Zostera marina	1	1	1	1	1	1
Charophytes	1	1	1	1	1	1
Mytilus sp.	1	1	1	1	1	1
Fucus sp.	1	1	1	1	1	1
Productive surface waters	1	1	1	0	1	1
Cod abundance	0	0	1	0	0	1
Cod spawning area	1	1	1	1	1	1
Herring abundance	0	0	0	0	0	1
Sprat abundance	0	0	0	0	0	1
Recruitment areas of perch	1	1	1	1	1	1
Recruitment areas of pikeperch	0	1	1	1	1	1
Wintering seabirds	1	1	1	1	1	0
Breeding seabird colonies	1	1	1	1	1	0
Grey seal distribution	0	0	0	0	0	0
Harbour seal distribution	0	0	0	0	0	0
Ringed seal distribution	1	1	1	1	0	0
Distribution of harbour porpoise	1	1	1	1	0	0

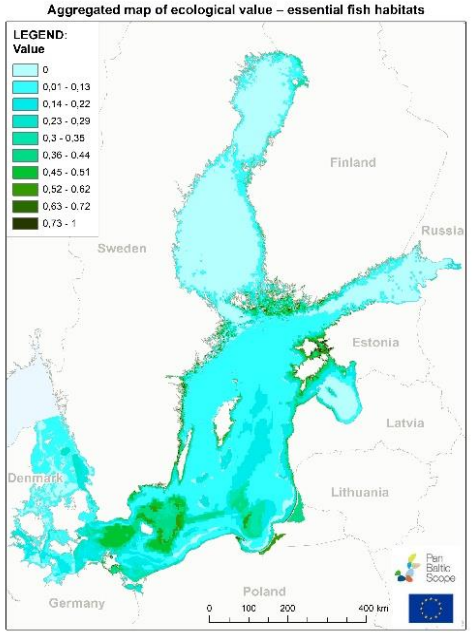


Aggregated EV maps

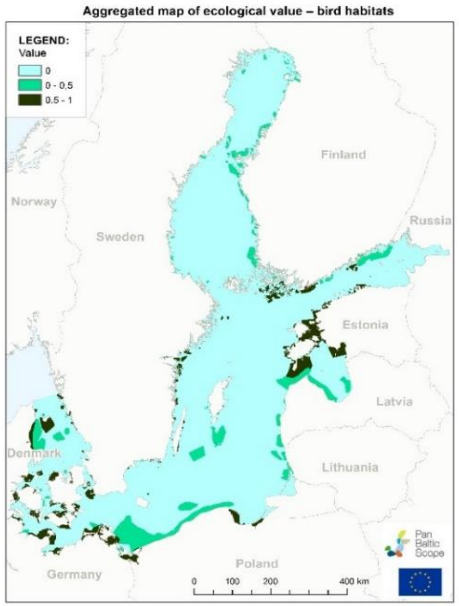
EV - Benthic



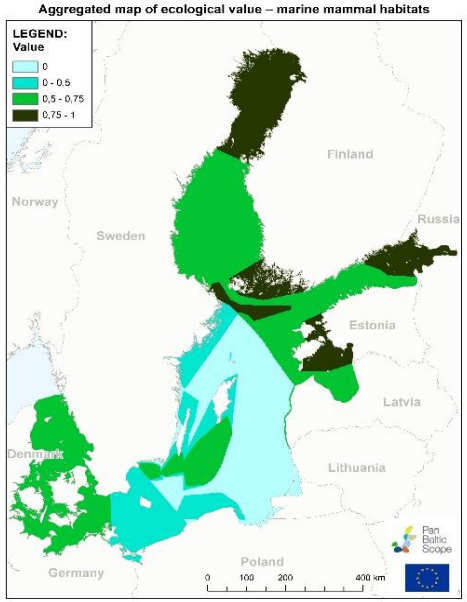
EV - Fish

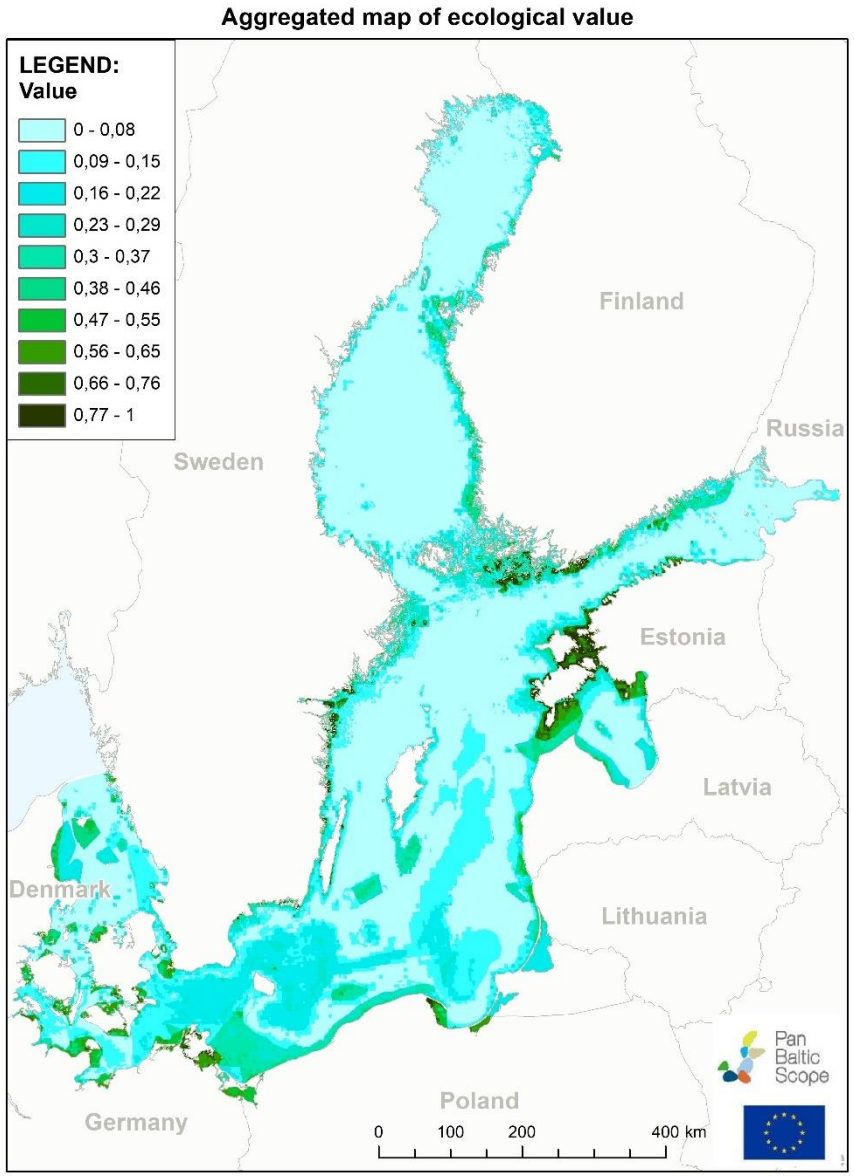


EV - Birds



EV - mammals





Step 3: Mapping of the areas of ecosystem service (ES) supply potential

- **Matrix assessment: Ecosystem components in relation to 10 ecosystem services:**
  1) filtration of nutrients; 2) storage of nutrients; 3) storage of hazardous substances;
  4) erosion control; 5) nursery habitats; 6) pest control;
  7) climate control by biological fixation photosynthesis & 8) by sequestration in sediments;
  9) recreation through active a& 10) passive interactions
- **Hierarchical data aggregation method in GIS:**

HELCOM BSII Ecological Diversity Components	Filtration/sequestration/storage/accumulation by micro-organisms, algae, plants, and animals			Control of erosion rates	Maintaining nursery populations and habitats	Pest control (including invasive species)	Regulation of chemical composition of atmosphere and oceans (atmospheric CO^2 and other greenhouse gases):		Characteristics of living systems that that enable activities promoting health, recuperation or enjoyment	
	filtration of nutrients	storage of nutrients	storage of hazardous substances				by biological fixation in process of photosynthesis	by sequestration in sediments	through active or immersive interactions	through passive or observational interactions
Availability of deep water habitat, based on occurrence of H2S	0	1	1	0	0	0	0	1	0	0
Infralittoral hard bottom	1	1	1	1	1	0	1	0	1	1
Infralittoral sand	0	1	1	0	1	0	1	0	1	1
Infralittoral mud	0	1	1	0	1	0	1	1	0	0
Infralittoral mixed	1	1	1	1	1	0	1	0	0	0
Circalittoral hard bottom	1	1	1	0	0	0	0	0	0	0
Circalittoral sand	0	1	1	0	0	0	0	0	0	0
Circalittoral mud	0	1	1	0	0	0	0	1	0	0
Circalittoral mixed	0	1	1	0	0	0	0	0	0	0
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Reefs (1170)	1	1	1	1	1	0	1	0	1	1
Submarine structures made by leaking gas (1180)	0	1	1	0	0	0	0	0	0	0
Baltic Esker Islands (UW parts, 1610)	1	1	1	1	1	0	1	1	1	1
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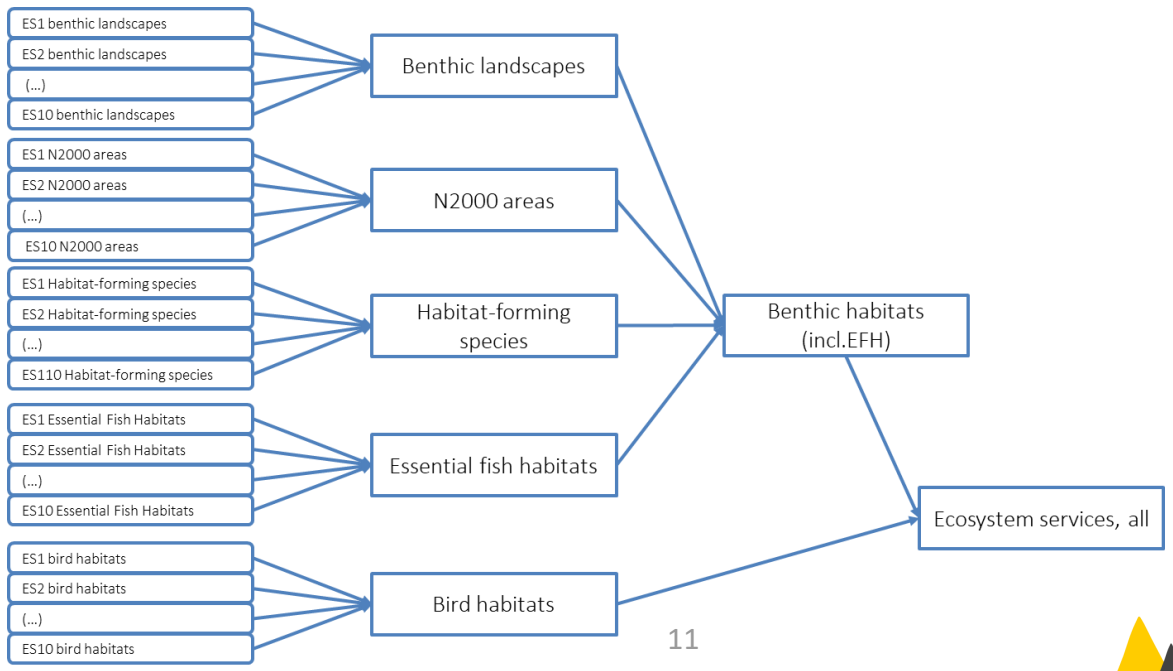
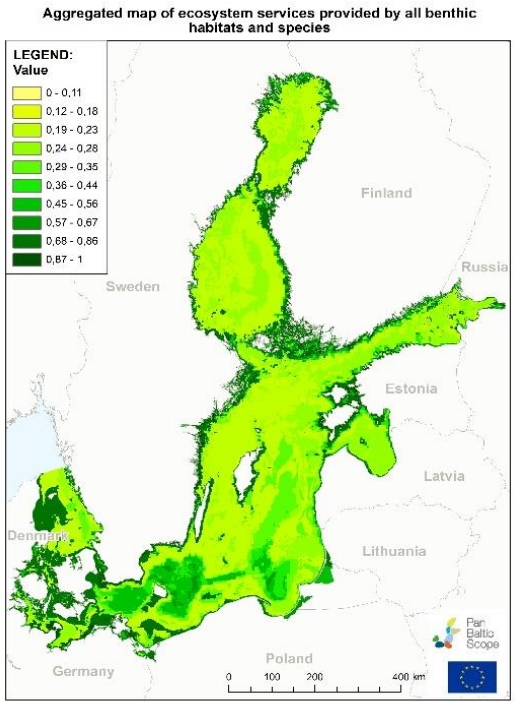
Furcellaria lumbricalis	0	1	1	0	1	0	1	0	1	1
Zostera marina	0	1	1	1	1	0	1	1	1	1
Charophytes	0	1	1	0	1	0	1	1	1	1
Mytilus sp.	1	1	1	0	1	0	0	0	1	1
Fucus sp.	0	1	1	0	1	0	1	0	1	1
Productive surface waters	1	0	0	0	1	0	1	0	1	1
Cod abundance	0	1	1	0	0	1	0	0	1	0
Cod spawning area	0	1	1	0	1	1	0	0	0	0
Herring abundance	0	1	1	0	0	0	0	0	1	0
Sprat abundance	0	1	1	0	0	0	0	0	1	0
Recruitment areas of perch	0	1	1	0	1	1	0	0	0	0
Recruitment areas of pikeperch	0	1	1	0	1	1	0	0	0	0
Wintering seabirds	0	1	1	0	0	1	0	0	1	1
Breeding seabird colonies	0	1	1	0	0	1	0	0	1	1
Grey seal distribution	0	1	0	0	0	0	0	0	1	1
Harbour seal distribution	0	1	0	0	0	0	0	0	1	1
Ringed seal distribution	0	1	0	0	0	0	0	0	1	1
Distribution of harbour porpoise	0	0	0	0	0	0	0	0	1	1

