Document title	Distribution, pattern and extent of benthic biotopes – indicator concept and test cases
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Background

As agreed at HOD 48-2015 the further indicator development in HELCOM is based on a Lead Country approach. The pre-core indicator 'Distribution, pattern and extent of benthic biotopes' has been developed through the HELCOM project TAPAS which is co-funded by the EU. The lead country for the indicator development work is Estonia, and co-lead countries are Finland, Germany, Latvia, Lithuania and Sweden. Recent development work has received guidance from the HELCOM Intersessional Network on benthic habitat monitoring (IN-BENTHIC) and intersessional online meetings as described in Document 1.

This document describes the indicator concept developed by the TAPAS theme 2 partner Estonian Marine Institute (EMI). The document also describes test cases that have been carried out to explore how the indicator concept works.

Test cases that make use of data at different scales have been considered to be of particular importance when developing the 'Distribution, pattern and extent of benthic biotopes' pre-core indicator. The indicator result has been anticipated to differ if a different resolution of spatial data is included or a different resolution of defining the biotope (e.g. photic sand vs. photic sand dominated by Zostera-community) is applied. The test cases have therefore been developed with the aim to provide a discussion base for the workshop to develop a proposal for the State and Conservation working group on the indicator concept including the relevant scales on which assessments should be carried out.

Action required

The workshop is invited to take note of the information and use it as a basis to discuss and propose the core indicator for endorsement to State and Conservation 5-2016.

Distribution, pattern and extent of benthic biotopes – indicator concept and test cases

Introduction

Currently indicator "Distribution pattern and extent of biotopes" is rated as pre-core indicator in HELCOM indicator system. No formal decision on methodology or habitat nomenclature to be used is made yet.

HELCOM has developed HUB biotope classification system to be used in the Baltic Sea region which is compatible with EUNIS habitat classification system (BSEP 139, HELCOM, 2013).

EU member states have been conducting reporting under Habitat Directive on the status of the Annex I habitat types according to standardised methodology.

Newly developed "Commission Decision on laying down criteria and methodological standards on good environmental status and specifications and standardised methods for monitoring and assessment, and repealing Decision 2010/477/EU" proposes to assess habitats through criteria:

> D1C5: The loss of extent of loss of the habitat type, resulting from anthropogenic pressures, does not exceed 5% of the natural extent of the habitat type in the assessment area. In cases where the loss exceeded this value in the reference year used for the Initial Assessment in 2012, there shall be no further loss of the habitat type.
>
> D1C6: The spatial extent of impacts from anthropogenic pressures on the condition of the habitat type, including its biotic (typical species composition and their relative abundance) and abiotic structure, and its functions, does not exceed 30% of its natural extent in the assessment area including any loss of natural extent, as assessed under criterion D1C5.

While in methodological section current version states:

> Criteria D1C5 and D1C6 correspond to the 'range/area covered by habitat type within range' and 'specific structures and functions' criteria of Directive 92/43/EEC
>
> For benthic habitats, assessments criterion D1C6 should, in particular, take into account the use assessments of the impacts from pressures, including under D2C3, D3C2, D3C3, D5C6, D5C7, D5C8, D5C9, D6C2, D7C2, D8C2 and D8C4.

Proposal for assessment scheme

Habitat nomenclature/classification system: Current proposal is to use HUB level 3 (substrate) for assessment on Baltic Sea scale. If data exists, HUB level 4 or 5 could be used for assessment on geographical scale of sub-basins, national level or waterbody/type level. (HUB level 3 was selected due to the pragmatic reason, we believe that only few countries have data for level 4 or 5. However, selection of HUB level is open for discussion.)

Assessment scheme: A general principle of proposed assessment system is based on practices used for HD reporting (Evans & Arvela 2011) taking into account requirements of MSFD new version of methodological guidelines.

Assessment procedure is composed of conditional classification of four different habitat properties:

1. Area
2. Extent (range)
3. Quality
4. Impact

Assessment result is classified in one of three status classes (comparable with three status classes of HD; naming of the classes should be agreed):

- GES
- subGES
- nonGES

Habitat properties to be assessed:

Area
Defined as the sum of the grid squares where habitat is found at present. Evaluation of area based on grid is suggested to minimize the national differences caused by spatial sampling frequency and/or used modelling techniques. Similar approach was used for HELCOM Red list assessment. Reasonable cell size for the grid should be discussed and agreed. Assessment is based on comparison of current situation with reference level (should be agreed, e.g. can be level determined during Initial Assessment). Historical data or current data combined with expert judgement may be used to define the reference level.

