GES-REG:
Good environmental status through regional coordination and capacity building

FOOD WEBS – KNOWLEDGE BASE

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GAME AND FISHERIES RESEARCH
GES REG
CENTRAL BALTIC INTERREG IV A PROGRAMME 2007–2013
EUROPEAN UNION
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WP3: Advance knowledge base to support assessment of GES

The objective of WP3:

- increase the knowledge base and guidance for the harmonized use of MSFD descriptors, criteria and indicators, in defining good environmental status

The MSFD descriptors considered in WP3:

- non-indigenous species
- marine litter
- underwater noise
- **food webs**

→ activities in the WP aimed to result in reports summarising and analysing the information on methodologies that can be used to further develop the scientific base for GES descriptors, criteria and indicators, as well as defining the need for capacity building

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What is a food web? Why study food webs?

- all organisms living in and feeding from the Baltic Sea are part of the food web
- major changes have occurred in the Baltic Sea food webs in past decades
- knowing how a marine ecosystem is structured and how it functions is essential to detect changes in its status and health

  → healthy food web prerequisite for sustainable use of resources
- the aim of food web research is to unravel the intricate energy flow pathways:
  - who eats what and in how large amounts?
  - what happens when there are environmental changes which cause changes in the occurrence of organisms?
- the importance of food webs has been recognized in the MSFD: one of the 11 qualitative descriptors for determining GES concerns food webs
- the research is c h a l l e n g i n g ,
  because energy flow pathways
  are complex

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Tasks of the GES-REG food web study

By compiling published information:

- identify key elements of the northern Baltic Sea food web
- analyse pressures and risks affecting these
- review existing and proposed Baltic Sea food web indicators:
  - HELCOM core indicators that can be suitable as food web indicators
  - food web indicators identified or proposed in the Marine Strategies of MSs
- catalogue indicators and indicator candidates, and their properties
- analyse gaps in the indicator coverage, and the similarity and dissimilarity of the indicators across the MSs

→ **provide guidance regarding the applicability of suggested indicators and for the future food web indicator development**

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Focus of the GES-REG food web study

Focus on particularly challenging questions, and those considered to be in the greatest need of development in the Baltic Sea:

- stable isotope analysis in assessing energy flows in the food web
- the large fish indicators
- by-catch and discards indicators
- zooplankton early warning indicators
- phytoplankton early warning indicators

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Main findings regarding food web indicator status and coverage

- the approaches to define national indicators, and these indicators themselves, vary considerably

  → **steps toward harmonization need to be taken**

- not all the indicators required in the Commission Decision were covered by the indicators reported by the MSs in their Marine Strategies

  → **continued indicator development needed**

- current monitoring is insufficient in providing data for some indicators

  → **monitoring needs to be updated according to indicator requirements**

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Main findings regarding the particularly challenging topics

Stable isotope analysis (SIA)

- can be applied for indicators used for observing shifts in the structure and functioning of Baltic Sea food webs
- doable:
  - sampling can be easily incorporated in current monitoring
  - analysis costs have decreased drastically in recent years
  - statistical analysis methods of data have likewise improved
- however: currently few efforts are being made to apply this method within Baltic Sea monitoring

→ **continued SIA indicator development is justified and needed**

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Main findings regarding the particularly challenging topics

Large fish – problematic indicator in the northern Baltic Sea

- in the pelagic food web, there are only small-sized pelagic species (herring and sprat); large predatory fish are missing
- large fish indicators on small pelagic species could be calculated at population level

By-catch and discards as indicators of change in population status and food webs

- in the northern Baltic Sea, with the exception of *cyprinid fish* we were not able to recognize any relevant links between by-catch, discarding and GES
- by-catch and discards of cyprinids are potential indicators of GES in coastal areas of the northern Baltic Sea
- targeted removals of cyprinids are currently state-subsidized in Finland (pilot study)