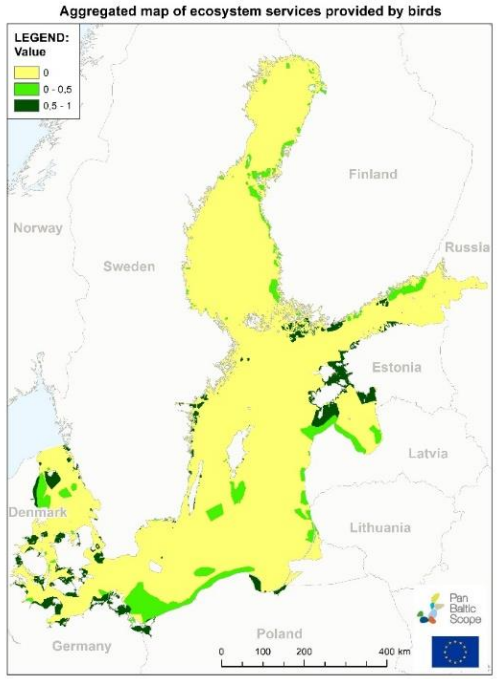


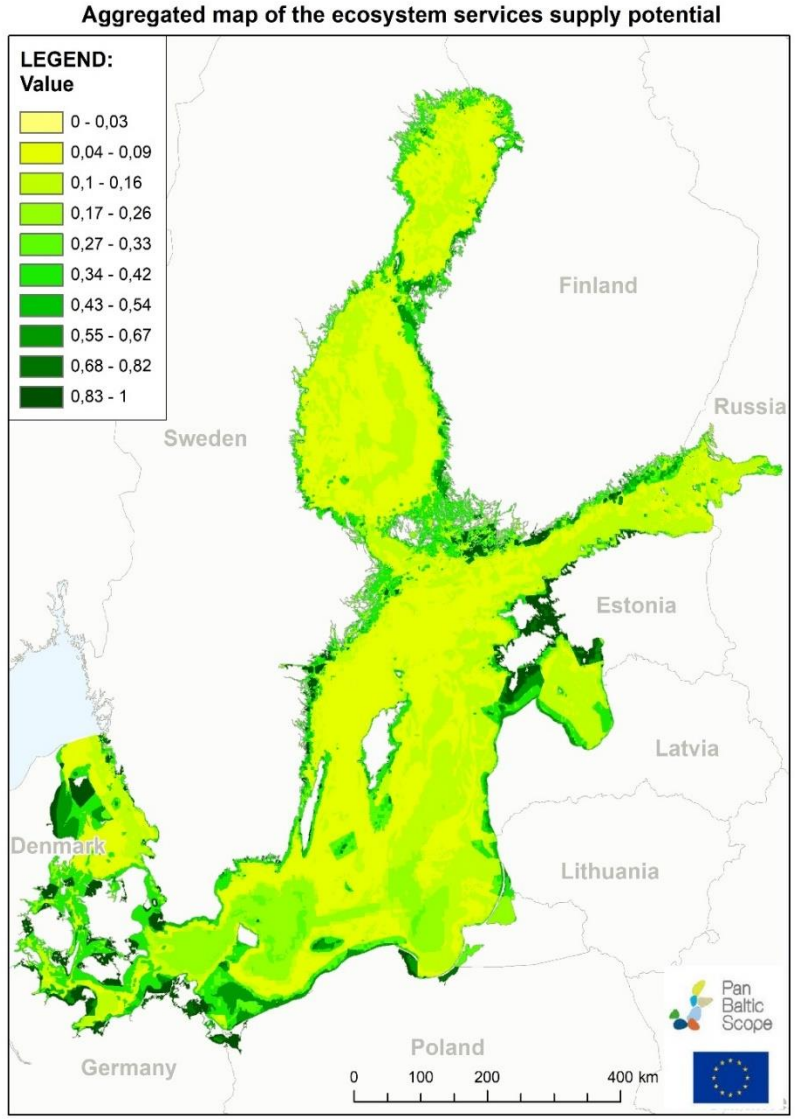
Aggregated ecosystem service maps

ES – Benthic (including ESH)



ES - Birds

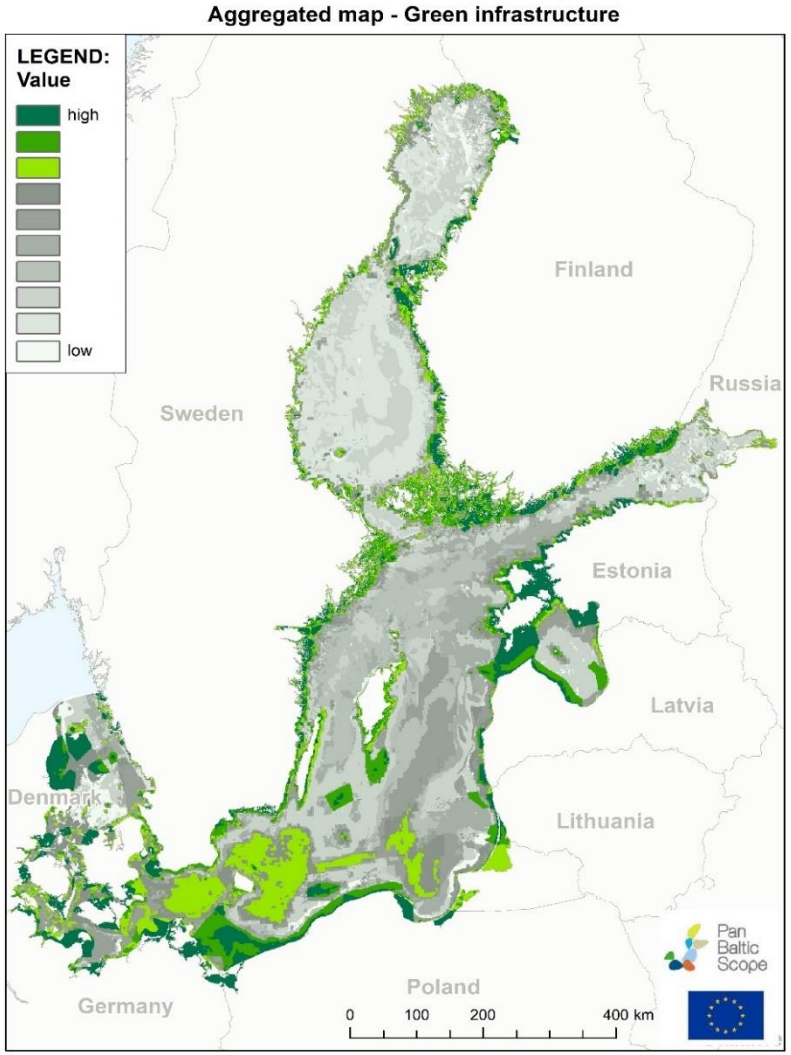




Step 4: Marine GI mapping: combining the tow

Results of testing Pan Baltic Scope approach to marine GI mapping :

- green color indicates the 30 % of the Baltic Sea area which represents the highest ecological and ecosystem service supply value (the most valuable areas in dark green, other highly valuable areas in light green).



Conclusions

- **Marine GI mapping can support implementation of the ecosystem-based approach in MSP** :
  - **To improve the knowledge base on marine ecosystem** structure, functions and service supply and thereby contribute to relational understanding of interrelation between ecological and social and economic systems
  - **To support development of the spatial solutions** by guiding away the potentially harmful development from ecologically valuable/sensitive areas
  - **To support cross-border coordination of the planning solutions in respect to ecological values** (also to improve the connectivity of the MPA network or functionally related parts of the ecosystems)
  - **To be used in SEA process to assess single and cumulative impacts on marine ecosystem**
- **The Pan Baltic Scope methodology shall be further developed:**
  - to improve input data quality
  - to include a connectivity analysis of ecologically valuable areas,
  - to apply more comprehensive approach to ES mapping considering spatial variations in biota, involve the assessment of ecosystem condition, and taking into account ES supply and demand relation.

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Thank you!

Reed more about it in the report:
"Green Infrastructure Concept for MSP and Its Application Within Pan Baltic Scope Project"
http://www.panbalticscope.eu/

Co-funded by the European Maritime and Fisheries Fund of the European Union

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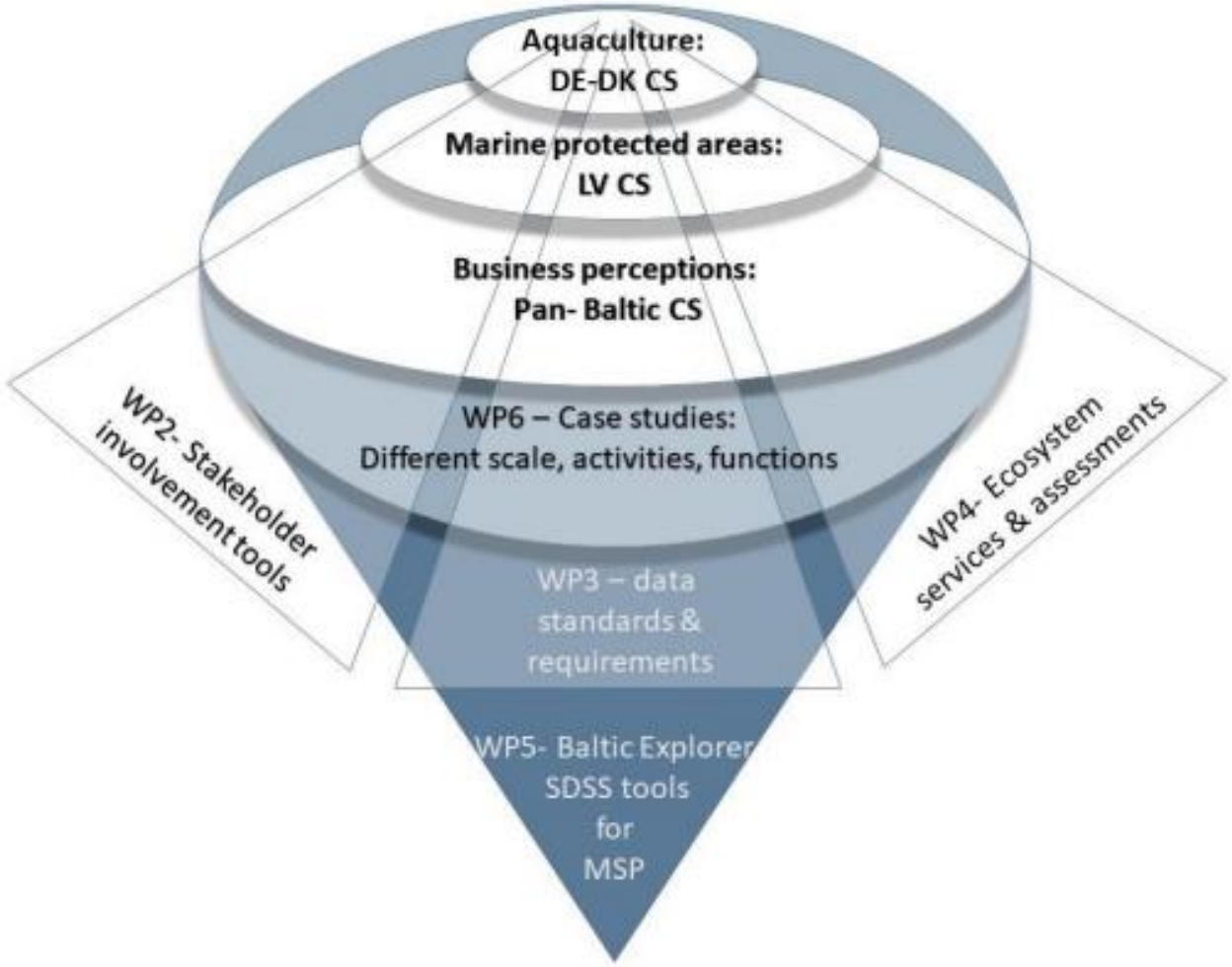
Marine GI mapping in Latvia – BONUS BASMATI case study