Extent
Defined as area inside the shortest continuous boundary which connects the outer corners of the grids where habitat is found at present. Grids that occur only in the unsuitable areas (e.g. terrestrial areas) will be excluded from the extent. Assessment is based on comparison of current situation with reference level (should be agreed, e.g. can be level determined during Initial Assessment). Historical data or current data combined with expert judgement may be used to define the reference area.

Quality
Quality includes the assessment of structure and functions of habitat (e.g. species composition of the benthic community or physical properties reflecting the quality of the habitat e.g. water transparency, presence of oxygen deficiency etc.). Assessment of quality may be based on nationally developed method or on expert judgement. For standardisation of the approach it is possible to develop list of meaningful environmental variables/indexes to be used, should be agreed. Proportion of the area or monitored stations in good status defines status class of the habitat quality.

Human impact (pressure) on the habitat (e.g. Cumulative impact on benthic habitats indicator)
HELCOM pre-core indicator on Cumulative impact on benthic habitats (under development) can be used as fourth component of assessment system.

Table 1. Proposal for overall assessment matrix for indicator "distribution and extent of habitats":

Parameter	**Status**		
	GES	**sub-GES**	**non-GES**
Area	Stable or increasing	Decline <10%	Decline >10%
Extent	Stable or increasing	Decline <10%	Decline >10%
Quality*	≥90% of area or stations in good status	<90-75% of area or stations in good status	>25% of area or stations in bad status
Impact	≥90% of area above threshold	<90-75% of area above threshold	>25% of area below threshold
Overall assessment**	**All "green"**	**One or more "amber", but no "red"**	**One or more "red"**

* The indicator assessed to have worst status decides the quality of habitat when several indicators were used.
** The parameter assessed to have worst status decides the overall status.

Example of application of proposed assessment matrix on Estonian sea area (test case).

To illustrate the proposed approach we have conducted test run on one widespread HUB level 3 habitat in Estonian waters (AA.A Baltic photic rock and boulders + AB.A Baltic aphotic rock and boulders). Assessment result is illustrated by Table 2.

Area

In demonstration exercise the area of the habitat was estimated in 10X10 km cells (Figure 1) (reasonable cell size should be agreed) and compared to area determined in Initial Assessment procedure. No decline in the area was observed so the classification of this property fell into class GES.

Extent

Extent was estimated according to the rules (10X10 km cells in example, terrestrial cells and areas outside of the Estonian territory with EEZ excluded) (Figure 1) and observed extent was compared to one determined in Initial Assessment data and no decline was observed and the classification of this property fell into class GES.

Quality

For this demonstration exercise we used three indicators to describe the habitat quality: 1) status of typical species, 2) modelled Secchi depth, and 3) oxygen deficiency (Figure 2 & 3, Table 2). Threshold values were taken from existing HD assessment scheme (status of typical species), WFD assessment scheme (Secchi depth) or proposed quality classes (Table 1, proposed based on HD thresholds). Based on status of the typical species the quality of habitat was GES. Based on Secchi depth and oxygen deficiency, the habitat quality was sub-GES. Lowest quality indicator determines the quality of habitat.

Impact

Whereas Cumulative impact on benthic habitats is under development, we used BSII layer from previous HOLAS in example. Threshold for the Index value was set to dividing 3rd and 4th quantile of the observed Index variance (Index value 155) (Figure 4). As a result we got that 75% of the habitat was below threshold level and that lead to classification result of sub-GES.

Overall assessment.

Overall assessment of this habitat in Estonian waters turned out to be sub-GES.

Table 2. Example of application of proposed assessment matrix for HELCOM HUB level 3: A. rock and boulder, Estonian EEZ and coastal waters:

Parameter	**Status**		
	GES	**sub-GES**	**non-GES**
Area	22600 km^2, stable		
Extent	31522 km^2, stable		
Quality	Status of typical species: 95% in good status in photic zone	Secchi depth: 76% of the area over 3.2 m Oxygen deficiency: 19% of the area	
Impact		BSII: 75% of the area below 155	
Overall assessment**		**Sub-GES**	

* The indicator assessed to have worst status decides the quality of habitat when several indicators were used.

