BLUES

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HELCOM BLUES – Activity 2.3

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Results summary – pelagic habitats

Task	Deliverables	Results
Subtask 2.3.1	Complete operationalisation of the HELCOM Zooplankton Mean Size and Total Stock (MSTS) indicator	Operationalised in 10 sub-basins. The data availability hampers operationalisation in the remaining 7 sub-basins, particularly in the Southern areas.
Subtask 2.3.2	Complete operationalisation of the HELCOM Seasonal succession of dominating phytoplankton groups indicator	Operationalised in 13 open sea sub-basins (from 7 tested in HOLAS II) and 13 coastal assessment units (from 6 tested in HOLAS II).
Subtask 2.3.3	Develop an approach to combine the operationalised indicators	The approach is developed combining three biological indicators and two eutrophication indicators
Subtask 2.3.4	Evaluation of unified pelagic habitat assessment approaches and development towards a viable assessment in the Baltic Sea	A pilot study is conducted using OSPAR indicator PH1/FW5 *Plankton lifeforms* in 3 subbasins

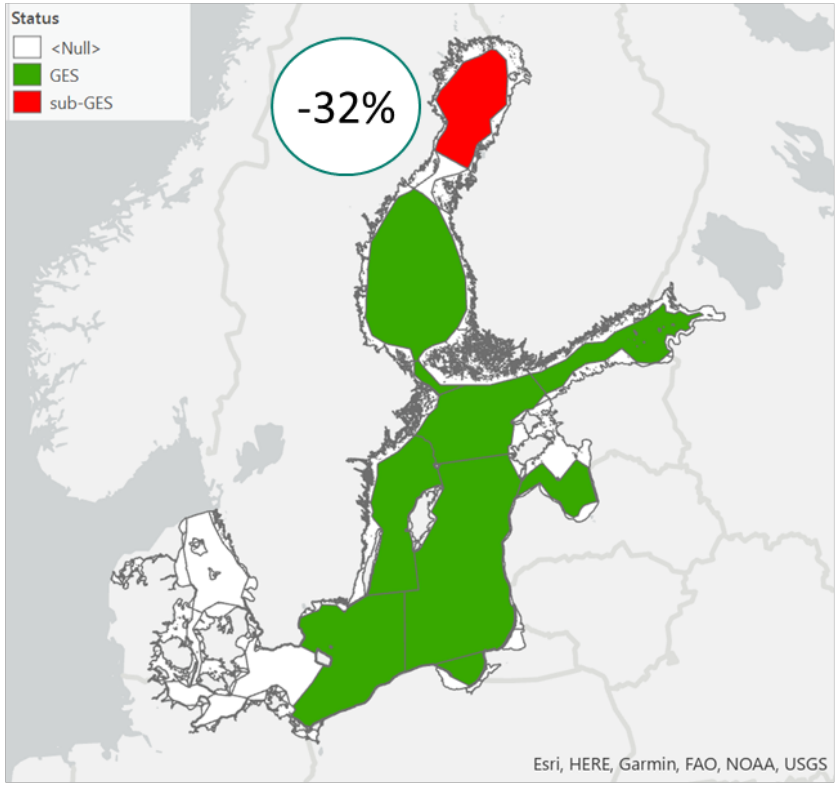
Results A2.3.1

Aim: Complete operationalisation of the HELCOM Zooplankton Mean Size and Total Stock (MSTS) indicator