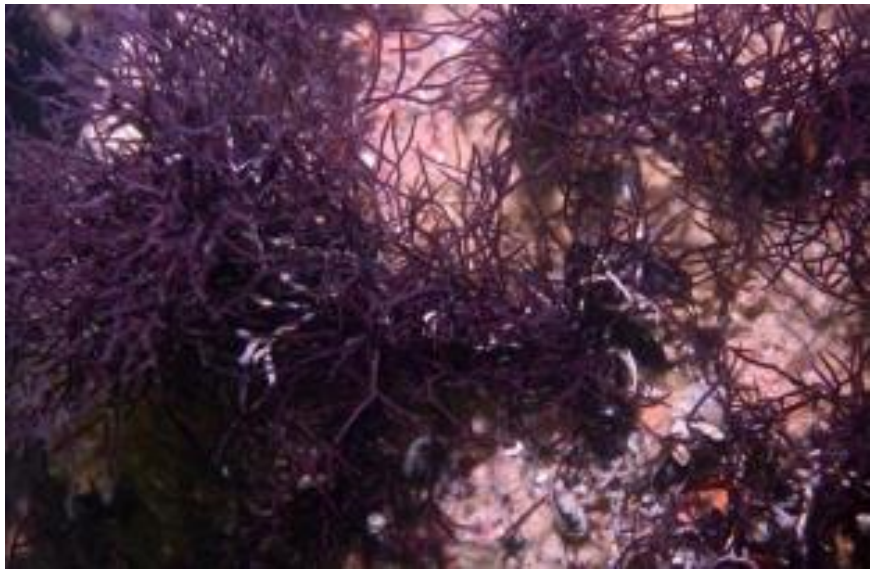
Senior scientist Solvita Strāķe

Latvian Institute of Aquatic Ecology

Co-funded by the European Maritime and Fisheries Fund of the European Union

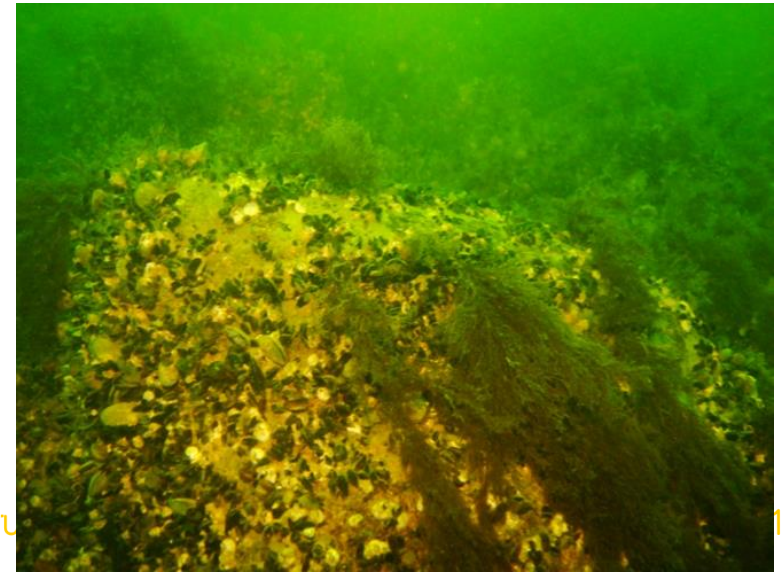
BASMATI
Baltic Sea Maritime Spatial Planning for Sustainable Ecosystem Services



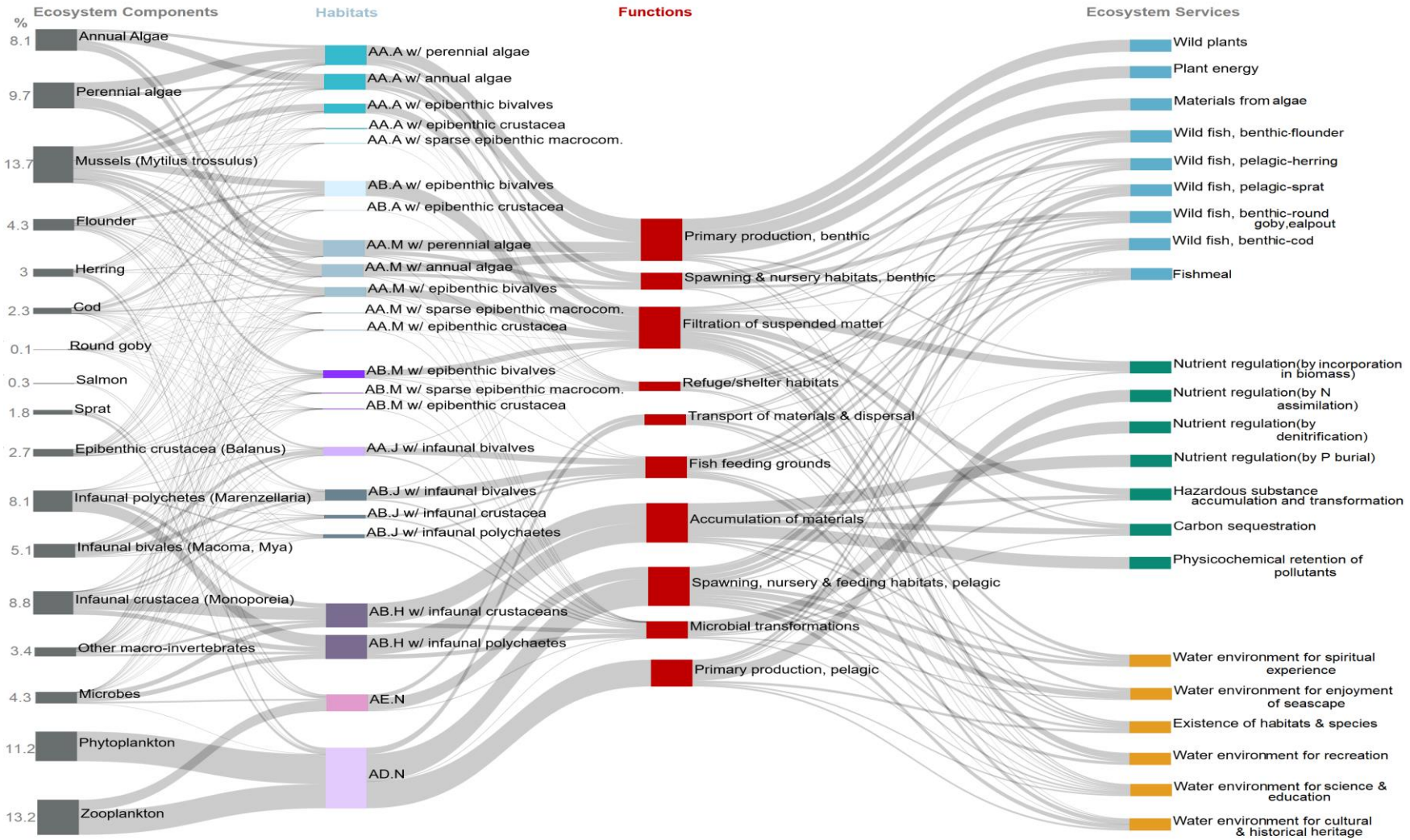


Benthic habitats

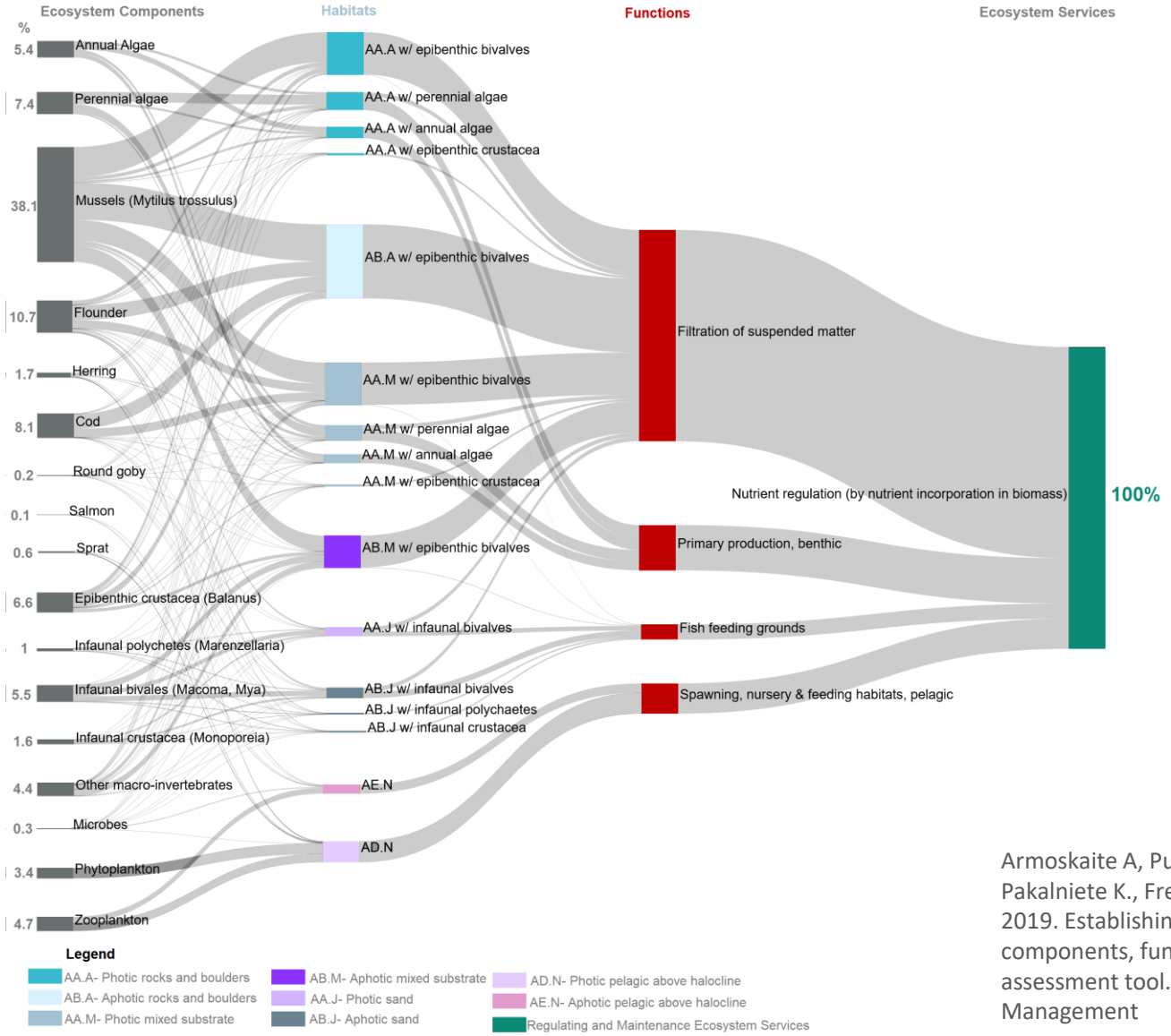
- Ecosystem component
- Ecosystem services
- Basis for MPA network
- Green Infrastructure



