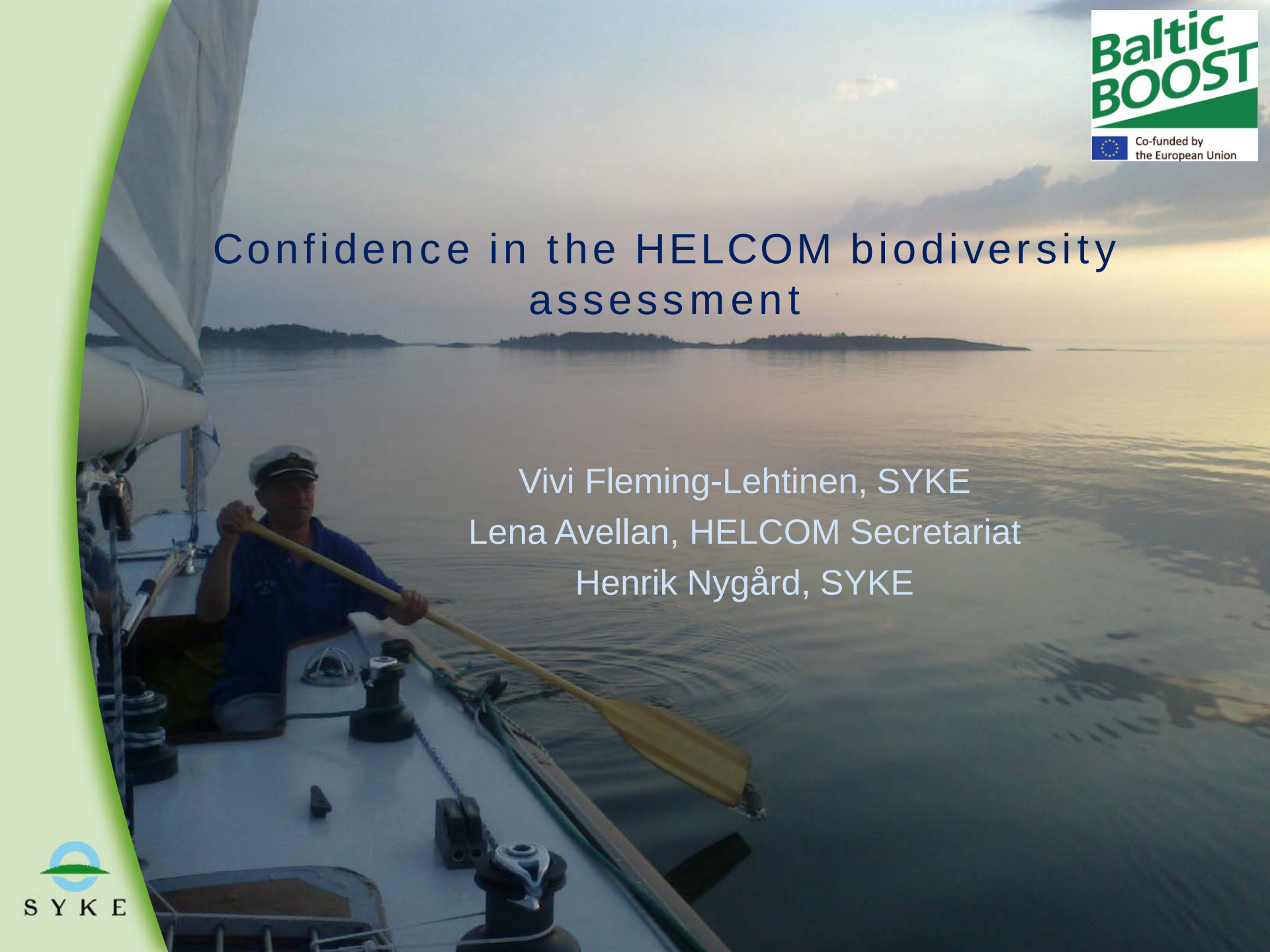

Confidence in the HELCOM biodiversity assessment

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Baltic BOOST
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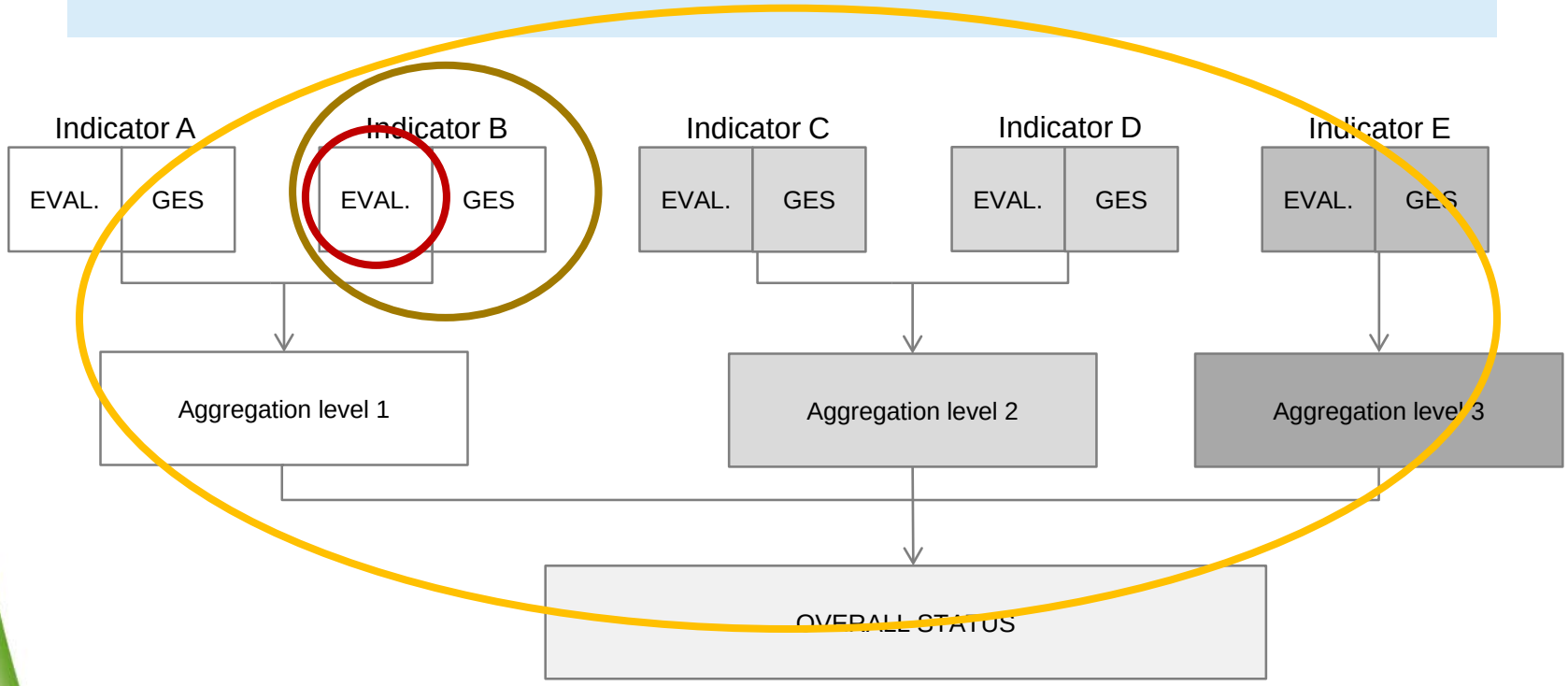
The levels of confidence in an assessment

1. Confidence of indicator evaluation: reliability of update data
2. Confidence of indicator approach
3. Confidence of assessment: relevance and representativity of elements



1. Confidence of indicator evaluation

’Goodness’ of the data used in updating the indicator

- Amount of monitoring; may also be expressed in relation to variability in data
- Spatial representativity of monitoring
- Temporal representativity of monitoring:
- reliability, accuracy of sampling: does it vary, have intercalibrations been made etc.

Possible solutions

1. Probability approach
2. Classification approach

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Probability approach

- Define the probability for the data reaching the result achieved
- Used in eg. Devotes-NEAT tool: expressed by standard error
- Advantage: relates monitoring sufficiency to the variation of data
- Disadvantage: is always restricted to the data used → does not assure sufficient spatial / temporal coverage It assumes a perfectly designed monitoring scheme
- Is only suitable in situations where data allows calculation of std err

