How can we tackle broader and more-detailed habitats within the same assessment.

Georg Martin, Kaire Torn, Antonia Nystrom Sandman, Henrik Nygård

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Problem description

- Currently different marine habitat classification systems are used under different directives and conventions which have different levels of detail.
- No common guidelines exist how to incorporate detailed quantitative biological information in quantitative status assessment of broader habitat types.
- Different legal instruments require harmonization of assessment results.

Work is organized in following steps

- Development of translation matrix between different habitat classification systems used by different directives and conventions (Baltic Sea case),
- Development of guidelines of status assessment aggregation principles between hierarchical units,
- Testing different approaches of status assessment for habitats in test areas.

Translation between different habitat classification systems used by legal instruments (EU Directives) and conventions (Baltic Sea case)

- Currently three different habitat classification systems are used in the Baltic Sea area for describing and assessing status of marine habitats:

  - HD Annex I habitat types
  - HELCOM HUB
  - MSFD

HD Annex I habitat types

- List is based on mixture of:
  - broadscale hydromorphological features,
  - landscape level properties,
  - some selected physical or biological features of marine benthic habitats.
- The list is not all inclusive, but reflects the natural features in most need of protection on European scale.
- Definition of each habitat type includes description of physical features of marine environment in some cases with description of characteristic biological communities or species.
- Differences exist in national interpretations of the definitions of habitats.
- Guidelines exist on assessment of the status of the habitat types and regular reporting system is in place.

Table 6.1 Habitats Directive Annex I habitats considered as 'marine'

Natura code	Annex I habitat name	Marine for Article 17 reporting	Marine for 2010 Biodiversity baseline
1110	Sandbanks which are slightly covered by sea water all the time	X	X
1120	*Posidonia* beds (*Posidonion oceanicae*)	X	X
1130	Estuaries	X	
1140	Mudflats and sandflats not covered by seawater at low tide	X	
1150	Coastal lagoons	X	
1160	Large shallow inlets and bays	X	X
1170	Reefs	X	X
1180	Submarine structures made by leaking gasses	X	X
1650	Boreal Baltic narrow inlets	X	
8330	Submerged or partially submerged sea caves	X	X

Evans, D., Condé, S. & Royo Gelabert E. (2014) *Crosswalks between European marine habitat typologies - A contribution to the MAES marine pilot*. ETC/BD report for the EEA.

Marine Strategy Framework Directive (MSFD)

- List consists of all inclusive list of very broadscale habitat features covering full range of possible habitats on the tidal shelf and open sea.
- Classification system includes both 'predominant seabed and water column types', often referred to as 'Predominant Habitat Types', and 'Special habitat types', which refer especially to those recognized or identified under Community legislation (the Habitats Directive) or international conventions as being of special scientific or biodiversity interest.
- System is compatible with EUNIS.
- Definitions of classification units do not include information on biological features and system does not include hierarchical divisions.
- General guidance on how to assess status exist and this requires information on both distribution pattern and structure of biological communities (New Commission Decision).

Ecosystem component	Broad habitat types	Relevant EUNIS habitat codes (version 2016)
Benthic habitats	Littoral rock and biogenic reef	MA1, MA2
	Littoral sediment	MA3, MA4, MA5, MA6
	Infralittoral rock and biogenic reef	MB1, MB2
	Infralittoral coarse sediment	MB3
	Infralittoral mixed sediment	MB4
	Infralittoral sand	MB5
	Infralittoral mud	MB6
	Circalittoral rock and biogenic reef	MC1, MC2

Ecosystem component	Broad habitat types	Relevant EUNIS habitat codes (version 2016)
	Circalittoral coarse sediment	MC3
	Circalittoral mixed sediment	MC4
	Circalittoral sand	MC5
	Circalittoral mud	MC6
	Offshore circalittoral rock and biogenic reef	MD1, MD2
	Offshore circalittoral coarse sediment	MD3
	Offshore circalittoral mixed sediment	MD4
	Offshore circalittoral sand	MD5
	Offshore circalittoral mud	MD6
	Upper bathyal[31] rock and biogenic reef	ME1, ME2
	Upper bathyal sediment	ME3, ME4, ME5, ME6
	Lower bathyal rock and biogenic reef	MF1, MF2
	Lower bathyal sediment	MF3, MF4, MF5, MF6
	Abyssal	MG1, MG2, MG3, MG4, MG5, MG6

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HELCOM Underwater Biotope and Habitat classification system (HUB)

- System was developed on the basis of EUNIS classification system with the aim to include also biological features of the marine habitats.
- HUB is hierarchical, all inclusive system covering all possible habitats occurring in the Baltic Sea.
- Built in a way to be comparable with EUNIS system.
- Higher hierarchical levels of this system reflect the physical properties of the habitat while lower levels (5-6) represent the biological features of the habitats.
- Clear classification scheme and guidelines exist for identification of the particular habitat.