Multiple Ecosystem Services

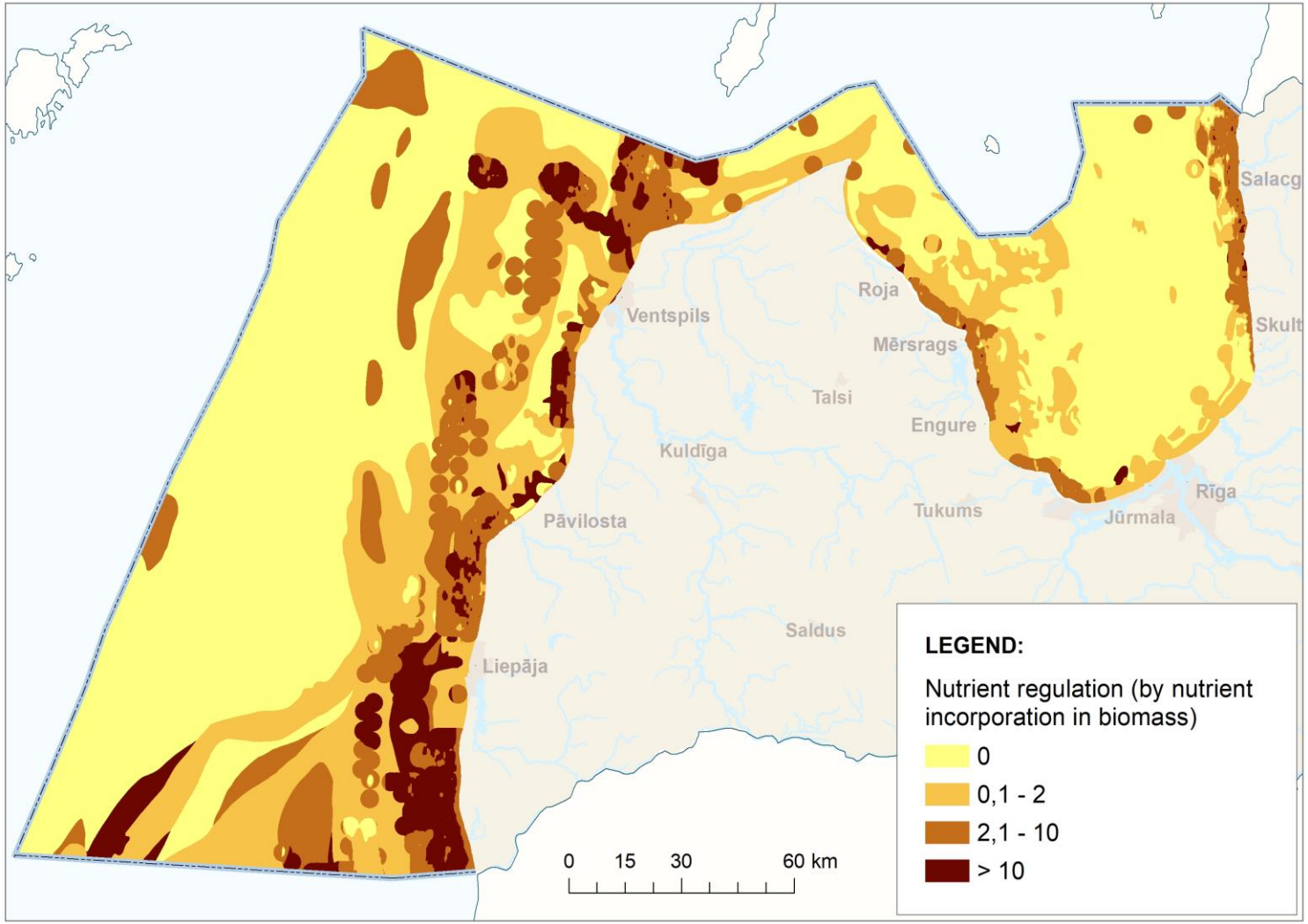


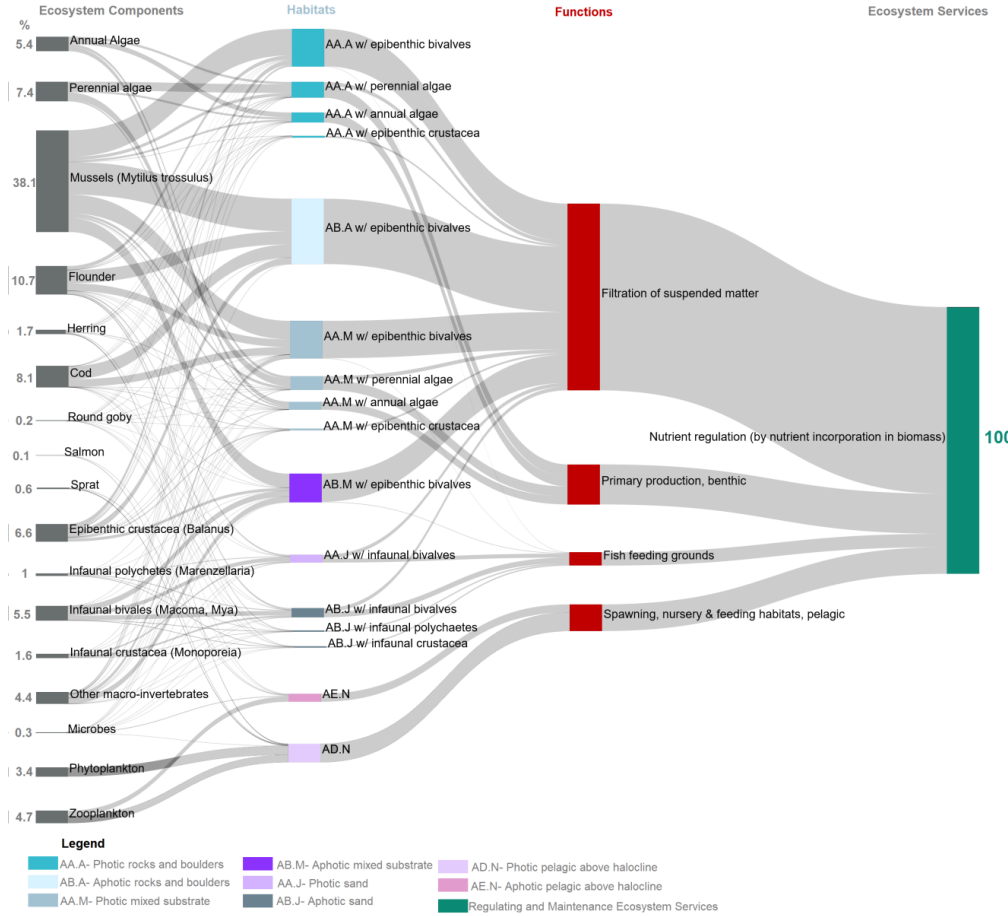
Single Ecosystem service

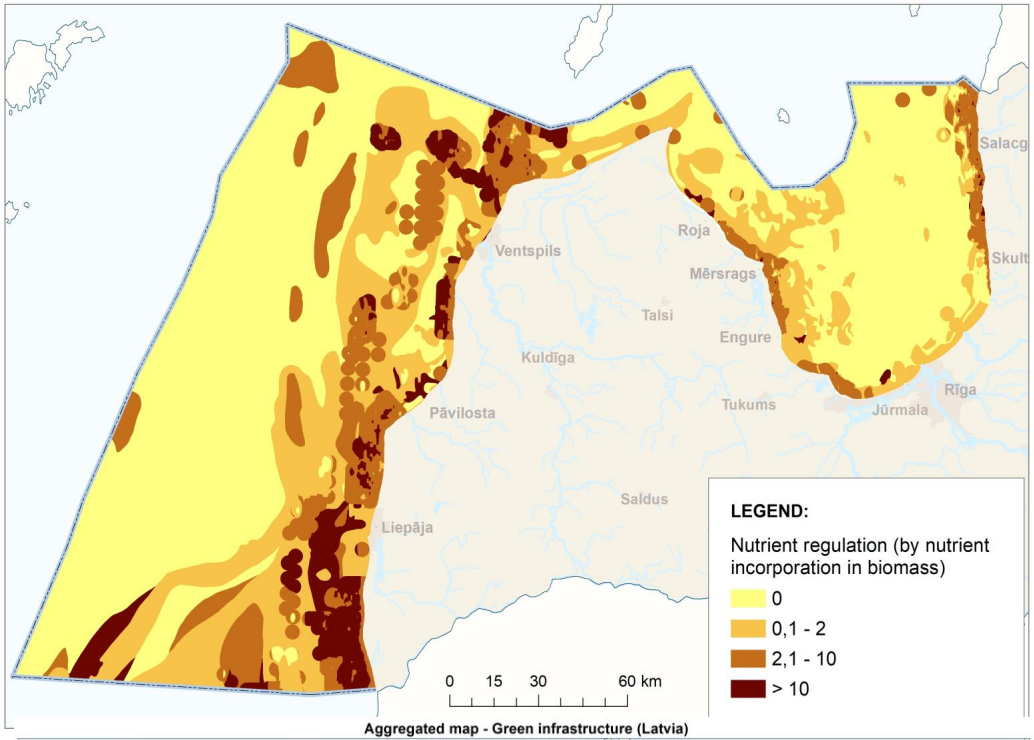


Armoskaite A, Purina I, Aigars J, Strake S, Pakalniete K., Fredriksen, P, Shroder L, Hansen H.S 2019. Establishing the links between ecosystem components, functions and services: An assessment tool. Submitted in Ocean and Coastal Management

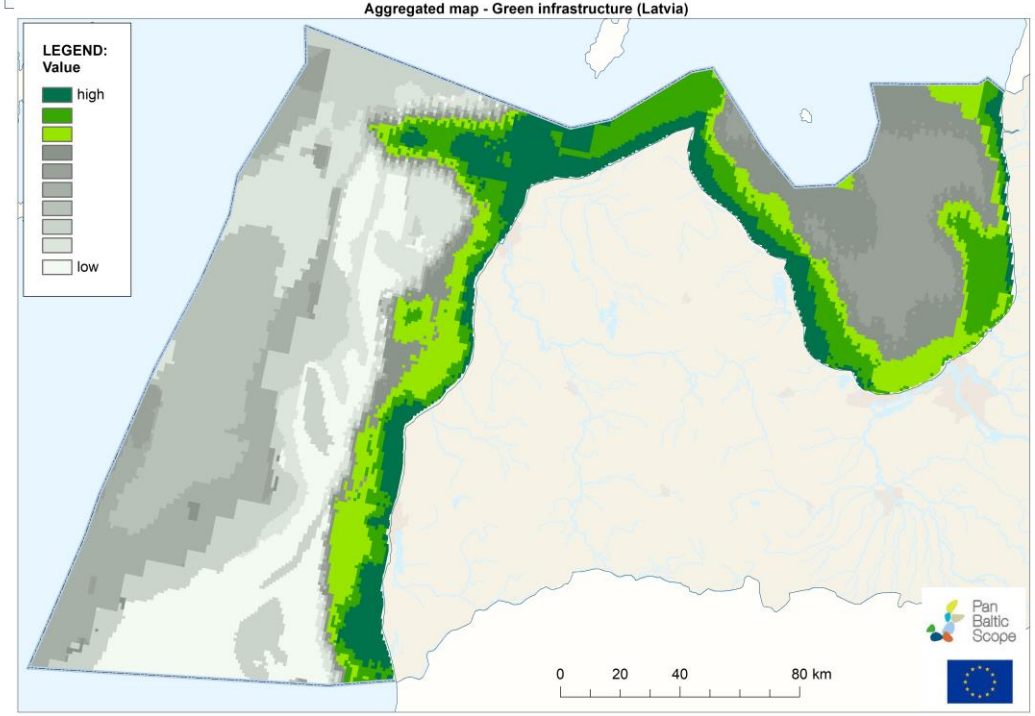
Spatial dimension







Aggregated map - Green infrastructure (Latvia)



Key messages

- The most recent data should be used for mapping of ES supply and Green Infrastructure
- The benthic habitats (mussels) are of high relative importance in the provision of ecosystem services, in MPA establishing process and Green Infrastructure mapping
- With better data coverage the Green Infrastructure map could be expanded connecting coastal zone with deeper areas

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BALTIC 3rd FORUM MSP

Thank you!

European Commission

United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

Sustainable Development Goals

VASAB VISION & STRATEGIES AROUND THE BALTIC SEA

UNIVERSITY OF LATVIA ANNO 1919

Pan Baltic Scope

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Marine GI in Swedish MSP – how to boost the MPA-system

Senior Analyst Jan Schmidtbauer Crona

Swedish Agency for Marine and Water Management

Co-funded by the European Maritime and Fisheries Fund of the European Union

Does the MPA system need boosting?

YES!

Because…

Green infrastructure

Without green infrastructure

We won't be fed

Without green infrastructure

The world would be dead

Without green infrastructure,

Ah ha without green infrastructure…

AND the marine green infrastructure won't be protected enough through the MPA-system and we won't reach our environmental objectives

But why should MSP care?