** The parameter assessed to have worst status decides the overall status.

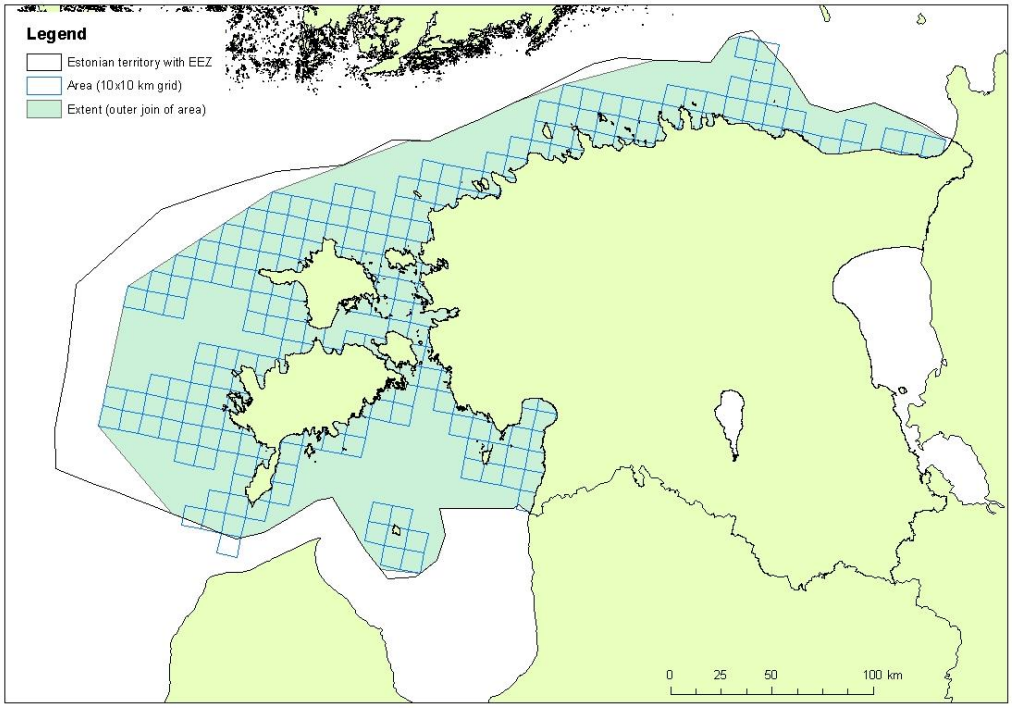

Figure 1. Area and extent of HUB level 3 biotope *AA.A Baltic photic rock and boulders + AB.A Baltic aphotic rock and boulders* in Estonian waters.

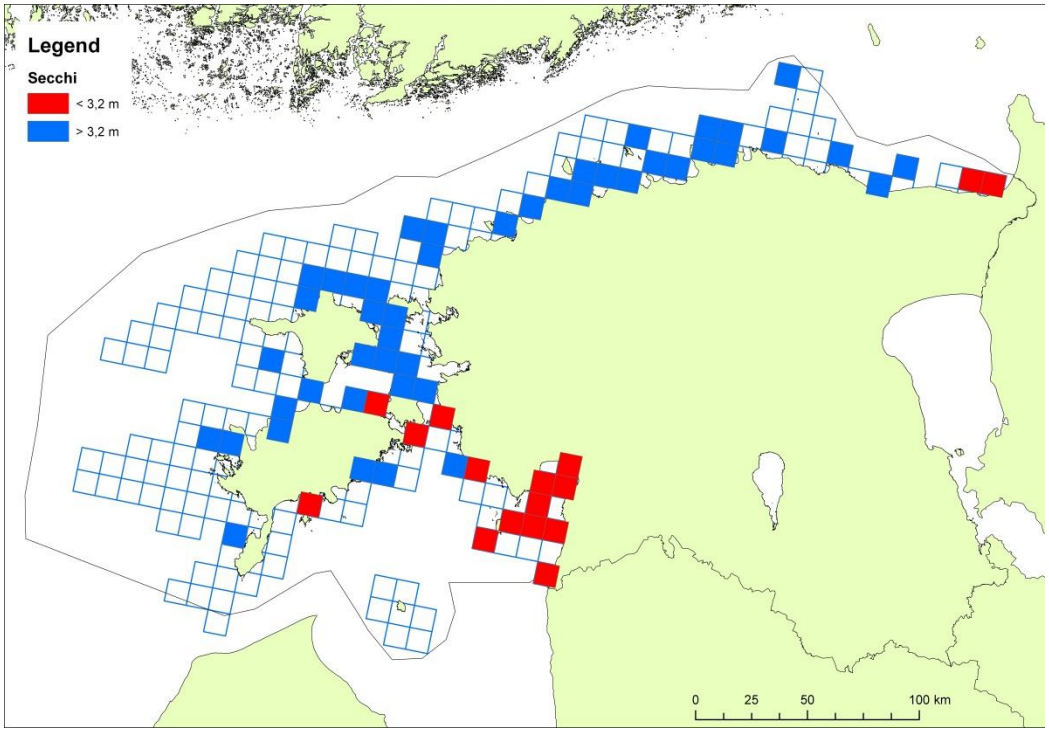

Figure 2. Average Secchi depth from years 2001-2015 used describing the quality of the habitat.