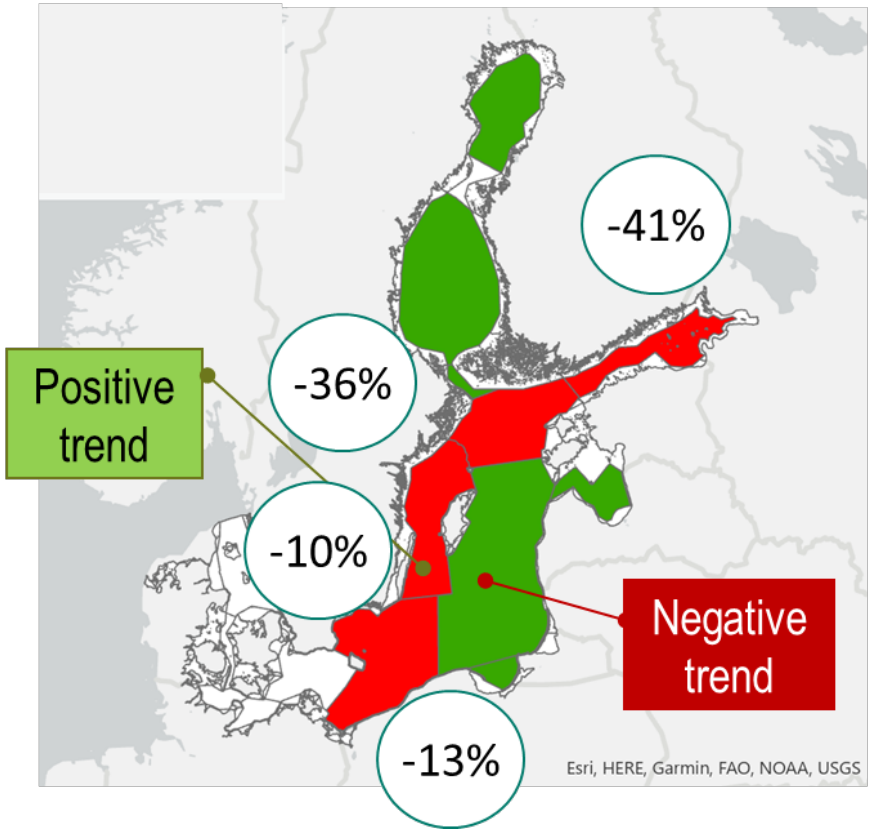
- **MSTS spatial coverage increased** from 6 sub-basins in the HOLAS II assessment to 10 in HOLAS III;
    - **Still missing:** Arkona, The Quark, Mecklenburg Bight, Kiel Bight, The Sound, Great Belt, Kattegat, and Skagerrak
- **GES is NOT achieved** in 50% of the assessment units, primarily due to the shifts towards the small-bodied zooplankton;
- **Negative long-term trends** for mean size and biomass were significant in 60% and 20%, respectively, of the assessment units;
- Population demography analysis implicates **predation pressure** as a critical driver of these changes.