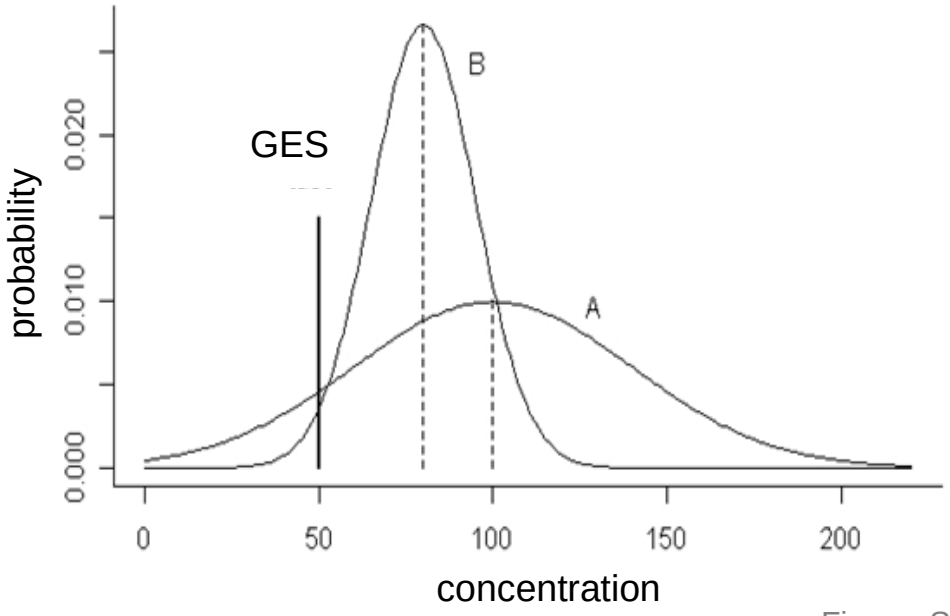

Figure: Sakari Kuikka, Univ. of Helsinki

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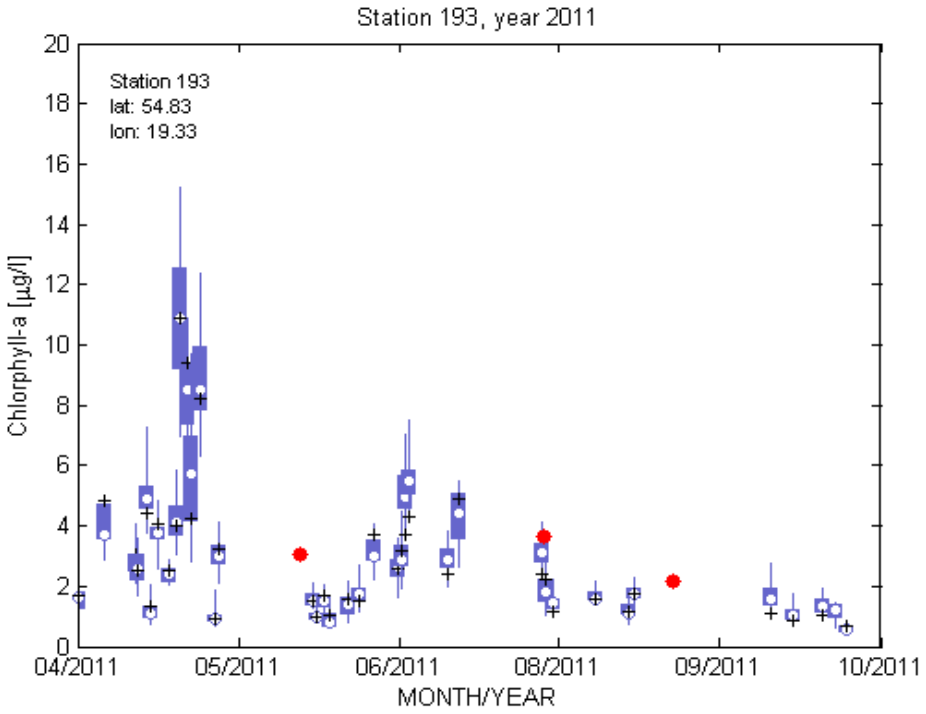
Examples on restrictions in data



blue: remote sensing
red: *in-situ* measurements

Less frequent and spatially biased measurements receive better standard deviation than data with higher temporal resolution and coverage

→ Better probability → Better confidence!

WRONG CONCLUSION !!