- Because MSP is a SPATIAL planning (policy) instrument.
- And we have (at least in Europe) a goal to contribute to Good Environmental Status with MSP

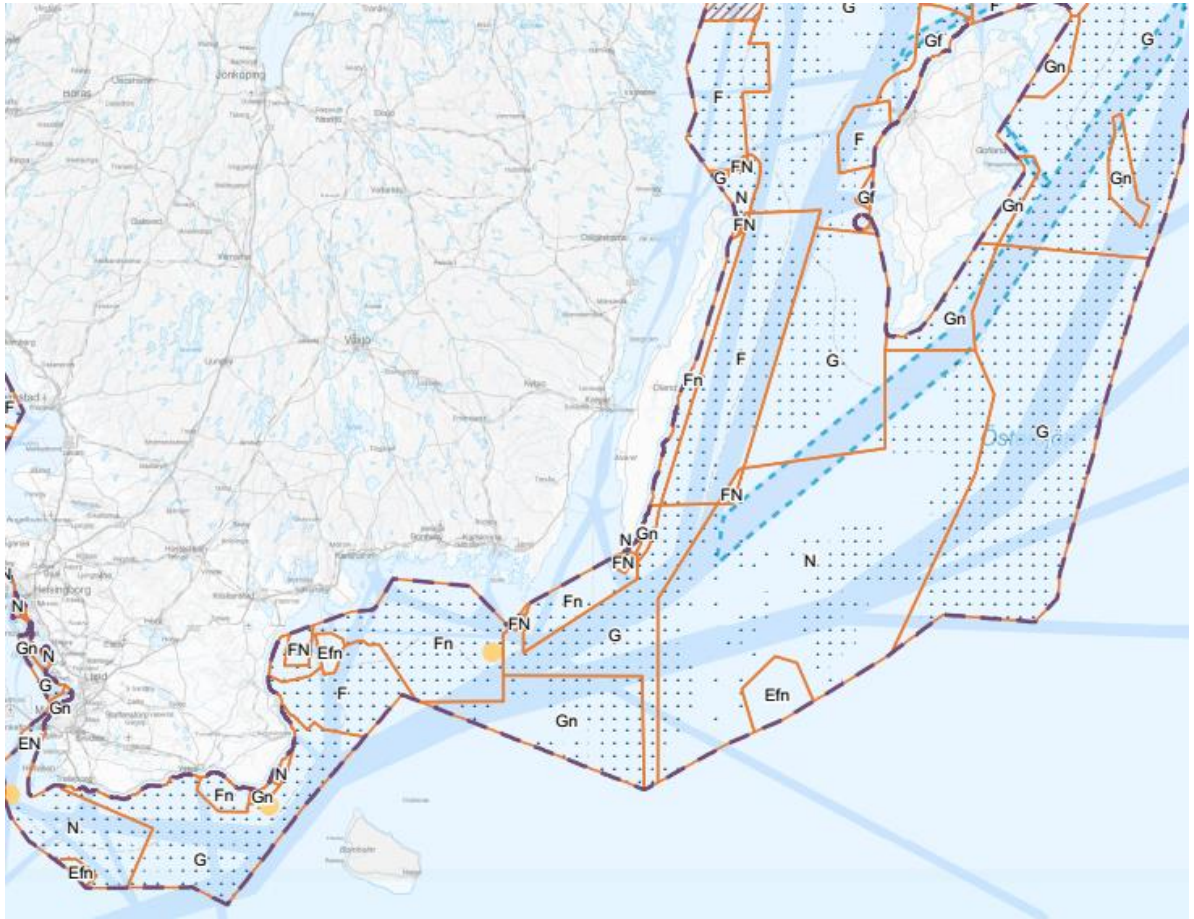
> *"The marine spatial planning contributes to coherent green structures by providing guidance on where different uses are most suitable and indicating areas were particular consideration must be taken to nature values."*
> *Traditional Swedish MSP proverb*

- MSP can identify and include OECMs *"Other Effective area based Conservation Measures"* or similar in maritime spatial plans

Nature and particular consideration to nature values in Swedish MSP, N and n

	Gulf of Bottnia	Baltic Sea	Skagerrak and Kattegat
100% (area km2) =	38 342	74 847	9 568
Nature ”N”	2 398 (6%)	15 133 (20%)	3 575 (37%)
Particular consideration of high nature values: ”n”	2 941 (8%)	9 780 (13%)	927 (10%)

Key messages



- MSP should contribute to environmental management
- MSP should identify OECM or similar and include in the plans
- Green infrastructure maps can be a basis for identification of OECMs
- Climate refuge areas for biodiversity should be part of Green infrastructure and be included in MSP

Maritime Spatial Planning Forum

Global Meets Regional

marine spatial planning forum

BALTIC 3rd FORUM MSP

Yes, Marine Green Infrastructure in MSP can boost the MPA-system!

Listen to your GES

Thank you!

European Commission

United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

Sustainable Development Goals

VASAB VISION & STRATEGIES AROUND THE BALTIC SEA

UNIVERSITY OF LATVIA ANNO 1919

Pan Baltic Scope

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Assessing future GI by modelling climate refugia

Oscar Törnqvist

oscar.tornqvist@sgu.se

Co-funded by the European Maritime and Fisheries Fund of the European Union

Future-proofing MSP

SGU Geological Survey of Sweden

UNIVERSITY OF GOTHENBURG

ClimeMarine

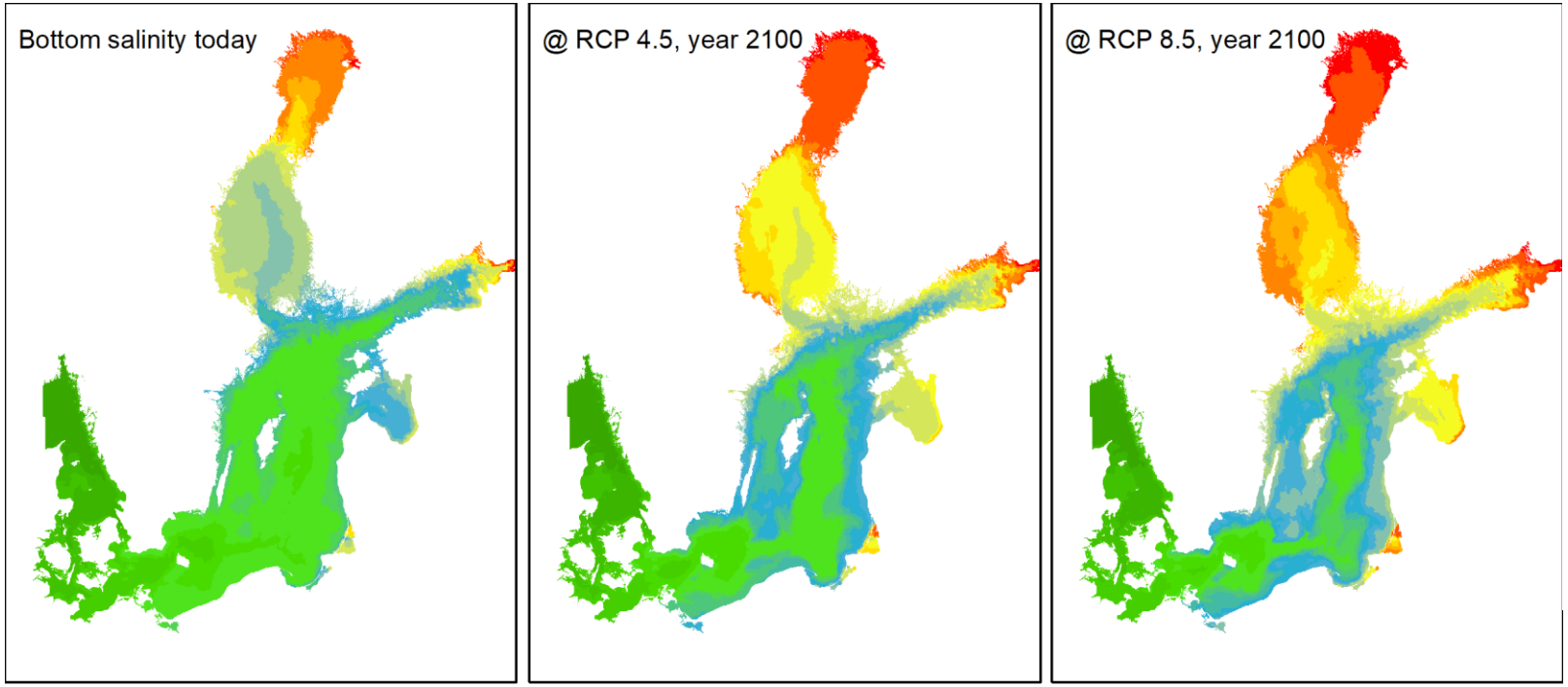
Swedish Agency for Marine and Water Management

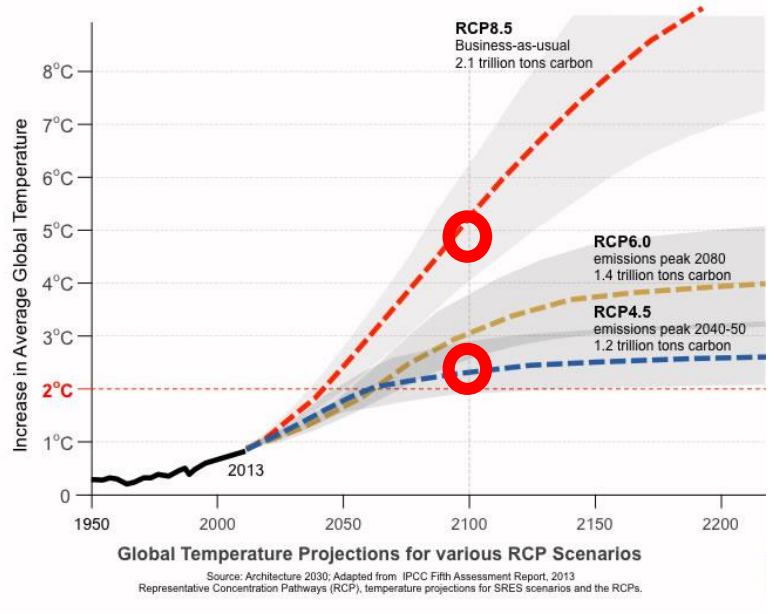
- Year 2100
- Two scenarios
- Latest models

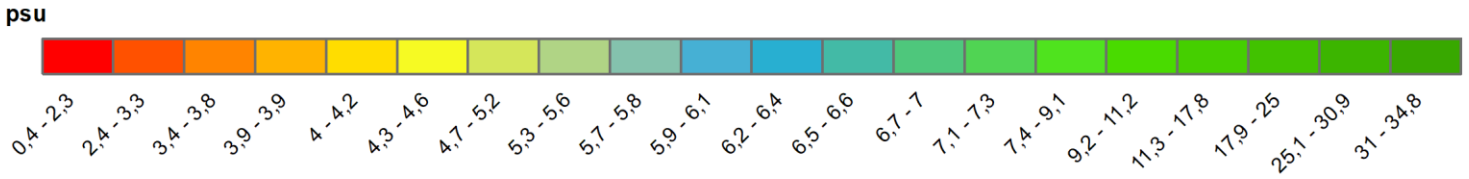
SMHI

Pan Baltic Scope

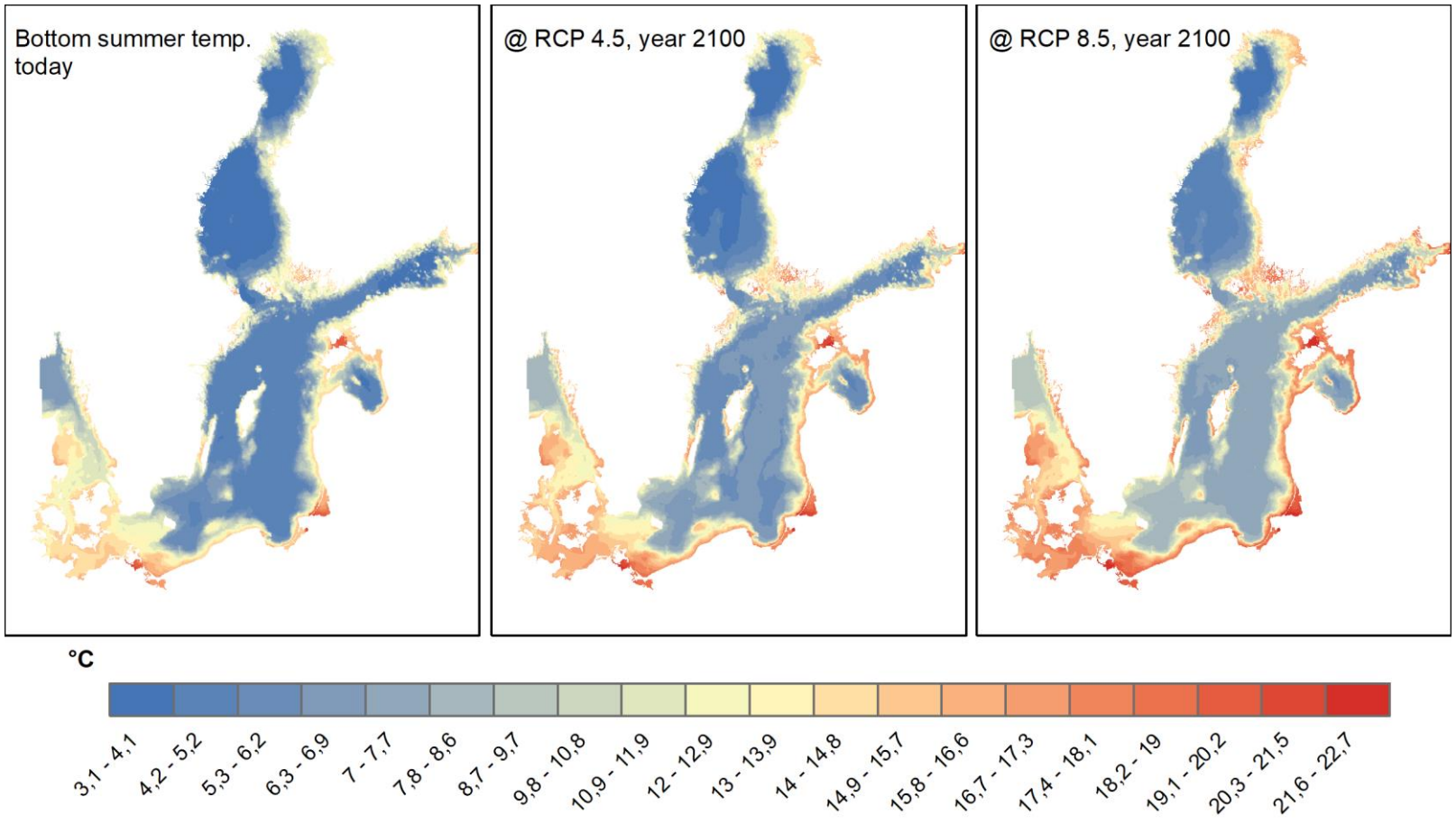
Climate Change in the Baltic?