MSTS: Deviation from the beginning of the time series

Total zooplankton biomass



Mean size

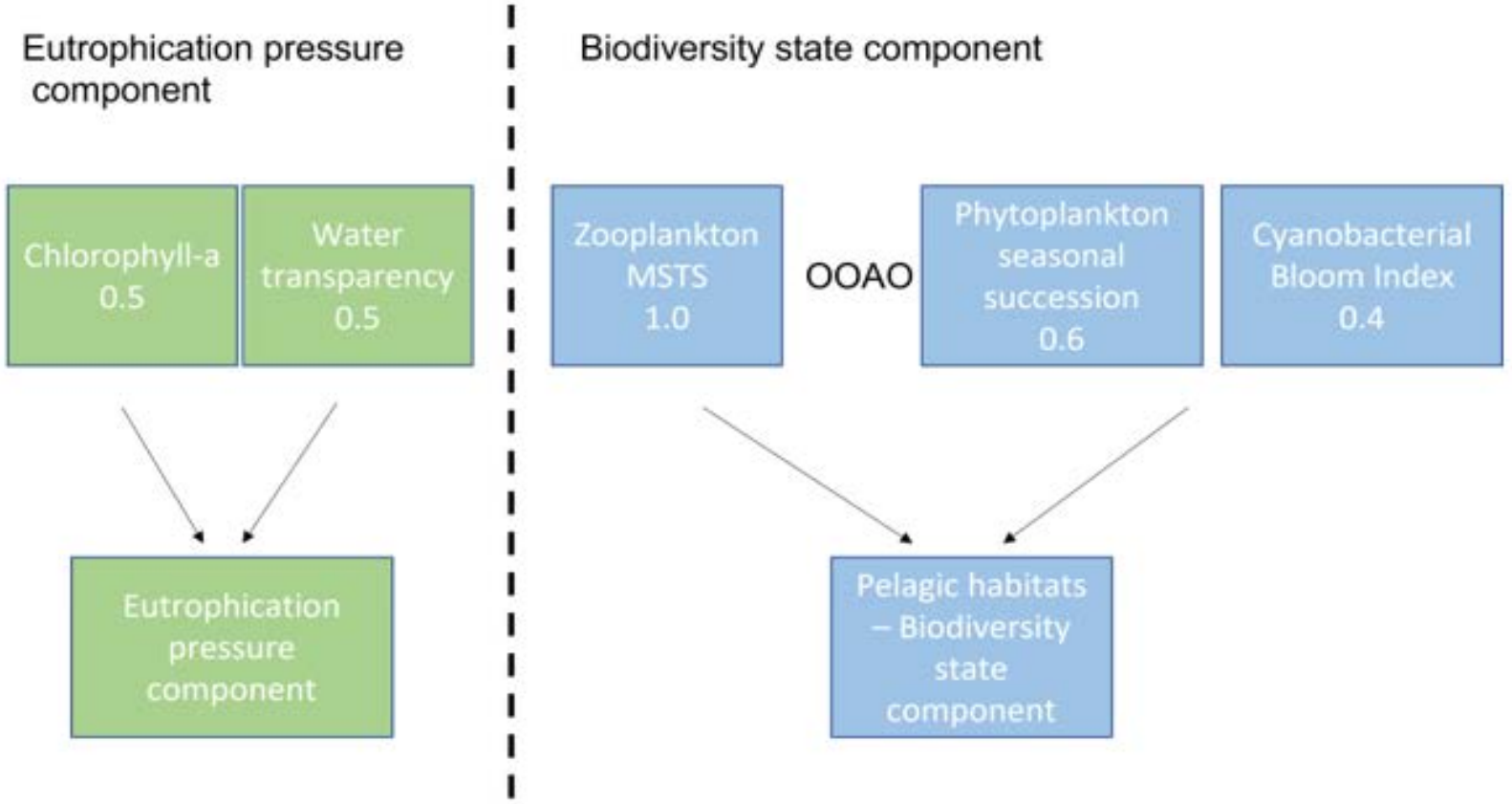


Results A2.3.2

- **Aim: Complete operationalisation of the HELCOM Seasonal succession of dominating phytoplankton groups indicator (SSDPG)**
- **Increased spatial coverage:** from 7 open sea sub-basin to 13 and from 6 coastal water units to 13 for HOLAS III in comparison to HOLAS II assessment
  - **Still missing:** The Sound, Great Belt; in some sub-basins either open sea or coastal units alone represented
- **GES is NOT achieved** in 19 of the assessment units out of 26 (73%). Most of the deviations are due to increased biomass of diatoms and/or the autotrophic ciliate *Mesodinium rubrum*;
- The deviations from the normal succession growth curves have become more frequent in the northern assessment units while in the southern Baltic Sea, phytoplankton communities are heading towards greater stability.