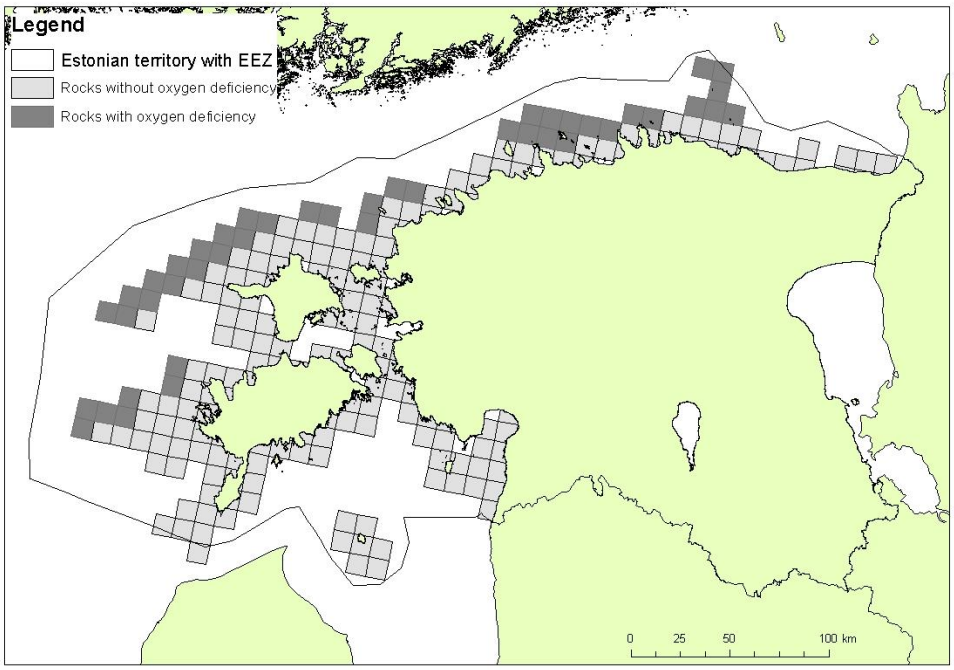

Figure 3. Oxygen deficiency determined by field data collected in 2016.

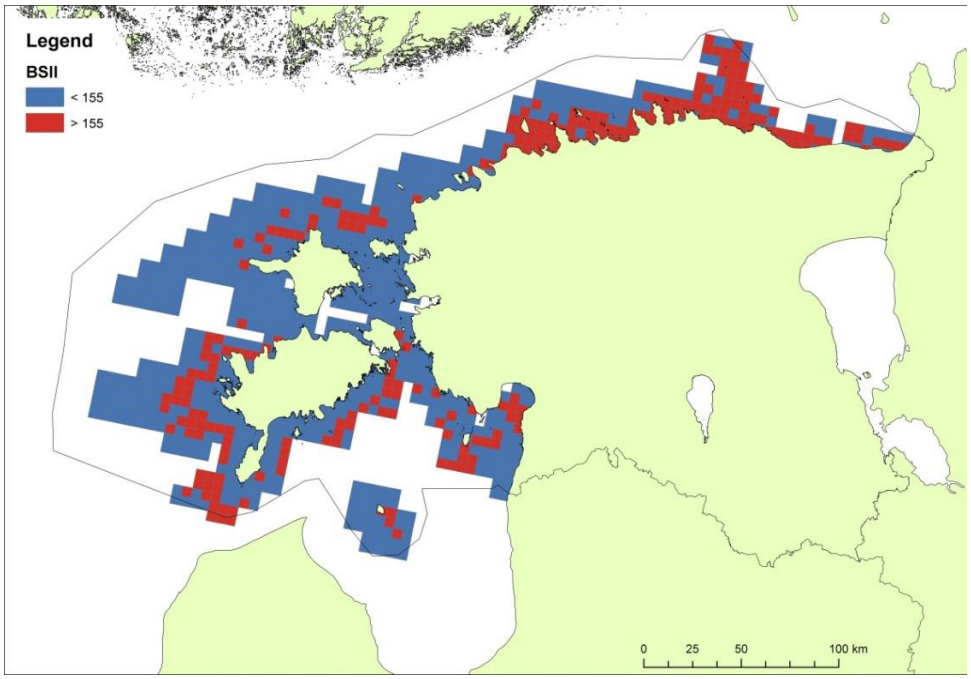

Figure 4. BSII values for assessed habitat.

References

Evans D, Arvela M, 2011. Assessment and reporting under Article 17 of the Habitats irective: Explanatory Notes & Guidelines for the period 2007-2012. Available at: http://bd.eionet.europa.eu/activities/Reporting/Article_17/reference_portal

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