Figure: HELCOM 2015, EUTRO-OPER project report

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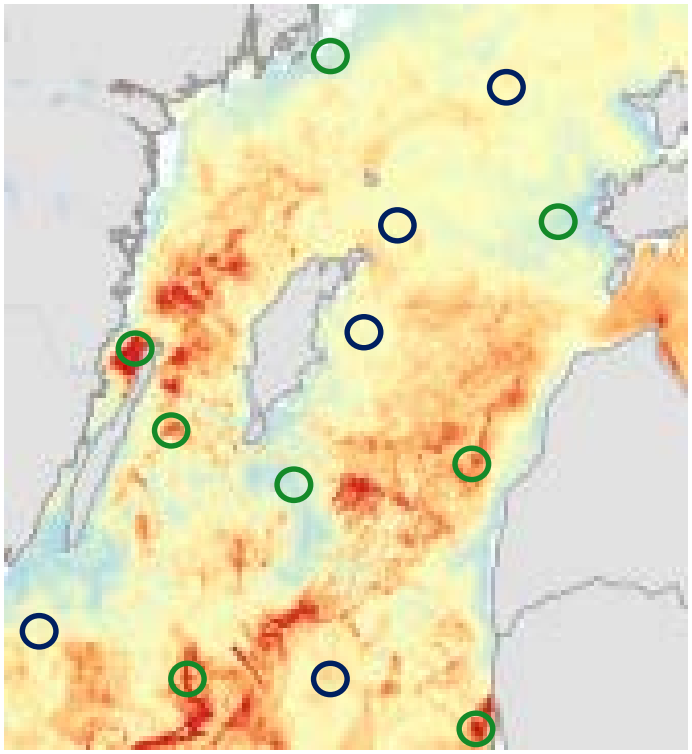
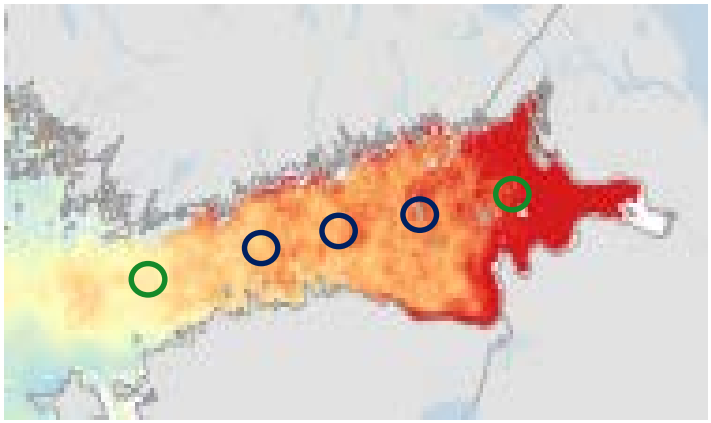
Examples on restrictions in data





In variable conditions, higher number of observations with better spatial coverage may increase standard deviation

→ Lower probability → Lower confidence!

WRONG CONCLUSION !!

Figure: HELCOM 2015, EUTRO-OPER project report

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Classification approach

- Setting criteria for confidence classes
- Used in eg. HELCOM-HEAT3 tool, where criteria are introduced to database algorithms
- Advantages
  - flexible, may be adjusted to different indicator approaches
  - allows taking into account spatial and temporal representativity
  - and accuracy of data
- Disadvantages
  - Relating to data variance might be complicated
  - Harmonization comparability between different types of indicators has to be made

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Example of classification approach

Confidence rating	Status evaluation
High	1) Full HOLAS II temporal coverage, i.e. all years in the range 2011-2016 included 2) Quality assured monitoring data used 3) Monitoring data considered to provide for the full needed temporal and spatial coverage to represent the ecological function the indicator is based on 4) Compliance check to GES boundary (threshold indicator specific, e.g. 80%), shows clear signal on whether GES has been achieved or not
Intermediate	1) Temporal coverage for HOLAS II range 3-5 years during 2011 - 2016 2) Data from mixed sources 3) Monitoring data considered to leave significant gaps in either spatial or temporal scope to represent the ecological function the indicator is based on 4) Compliance check to GES boundary shows that values are generally clearly GES/sub-GES however some outliers and variation in the data is present
Low	1) Only 1-2 years of HOLAS II range 2011-2016 data included OR only expert judgement 2) Data not quality assured 3) Monitoring data considered to leave significant gaps in both spatial and temporal scope to represent the ecological function the indicator is based on 4) Compliance check to GES boundary does not show clearly whether the data points are GES/sub-GES and/or the overall evaluation is very close to the boundary

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From present indicator reports

Indicator(s)	Elaboration of confidence
Abundance of coastal fish key functional groups	generally high, great regional differences
Abundance of key coastal fish species	generally high, great regional differences
Abundance of salmon spawners and smolt	higher in GoB than in BP and GoF
Abundance of sea trout spawners and smolt	no regional difference
Abundance of waterbirds in the breeding / wintering season	*no evaluation made* / high for coastal
Distibution of Baltic seals	high, no regional differences
Distribution pattern and extent of benthic biotopes	*no evaluation made*
Lower depth limit of macrophyte communities	*no evaluation made*
Number of drowned mammals and waterbirds in fishing gears	*no evaluation made*
Nutritional status of marine mammals	high (grey seal), *no eval. made* (others)
Population structure of long-lived macrozoobenthic species	
Population trends and abundance of seals	high, all species and regions
Proportion of large fish in the community	high / low, depending on species / area
Reproductive status of marine mammals	*no evaluation made*
State of the soft-bottom macrofauna communities	*no evaluation made*
Zooplankton mean size and total stock	*no evaluation made, expected moderate*

→ More accurate confidence estimates should be made!