Climate Change in the Baltic?



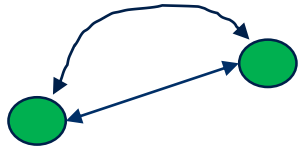
GI using key foundation species

- Fucus spp.
- Zostera marina
- Mytilus edulis/trossulus
- Stuckenia pectinata




Resilience and importance:

- Size and richness
- Source to network
- Sink from network



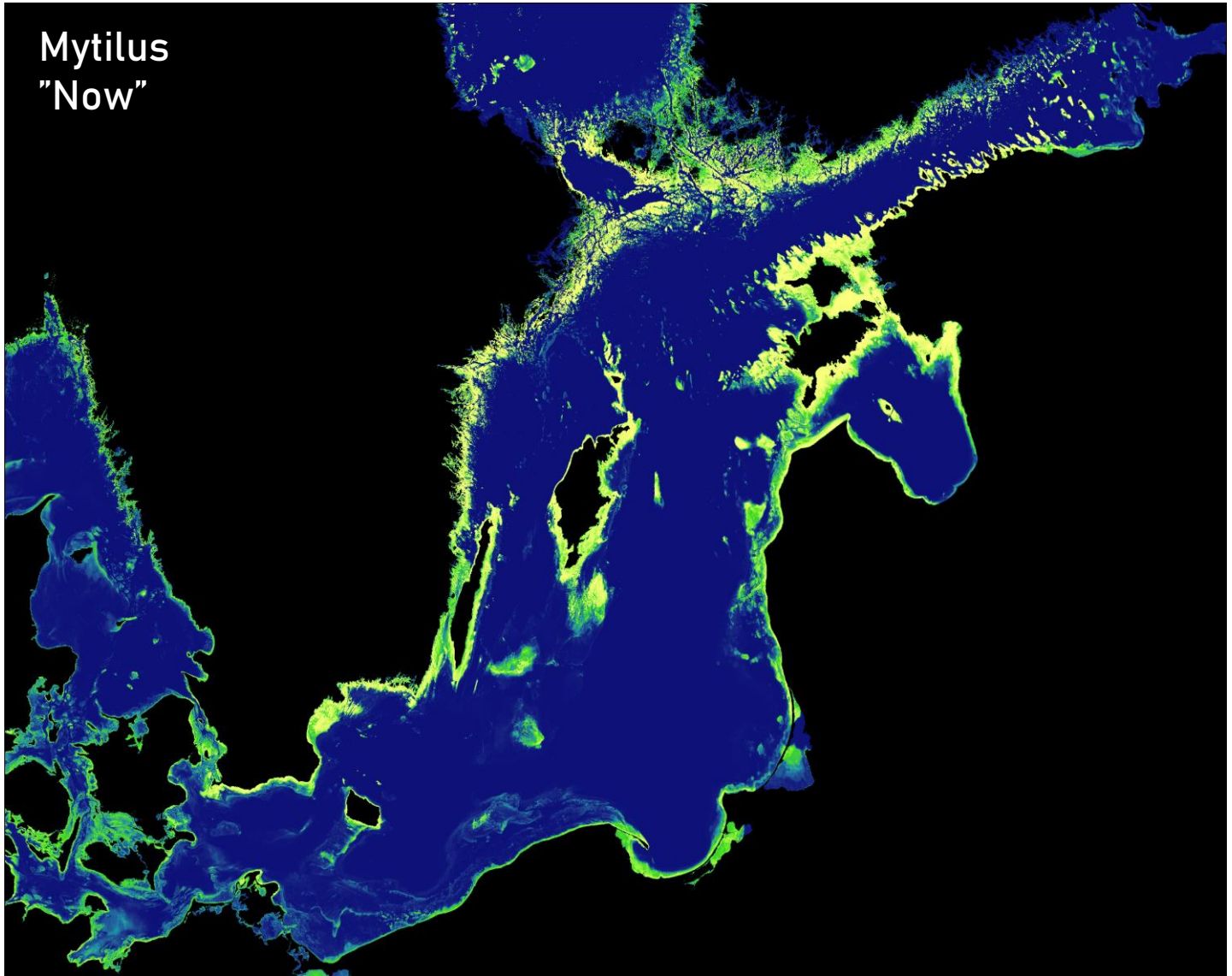
Method

- 250 m. resolution
- 17 environmental variables, now & then
- Species distribution model via BIOMOD2 / R

- Source & sink modelling from SDM via hydrodynamic simulation (drop seed and track destination)

- Model accuracy: > 90%
- Future climate: temp/nutrients OK, salinity uncertain

GI and Climate Change



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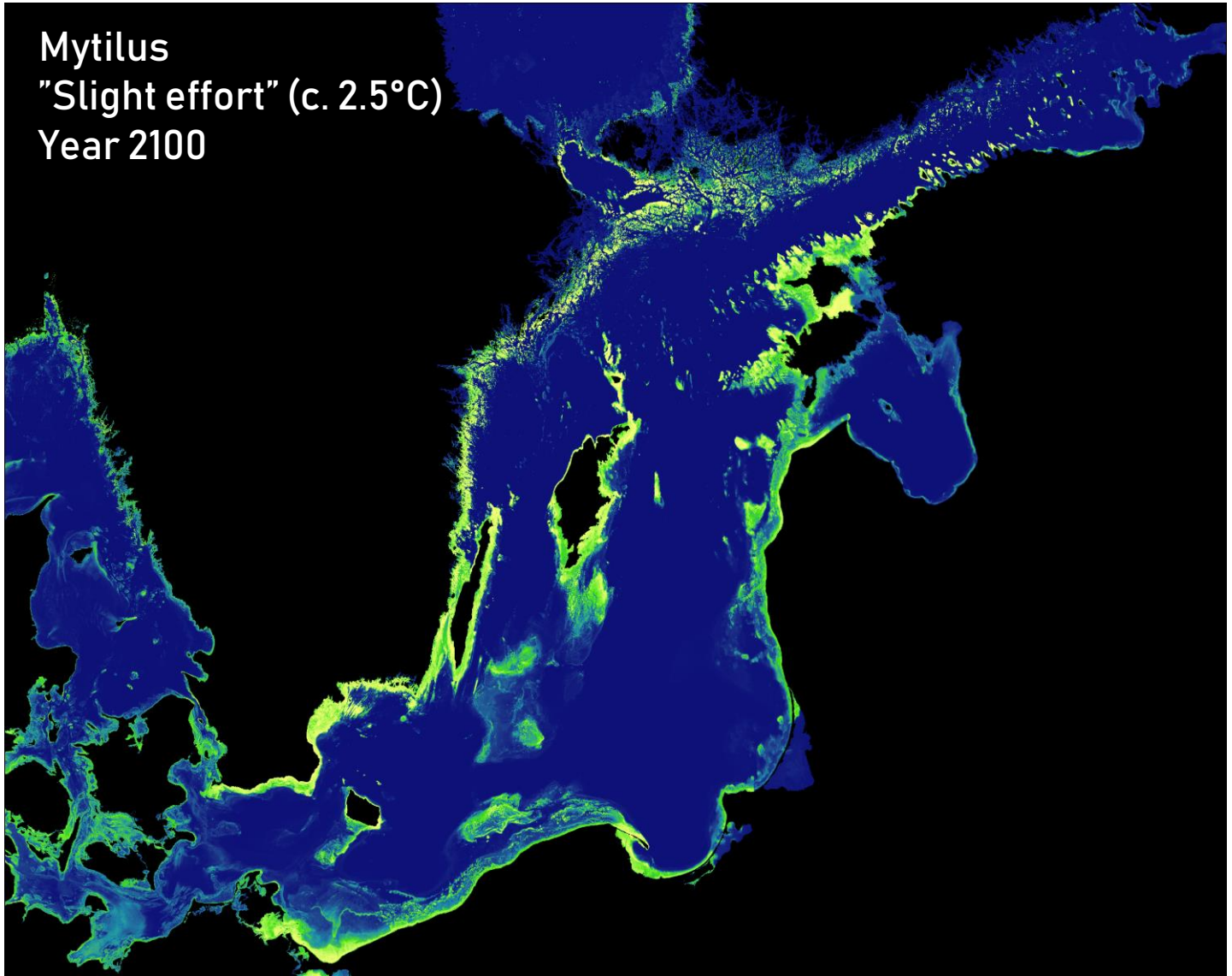

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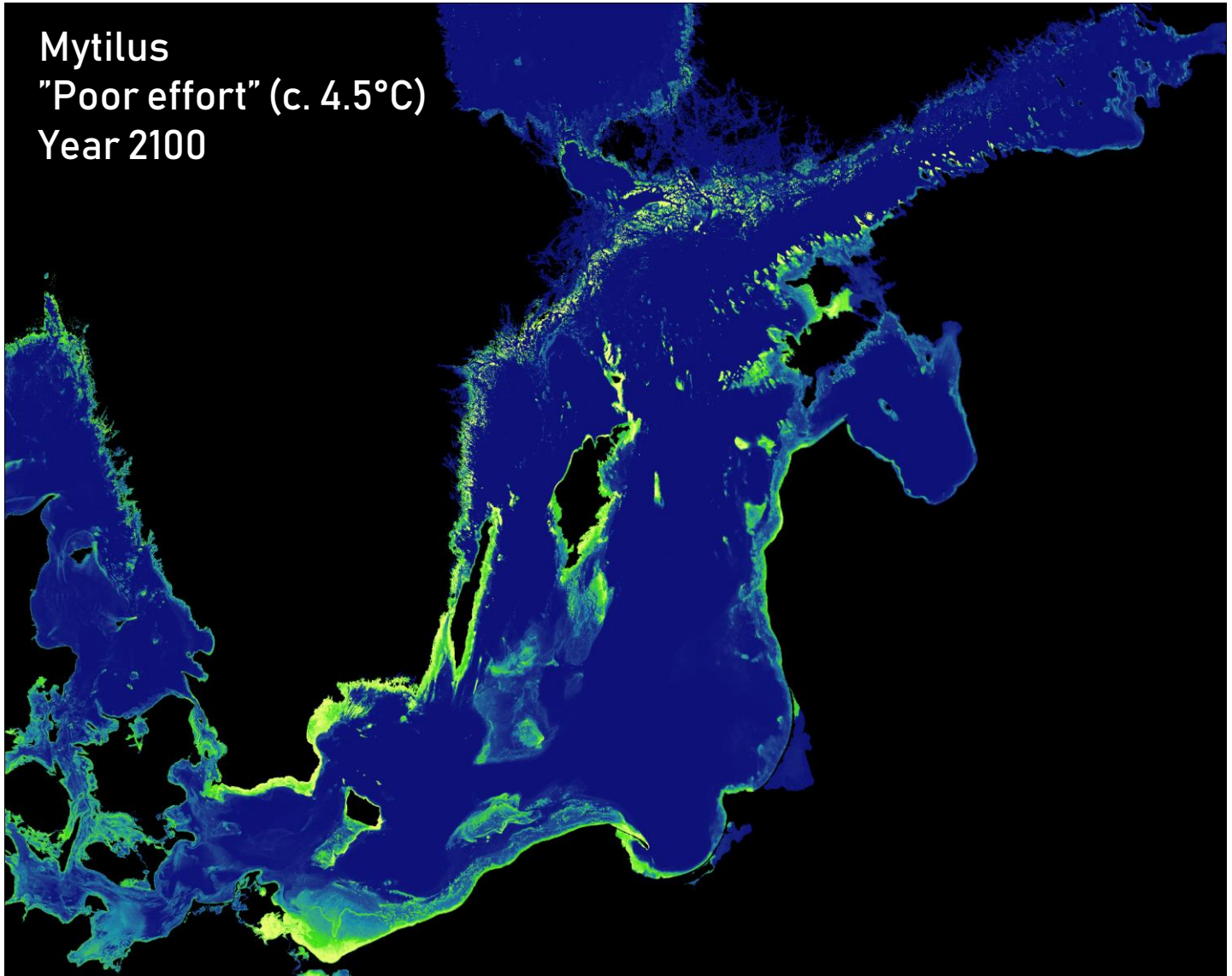