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HELCOM HUB

Technical Report on the HELCOM Underwater Biotope and habitat classification

Helsinki Commission

Baltic Marine Environment Protection Commission

Table 4. Key to reading the code of biotopes in HUB, the table is not to be used for creating 'new' biotopes by selecting one feature from each level.

Level 1 'region'	Level 2 'vertical zones'	Level 3 'substrate'	Level 4 'community structure'	Level 5 'characteristic community'	Level 6 'dominating taxa'
A. Baltic	A. photic benthos B. aphotic benthos C. seasonal sea ice D. photic pelagic E. aphotic pelagic	A. rock and boulder B. hard clay C. marl D. maërl beds E. shell gravel F. ferro-manganese concretion bottom G. peat H. mud I. coarse sediment J. sand K. hard anthropogenically created substrates L. soft anthropogenically created substrates M. mixed substrate N. above halocline (pelagic) O. below halocline (pelagic)	1. macroscopic epibenthic biotic structures 2. sparse macroscopic epibenthic biotic structures 3. macroscopic infaunal biotic structures 4. no macroscopic biotic structures 5. oxic (pelagic) 6. anoxic (pelagic)	A. emergent vegetation	1. *Phragmites australis* 2. Cyperaceae
				C. submerged rooted plants	1. *Potamogeton perfoliatus* and/or Stuckenia pectinata 2. *Zannichellia* spp. and/or *Ruppia* spp. and/or *Zostera noltii* 3. *Myriophyllum spicatum* and/or *Myriophyllum sibiricum* 4. Charales 5. *Najas marina* 6. *Ranunculus* spp. 7. *Zostera marina* 8. *Eleocharis* spp.
				I. perennial algae	1. *Fucus* spp. 2. non-filamentous corticated red algae 3. foliose red algae 4. kelp 5. filamentous algae
				F. aquatic moss	
				G. epibenthic bivalves	1. Mytilidae 2. *Dreissena polymorpha* 3. *Valvata* spp. 4. *Astarte* spp.
				E. epibenthic chordates	1. *Ascidiacea* / vase tunicate
				B. epibenthic cnidarians	1. Hydrozoa 2. Actiniarida 3. Scleratinida 4. Alcyonacea 5. seapens
				F. epibenthic moss animals	1. crustose moss animals (Electra crustulenta) 2. erect moss animals (Flustra foliaceae)
				C. epibenthic crustaceans	1. Balanidae 2. *Haploops* spp.
				C. epibenthic sponges	
				D. epibenthic polychaetes	1. tube building polychaetes
				B. infaunal bivalves	1. *Macoma baltica* 2. *Cerastoderma* spp. 3. *Arctica* spp. 4. *Mya arenaria* 5. *Astarte* spp. 6. Unionidae 7. *Chamelea gallina* 8. *Abra* spp. 9. multiple infaunal bivalve species: *Cerastoderma* spp., *Mya arenaria*, *Astarte borealis*, *Arctica islandica*, *Macoma balthica* 10. multiple infaunal bivalve species: *Macoma calcarea*, *Mya truncata*, *Astarte* spp., *Spisula* spp. 11. *Ophelia* spp. and *Travisia* spp. polychetes ≥ 10% biomass when disregarding biomass of present bivalves

Development of translation matrix between the three habitat classification systems. MSFD-HD

- Following documents were used:

Links between the Marine Strategy Framework Directive (MSFD 2008/56/EC) and the Nature Directives (Birds Directive 2009/147/EEC (BD) and Habitats Directive 92/43/EEC (HD)) - Interactions, overlaps and potential areas for closer coordination", 27 July 2012.

Evans, D., Condé, S. & Royo Gelabert E. (2014) Crosswalks between European marine habitat typologies - A contribution to the MAES marine pilot. ETC/BD report for the EEA.

- Modifications of the recommended translation matrix were done taking into account Baltic Sea conditions

Draft of translation matrix between MSFD and HD classification systems of marine habitat types in the Baltic Sea.