2. Confidence on indicator approach and methodology

Expressing quality of each indicator *

- Ecological relevance
- Responsiveness – link to pressure
- Precautionary capacity, 'early warning', response time
- Accuracy, presision, quality assurance of methods
- Sound scientific basis, thorough report
- Confidence of GES boundary

IMPORTANT: WHAT IS TO BE INCLUDED INTO ASSESSMENT RESULT, WHAT IN CONFIDENCE ASSESSMENT?

Possible approaches

a) Indicator experts review indicator performance through these properties
   - Potential to improve these properties during indicator development
   - Best knowledge on scientific facts

b) An group of experts (eg. HOLAS II) review all the indicators
   - Ensures better harmony between indicators

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* See Krause-Jensen et al. and references within

Example of analysing indicator confidence

- HEAT: expresses only confidence of GES
- Devotes indicator quality catalogue*, with different types of criteria (also sociological, status confidence…)

Confidence rating	GES boundary
High	GES boundary has good scientific justification (e.g. reference conditions, supported by extensive scientific literature, set based on verified models)
Intermediate	GES boundary has good thinking by major improvement could be done in identifying the quantitative boundary
Low	GES boundary has weak conceptual support and is not supported by data(e.g. on the basis of 'no further degradation from an arbitrary point in the available dataset))

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* See Krause-Jensen et al. and references within

3. Confidence on overall assessment

The quality of the overall assessment may vary, even between assessment units

- Confidence of each indicator in assessment (earlier levels 1 & 2)
- Representation of criteria, number of indicators per criteria
- Representation of species groups, number of indicators per species group
- Temporal variability within assessment period

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Points for discussion

- Should all three levels of confidence (status-indicator-assessment) be addressed?
- How should confidence be expressed: as part of result or as separate (secondary) assessment?
- Are there items that should rather be expressed in the status assessment (through eg. weighing) than in the confidence?
- Which approaches should be chosen, bearing in mind the restrictions set by the HELCOM BD CORE indicators?
- What guidelines should be given to the indicator developers regarding assessment of data confidence to ensure that the needs of the tool are covered?

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References

HELCOM 2015: Final report of the ’Project on making HECOM eutrophication assessments operational (EUTRO-OPER)’

Krause-Jensen et al. (2015): Report on the criteria for good indicators selection. Deliverable 3.2 of the DEVOTES project.

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Determining indicator confidence

Indicator(s)	Data unit
Abundance of coastal fish key functional groups	tn?
Abundance of key coastal fish species	tn?
Abundance of salmon / sea trout spawners and smolt	% , tn?
Abundance of waterbirds in the breeding / wintering season	n indiv.
Distibution of Baltic seals	
Distribution pattern and extent of benthic biotopes	km^2?
Lower depth limit of macrophyte communities	m
Number of drowned mammals and waterbirds in fishing gears	?
Nutritional status of marine mammals	mm
Population structure of long-lived macrozoobenthic species	mm
Population trends and abundance of seals	n indiv.
Proportion of large fish in the community	%
Reproductive status of marine mammals	%
State of the soft-bottom macrofauna communities	[index]
White-tailed eagle productivity	n. indiv.?
Zooplankton mean size and total stock	µg

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Determining indicator confidence

Indicator(s)	Update method	Data unit
Abundance of coastal fish key functional groups	site data	tn?
Abundance of key coastal fish species	site data	tn?
Abundance of salmon / sea trout spawners and smolt	Assimilation model, expert eval.	% , tn?
Abundance of waterbirds in the breeding / wintering season	site data	n indiv.
Distibution of Baltic seals		
Distribution pattern and extent of benthic biotopes	site data	km^2?
Lower depth limit of macrophyte communities	site data	m
Number of drowned mammals and waterbirds in fishing gears	site data?	?
Nutritional status of marine mammals	site data	mm
Population structure of long-lived macrozoobenthic species	site data	mm
Population trends and abundance of seals	site data	n indiv.
Proportion of large fish in the community		%
Reproductive status of marine mammals	site data	%
State of the soft-bottom macrofauna communities	site data	[index]
Zooplankton mean size and total stock	site data	µg