  → targeted subsidized and non-targeted WFD-driven monitoring practices should be gear-standardized jointly with proper statistical tools in order to provide information on GES

→ continued fish indicator development is justified and needed

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Main findings regarding the particularly challenging topics

ZOOPLANKTON early warning indicators:

- several indicators related to zooplankton community composition were reviewed
- the indicator *Zooplankton mean size and total stock* (MSTS) is one of the HELCOM core indicators and will therefore be applied in the whole Baltic Sea

  → comparable methodology to measure the value of this indicator needs to be developed, as well as comparable criteria to set the targets for different sea areas
- other zooplankton indicators need to be evaluated to determine if they are able to provide additional information

→ **continued zooplankton indicator development is justified and needed**

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Main findings regarding the particularly challenging topics

PHYTOPLANKTON early warning indicators:

- primary production is the basis of all food webs; in the pelagic ecosystem, phytoplankton is responsible for practically all primary production
- phytoplankton indicator development has proved challenging

  → the work is still in its early stages
- we focused on indicators in most urgent need of attention and explored the theoretical background for 3 indicators with the aim to describe the quality and quantity of food available for the consumers of phytoplankton:

  1. *Diatom/dinoflagellate ratio in reference to mesozooplankton*
  2. *Diatom/dinoflagellate ratio in reference to zoobenthos*
  3. *Cyanophyte/total phytoplankton biomass ratio in reference to mesozooplankton*

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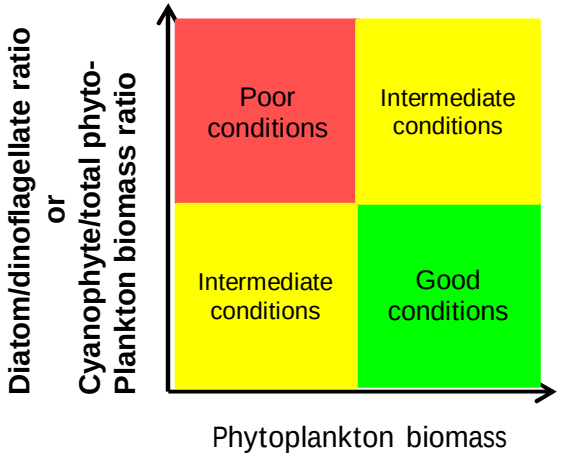
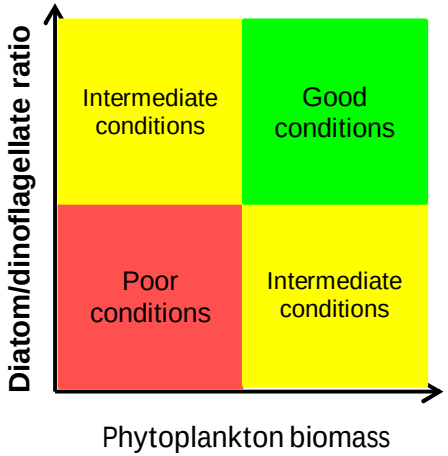
The phytoplankton food web indicators

- *early warning –indicators* of the quality and quantity of food available for the heterotrophs at the lower trophic levels in the food web
- the occurrence of the different phytoplankton groups indicate whether there is “good” of “bad” food on offer, as well as whether there is a lot to eat or not
- we plan to test the application of the MSTS zooplankton indicator approach

For zooplankton



For zoobenthos



Figures by Uusitalo & Hällfors

→ continued phytoplankton indicator development justified and needed

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Summary

Our aim was to

- provide guidance regarding the applicability of suggested indicators and for the future food web indicator development

We conclude that

- steps toward indicator harmonization need to be taken within the Baltic Sea area
- continued indicator development is needed to fulfil the requirements of the MSFD
- monitoring strategies need to be updated to comply with food web indicator data requirements
- Within the GES-REG project, good work done regarding food web indicators

  → provides solid basis for the responsible institutions to take necessary actions

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Thank you!

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