	1110 Sandbanks which are slightly covered by sea water all the time	1130 Estuaries	1140 Mudflats and sandflats not covered by seawater at low tide	1150 Coastal lagoons	1160 Large shallow inlets and bays	1170 Reefs	1180 Submarine structures made by leaking gasses	1650 Boreal Baltic narrow inlets	8330 Submerged or partially submerged sea caves
Infralittoral rock and biogenic reef									
Infralittoral coarse sediment									
Infralittoral mixed sediment									
Infralittoral sand			*						
Infralittoral mud			*						
Circalittoral rock and biogenic reef									
Circalittoral coarse sediment									
Circalittoral mixed sediment									
Circalittoral sand									
Circalittoral mud									

* In the tideless Baltic littoral is not defined as separate habitat. In tidal environments, habitat type 1140 belongs to Littoral sediment.

Development of translation matrix between the three habitat classification systems. MSFD-HUB

- available guidance documents were used:

translation between MSFD and EUNIS systems provided in the new *Commission Decision laying down criteria and methodological standards on good environmental status of marine waters and specifications and standardised methods for monitoring and assessment, and repealing Decision 2010/477/EU* - modified them according to Baltic Sea conditions.

Evans et al. 2014 *"Crosswalks between European marine habitat typologies - A contribution to the MAES marine pilot"*

- As HUB is hierarchical system and MSFD system covers only the very broadscale features of marine environment only one HUB level (level 3) was included in the translation matrix

Translation matrix between MSFD habitat types HUB level 3 habitats

MSFD	HUB level 3
Infralittoral rock and biogenic reef	AA.A Baltic photic rock and boulders AA.B Baltic photic hard clay AA.C Baltic photic marl (marlstone rock) AA.D Baltic photic maerl beds AA.E Baltic photic shell gravel AA.F Baltic photic ferromanganese concretion bottoms AA.G Baltic photic peat bottoms AA.K Baltic photic hard anthropogenically created substrates
Infralittoral coarse sediment	AA.I Baltic photic coarse sediment
Infralittoral mixed sediment	AA.M Baltic photic mixed substrate
Infralittoral sand	AA.J Baltic photic sand AA.L Baltic photic soft anthrophogenically created substrates*
Infralittoral mud	AA.H Baltic photic muddy sediment AA.L Baltic photic soft anthrophogenically created substrates*
Circalittoral rock and biogenic reef	AB.A Baltic aphotic rock and boulders AB.B Baltic aphotic hard clay AB.C Baltic aphotic marl (marlstone rock) AB.D Baltic aphotic maerl beds AB.E Baltic aphotic shell gravel AB.F Baltic aphotic ferromanganese concretion bottoms AB.G Baltic aphotic peat bottoms AB.K Baltic aphotic hard anthropogenically created substrates
Circalittoral coarse sediment	AB.I Baltic aphotic coarse sediment
Circalittoral mixed sediment	AB.M Baltic aphotic mixed substrate
Circalittoral sand	AB.J Baltic aphotic sand AB.L Baltic aphotic soft anthrophogenically created substrates*
Circalittoral mud	AB.H Baltic aphotic muddy sediment AB.L Baltic aphotic soft anthrophogenically created substrates*

* To be determined in each case separately

Development of guidelines of status assessment aggregation principles between hierarchical units

- The aim of proposed methodology is to transfer the status classification result from lowest hierarchical habitat classification system (level at which the classification of single stations is usually performed) to higher levels (e.g. HUB level 3) with possibility of translation to status of MSFD broad habitat types.

Preconditions of using proposed methodology

- Status of HUB level 5/6 habitat is expressed in numerical continuous value (e.g. EQR/BQR or similar);
- The area of HUB level 5/6 habitat is known in the assessment unit/area;
- In case of applying assessment of limited “important habitats”, those have to be defined for all assessment units.

Proposal for hierarchical aggregation principle of the habitat status classification.

Step 1. Status assessment of HUB level 5/6 habitat. This is performed using a metric expressing the final result in numeric value/ratio.