Results A2.3.3

Aim: Develop an approach to combine the operationalised indicators

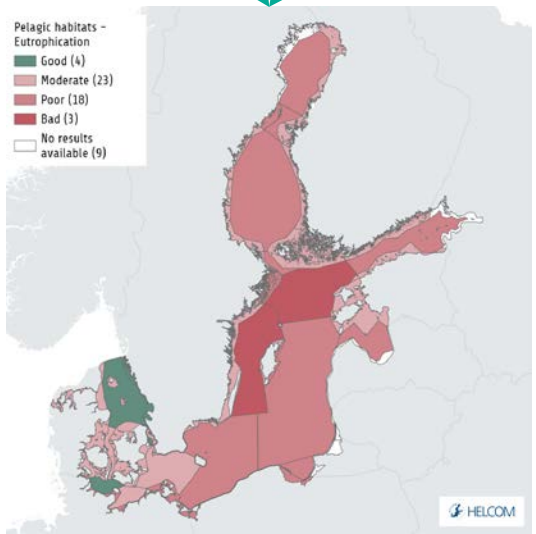


Results A2.3.3

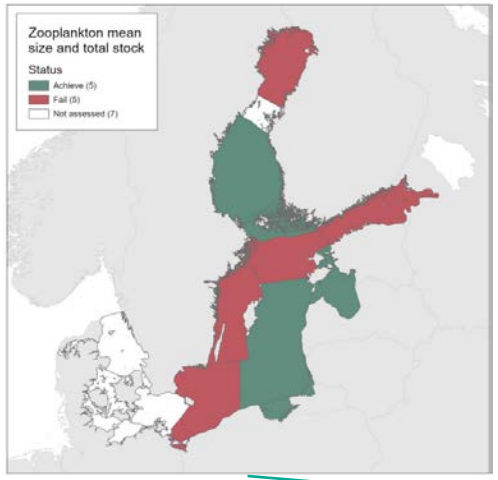
Eutrophication pressure components

Chl a

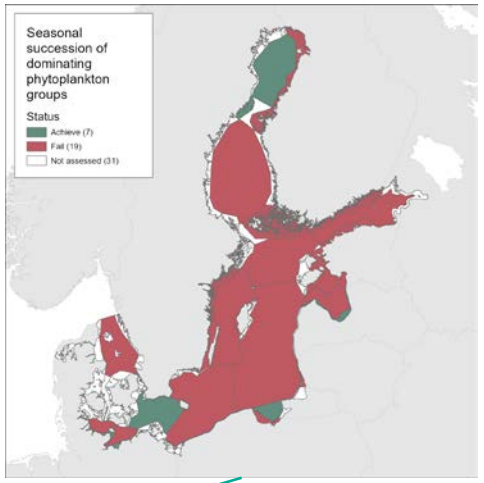
Water transparency

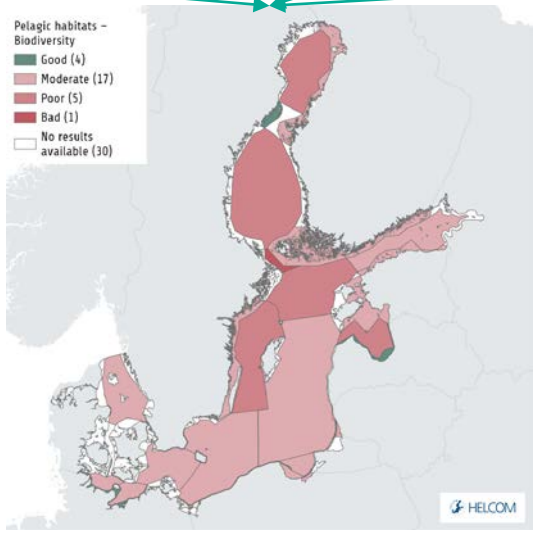


Biodiversity state components



OOAO





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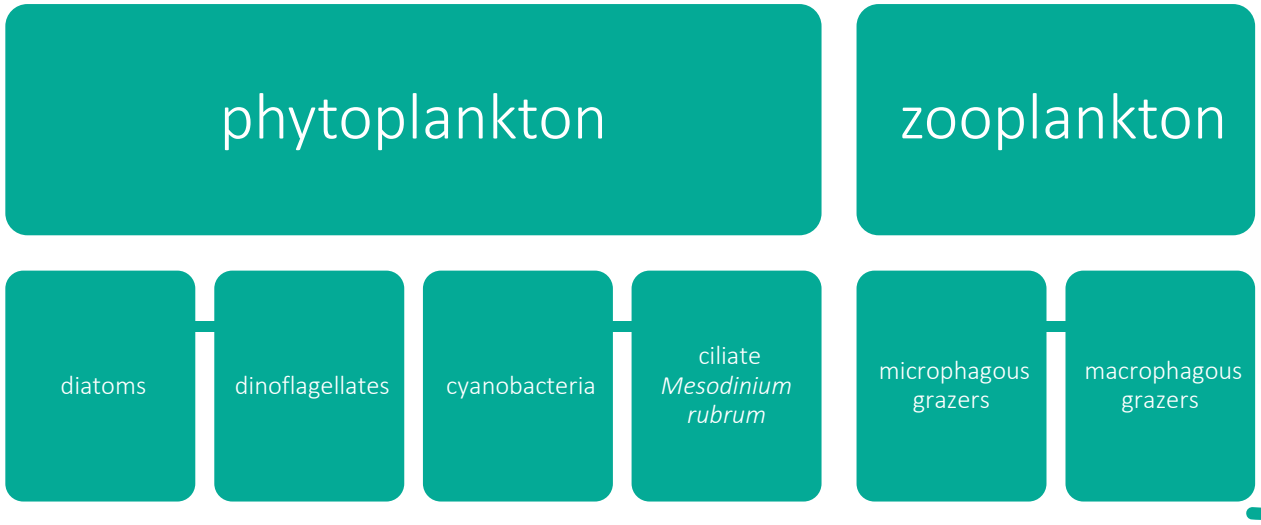
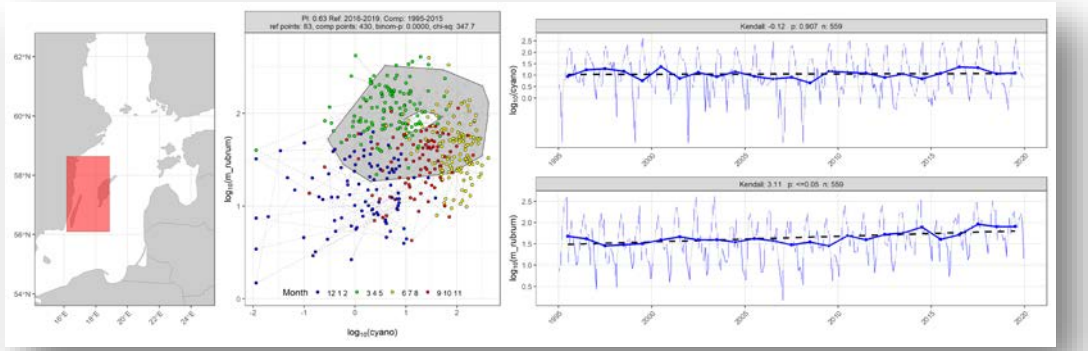
Results A2.3.4