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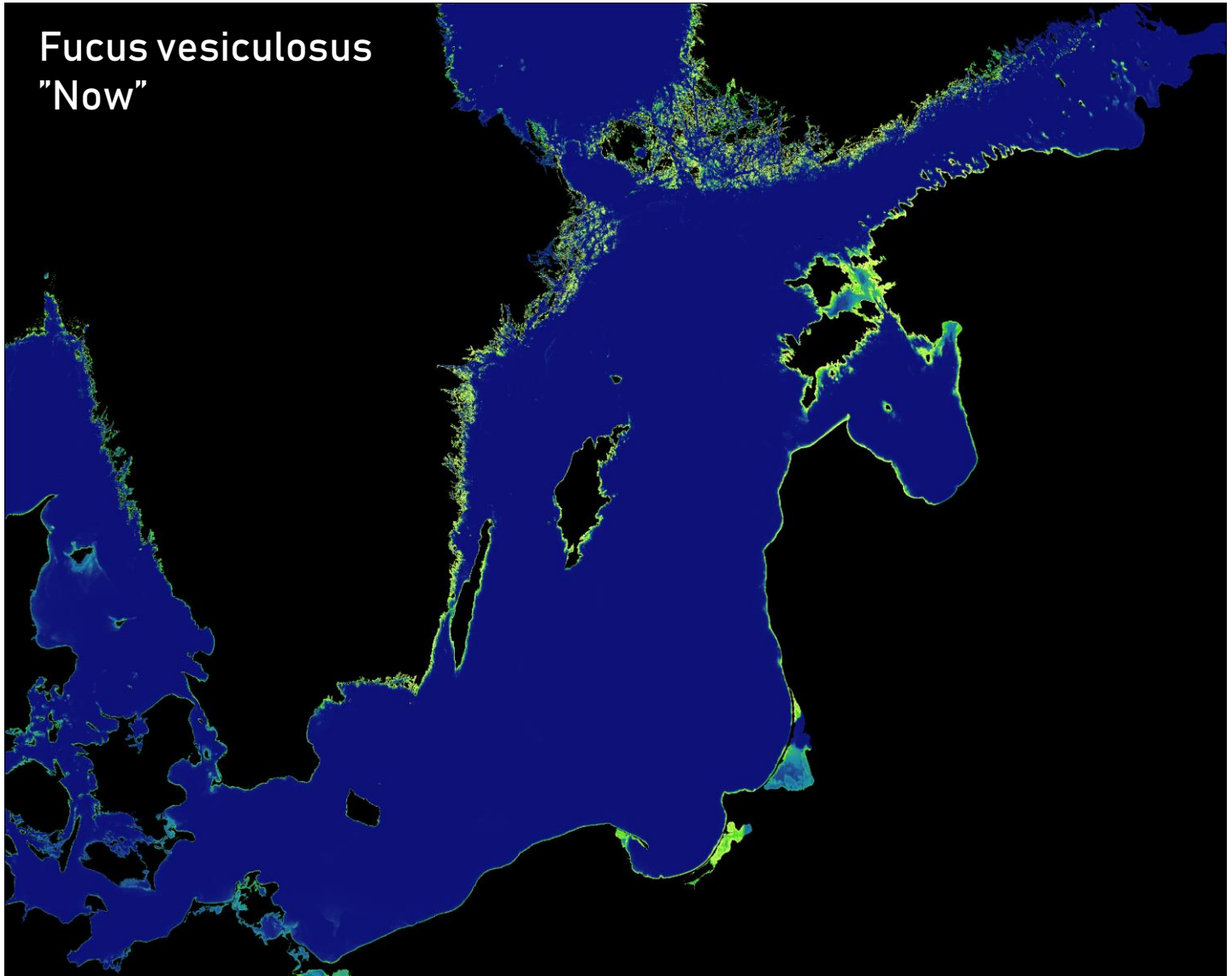

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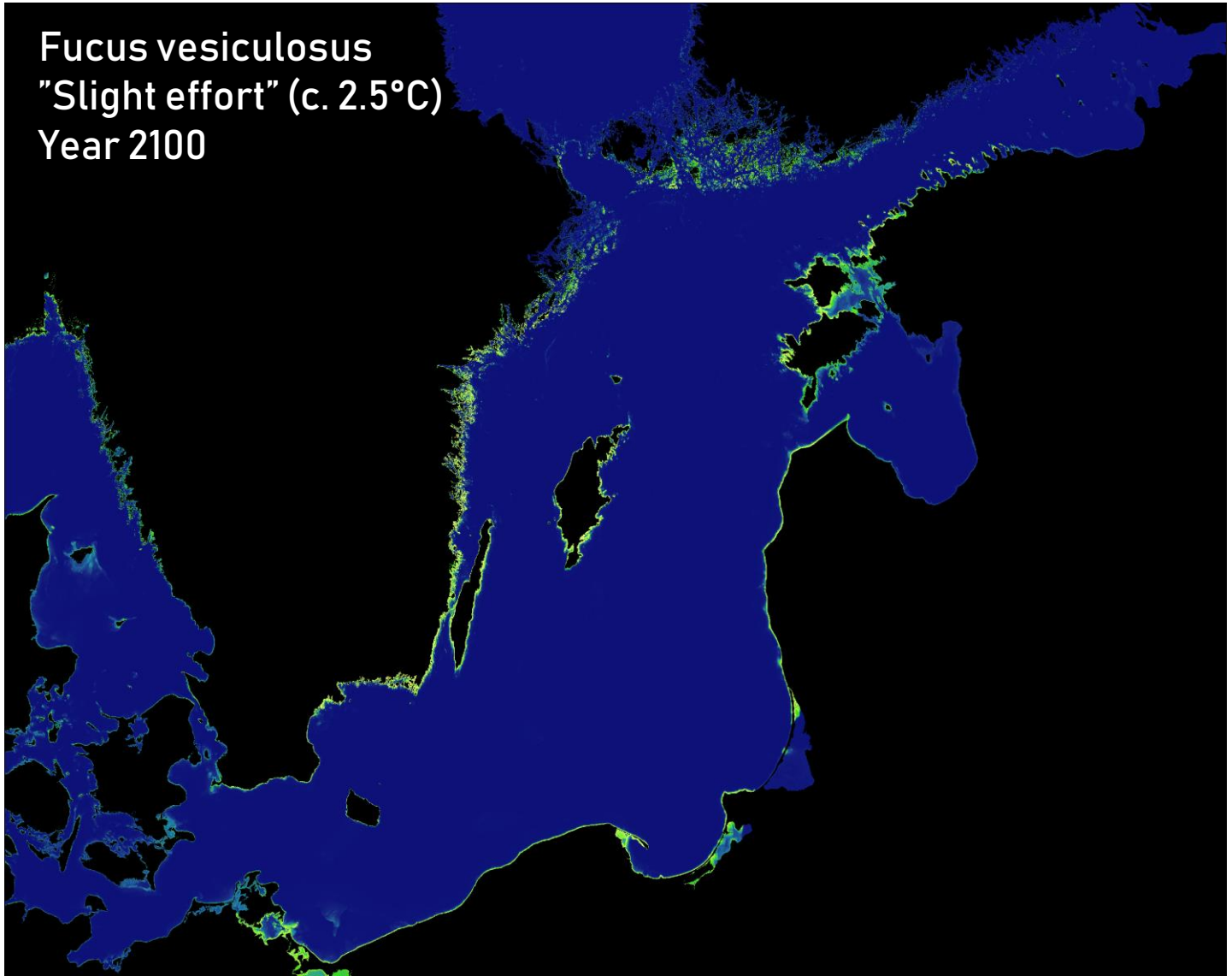