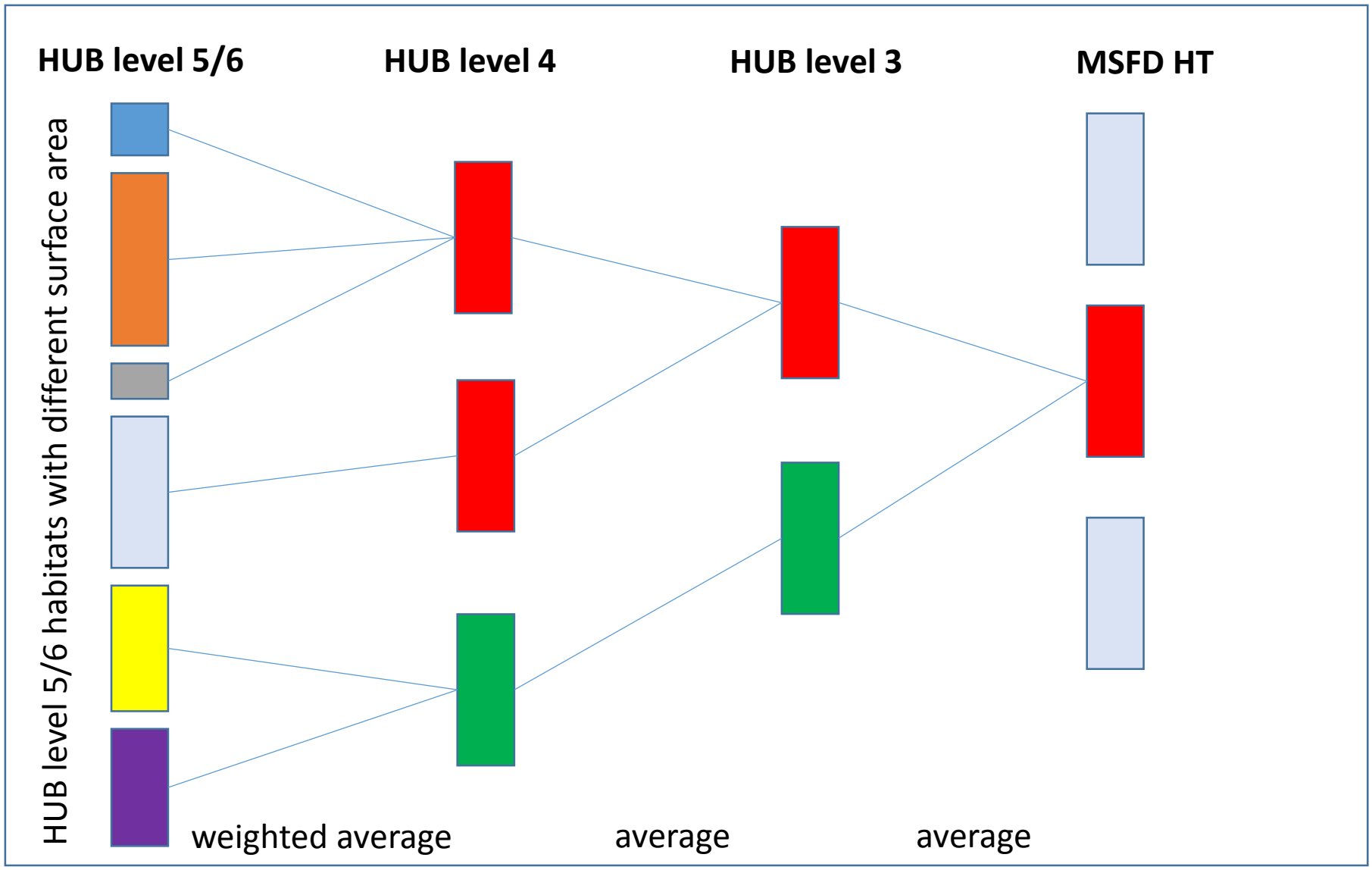
Step 2. Further procedure depends on the use of: A) selected list of "important" HUB level 5/6 habitats, or B) using status classification of all available HUB level 5/6 habitats in the assessed sea area (assessment unit).

Option A). Assessment is done for single HUB level 5/6 "important" habitat. Aggregation for HUB level 4 and 3 is carried out by applying averaging of assessment ratio (EQR/BQR) of previous level.