Aim: Evaluation of unified pelagic habitat assessment approaches and development towards a viable assessment in the Baltic Sea

- Pilot study: the applicability of *OSPAR common indicator PH1/FW5 Plankton lifeforms* for the Western Gotland Basin, the Bothnian Sea and the Gulf of Riga





Example output for cyanobacteria vs *M.rubrum*

A2

Results A2.3.4

Main challenges identified

Specific pairs of lifeforms for Baltic plankton need to be established

Sampling frequency is lower than in OSPAR region; winter-spring data are rare

Future work

Database for plankton functional traits (specific for the Baltic Sea)

Identification of ecologically relevant lifeform pairs, including multi-trophic pairs, e.g., combining phytoplankton-zooplankton taxa

Appropriate data aggregation with regard to season

Key messages

for **science**

- All plankton indicators suggests profound changes in the pelagic food web, characterised by shifts towards smaller body size of zooplankton, prevalence of cyanobacteria, increased biomass of diatoms and/or the autotrophic ciliate *Mesodinium rubrum*. The relative importance of anthropogenic pressures vs climate for these changes are not sufficiently understood.
- Indicators based on growth and production are needed to understand the mechanisms behind the observed community changes.
- Linking pelagic indicators to biochemical flows in the food web can provide a mechanistic understanding of their dynamics.

for **policy makers**

- A better conceptualisation of good environmental status for pelagic habitat and its components in different subbasins of the Baltic Sea is needed for meaningful targets and policy requirements.
- Integration of plankton-based indicators into the food web assessment (D4) is needed to have ecologically relevant targets.
- Harmonization of assessment scales would facilitate integration of plankton indicators

Use of results so far and in future

- HELCOM → Development and update of core indicators, broader overarching approach, and integration.
- BSAP Goal → "Baltic Sea ecosystem is healthy and resilient"
- BSAP Ecological objective → "Viable populations of all native species"
- BSAP Management objective → "Reduce or prevent human pressures that lead to imbalance in the foodweb"
- BSAP action B33
- MSFD → reporting on D1C6, D4; Art. 8 Guidance;
- HELCOM HOLAS 3 Thematic Assessment of Biodiversity
- Other relevant processes → JRC pelagic habitat
- …

Data for pelagic habitats A2.3

This work was possible due to support from

- The HELCOM expert group of phytoplankton (EG PHYTO)
- The HELCOM expert group on zooplankton (EG ZOO)
- ICES DOME database, Hans Mose Jensen & Anna Osypchuk

- The Swedish Agency for Marine and Water Management (SwAM)
- The OSPAR NEA PANACEA project, Matt Holland and Anthony Ndah
- EU Baltic Data Flow project especially Henrik Nygård

Outputs

- Magliozzi et al. Pelagic habitats under the MSFD D1: scientific advice of policy relevance, EUR 30671 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-35958-6, doi:10.2760/081368, JRC124882.
- Labuce, A., Gorokhova, E., 2023. A script-based workflow to calculate zooplankton community indicator for environmental status assessment in the Baltic Sea. Ecological Informatics 74, 101965. https://doi.org/10.1016/j.ecoinf.2022.101965
- Magliozzi et al. 2023. Status of pelagic habitats within the EU-Marine Strategy Framework Directive: Proposals for improving consistency and representativeness of the assessment. Marine Policy 148, 105467. https://doi.org/10.1016/j.marpol.2022.105467
- HOLAS III report
- Indicator reports
- Future publications in peer reviewed journals…..

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