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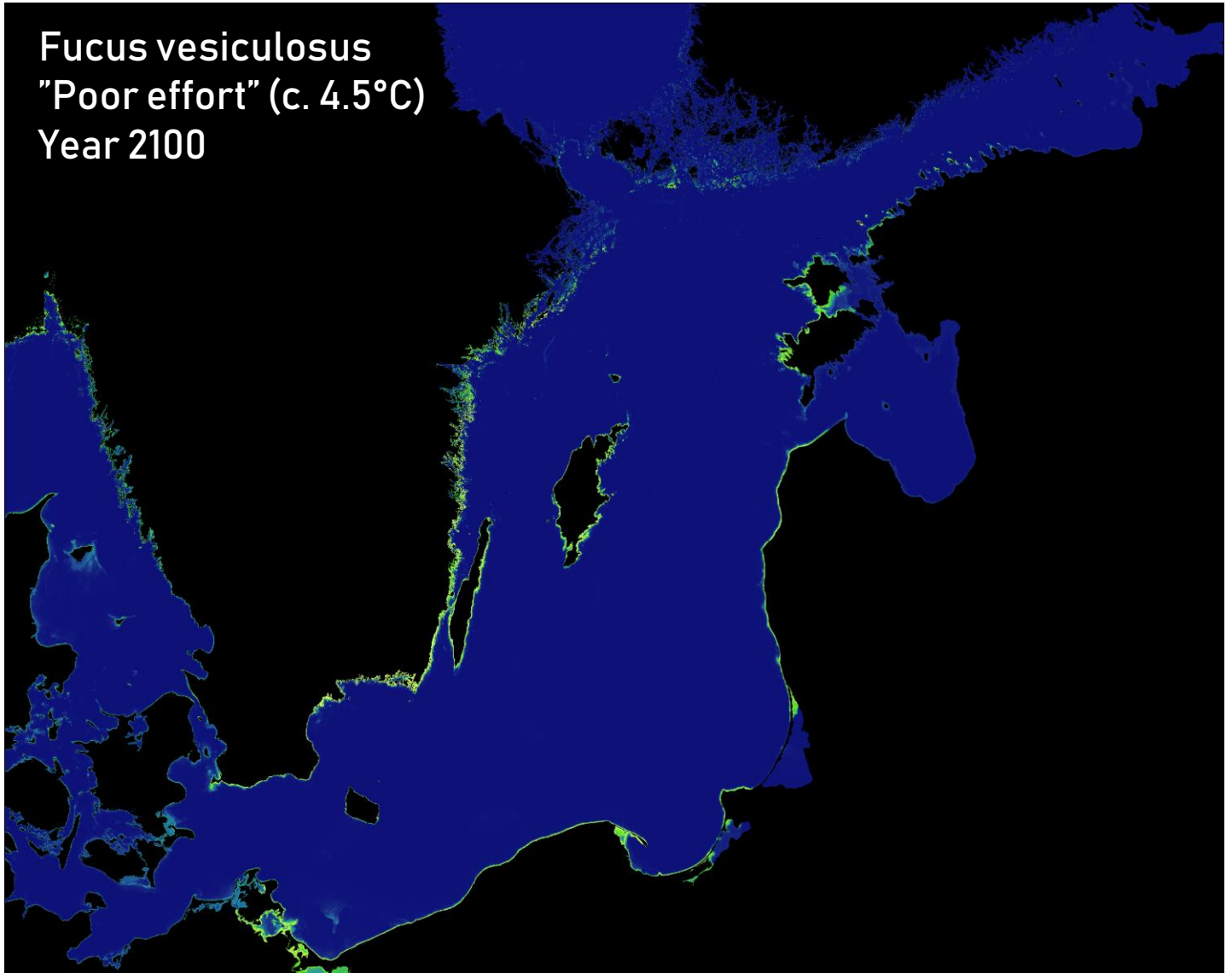
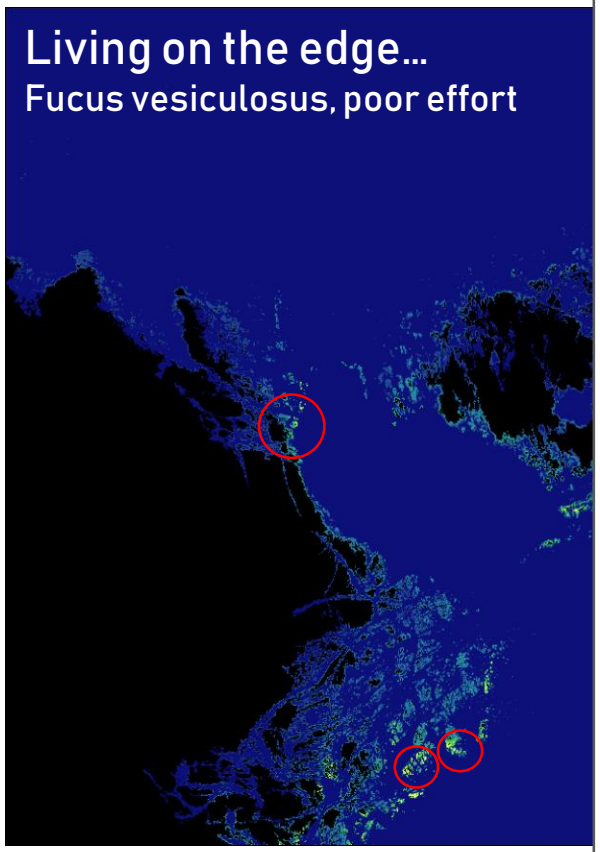
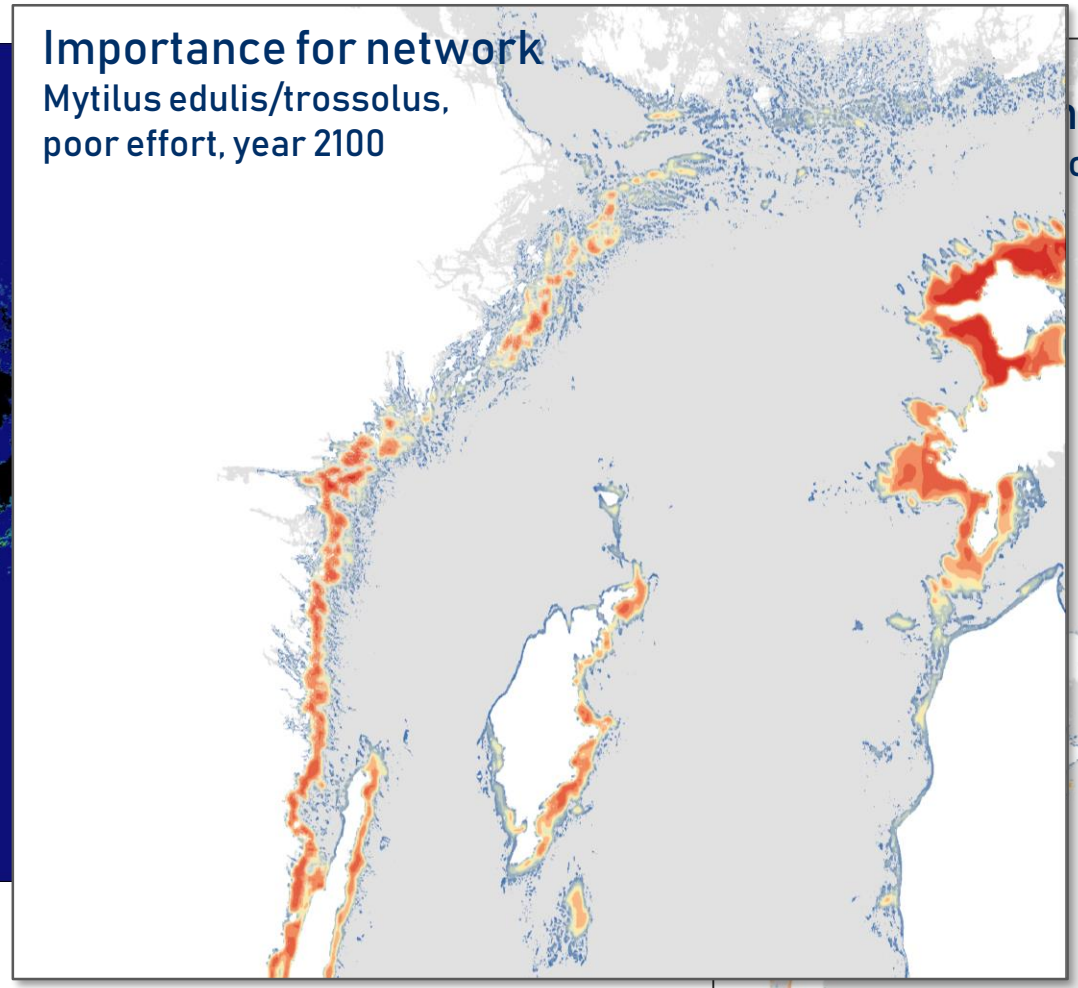
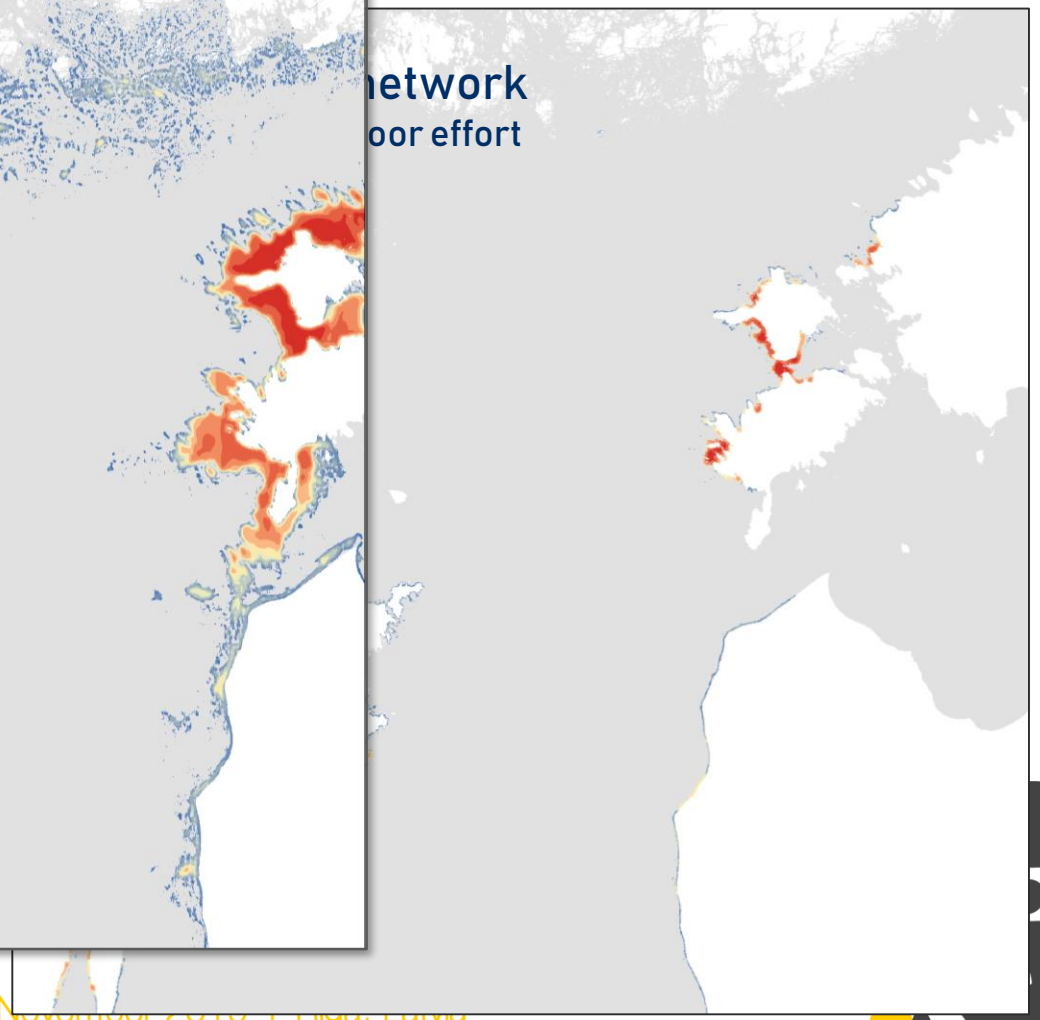


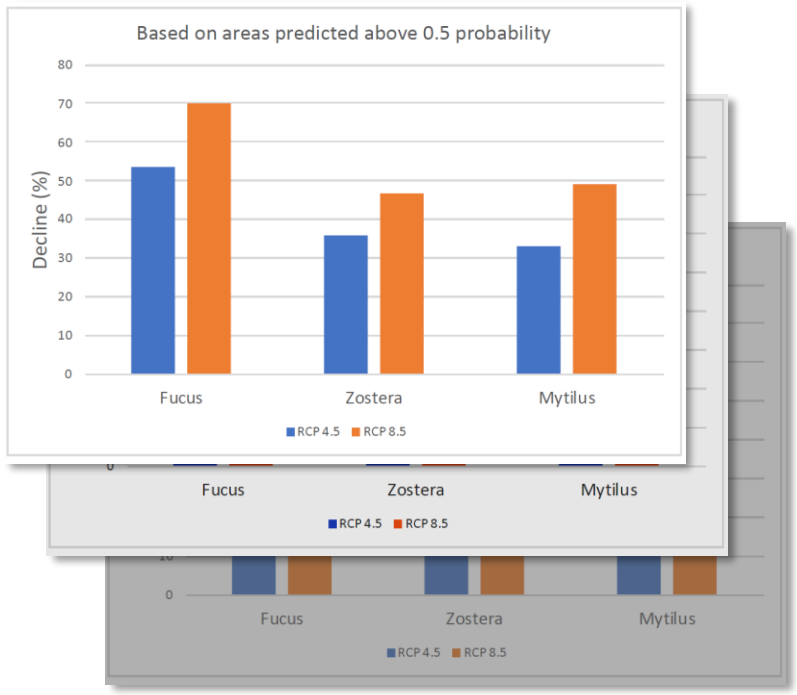
Results: Patches / networks for GI

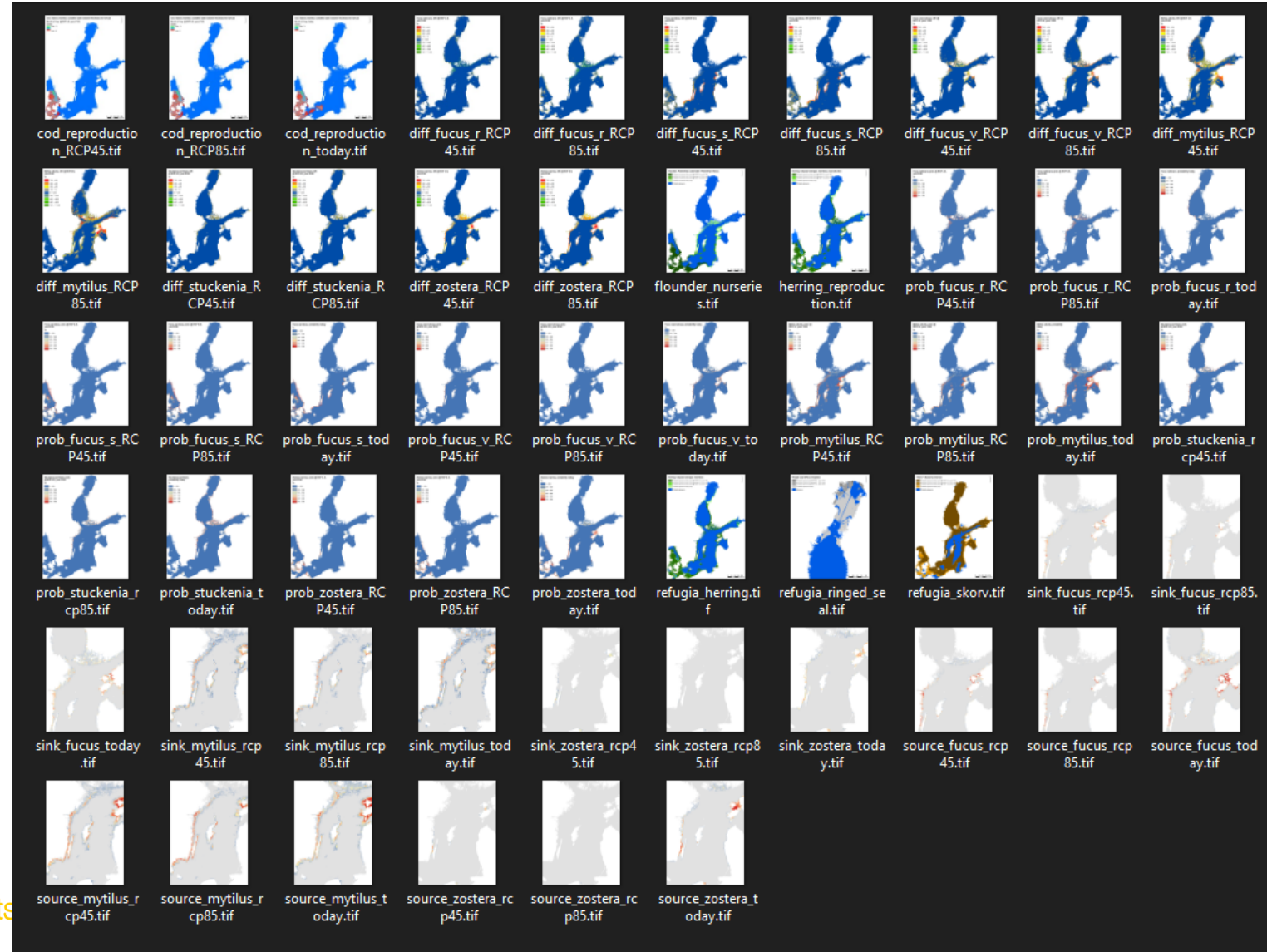






Results: An atlas of coming change?





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