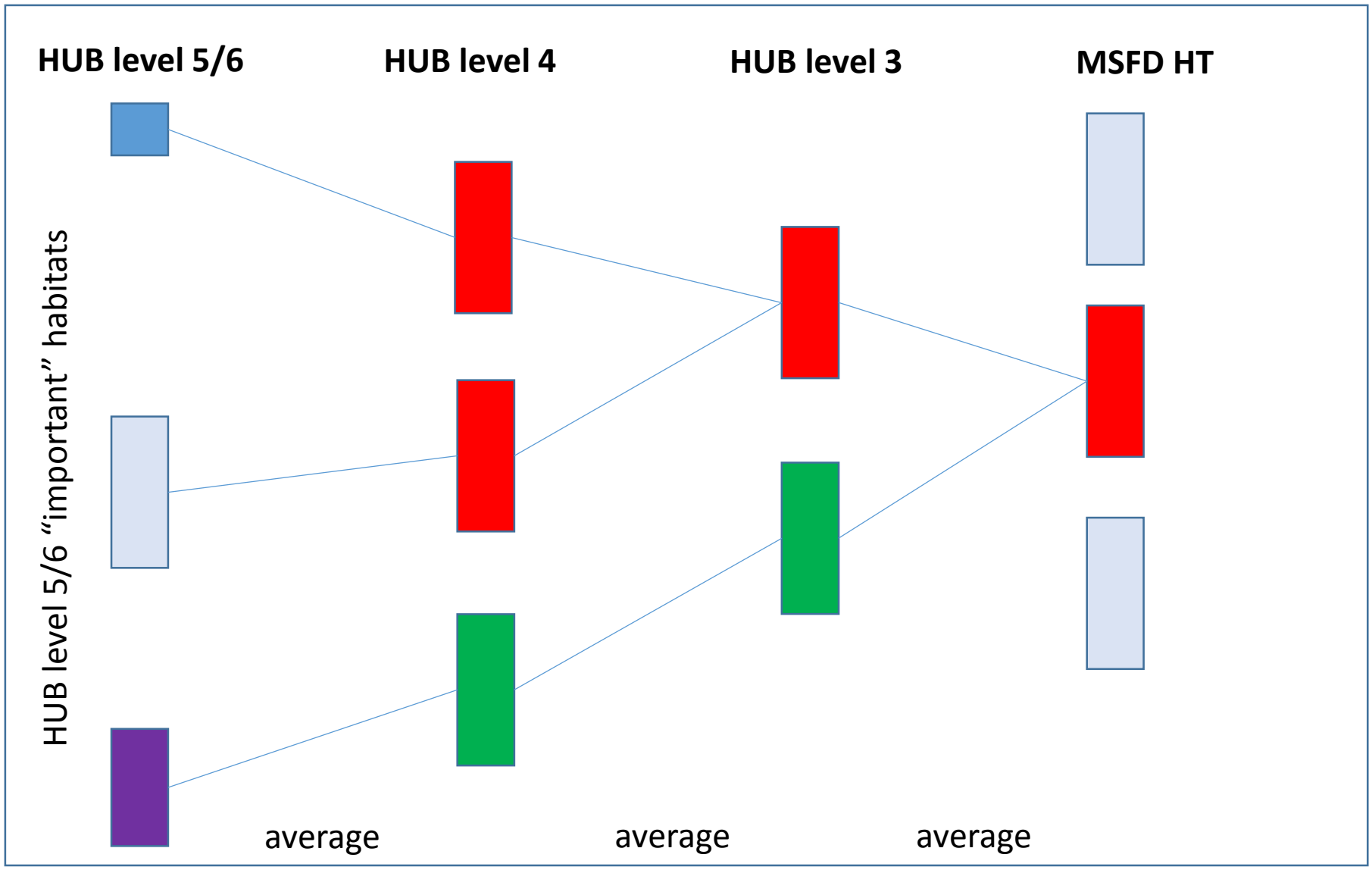
Option B). Assessment is done for each HUB level 5/6 habitat available in assessment unit. Aggregation for HUB level 4 is carried out using weighted averaging using HUB level 5/6 habitat area as weighting factor. Aggregation to level 3 is done through averaging the assessment ratio of level 4.

Step 3. Transfering the assessment result from HUB level 3 to MSFD broad habitat types using the translation matrix

Schematic representation of aggregation methodology, option B



Schematic representation of aggregation methodology, option A



What is needed to apply this method

- Agreement (at least on the level of assessment unit) on the habitat status assessment metric (e.g. HELCOM indicator on condition of benthic habitat)
- In case of Option A – need to know the status and surface area of all HUB level 5/6 habitats in the assessment unit
- In case of Option B – need of agreement on the list of “important” habitats
- Agreement on threshold level (GES/non GES)