



Notes of HELCOM ACTION Workshop 2.2 - Existing and tentative new measures and the status of benthic species and habitats.

The Workshop was held on 4-5 February 2020 at the premises of Finnish Environment Institute.

The Workshop was chaired by Ms. Leena Laamanen, lead of the Impacts on the Seabed Work Package in the HELCOM ACTION Project, an EU co-funded project for which HELCOM acts as coordinator.

Ms. Laura Hoikkala and Mr. Owen Rowe acted as secretaries of the Workshop.

The list of participants is contained in **Annex 1** to this Outcome.

The Workshop opened with a welcome, brief introduction to the Workshop and a round of introductions.

Agenda Item 1: Introduction and overview report

The workshop took note of the progress made on the summary report 'Impacts on seabed - Approaches for assessment and successful measures' from the ACTION project (document 1).

A number of comments and suggestions were discussed, including:

- Consider splitting the figures into infralittoral and circalittoral summaries or pressures and activities so that the overview is more in keeping with the activities in the work package that are largely focussed on coastal activities (restoration) and those more offshore (fishing).
- Clarify that where relative contribution vs actual percentage values are shown and add information (for example an overlaid line chart) indicating the total area affected per region.
- Integrate new data on small-scale dredging (informed that new data had recently been submitted to HELCOM). Important as can be a significant contributor to disturbance.
- Discussed how sand extraction in offshore areas had been noted in some site in Finland to cause loss of sand at nearby beaches (depletion due to re-dispersal to extracted area).
- Clarify in the text or map legend what the map colours reflect. For example, are blue areas areas of low/no impact or where data is not available to make an assessment.
- Discussed how the sensitivity tables show for the Swedish Symphony approach and the apparent difference between those used in equivalent HELCOM SPICE work may also reflect differences in scale of assessment between the HELCOM and Symphony tools. This should be explored and clarified by the authors.
- Noted that positive effects are rarely discussed (e.g. growth of biota on hard substrates from construction). Discussed that it was an interesting concept that should not be ignored, even though the concept is not generally directly addressed/required by the Marine Strategy Framework Directive (MSFD).
- Discussed how the translation between MSFD and HD habitat types may risk excluding the assessment of significant amounts of the seafloor (or habitat type) in many areas, and it should be reflected that these are not exclusive cover of the entire seafloor/benthic habitats in the Baltic Sea.

Agenda Item 2. Coastal restoration measures and potential impacts on Good Environmental Status

The Workshop took note of an introduction to the results from the ACTION project work on collating and evaluation coastal restoration measures as presented by Patrik Kraufvelin (document 2).

The Workshop took note that synopses for the 16 collated measures affecting benthic habitats were submitted to the HELCOM call for synopses for potential new HELCOM measures/actions.

The Workshop took note that in general the effects of the measures are local, and in best cases on a sub-region scale. The Workshop further took note that the cheapest and often the best option for restoration is to leave the site for natural restoration process. The Workshop discussed that it is more efficient to use multiple restoration measures at the same time to tackle the multiple pressures affecting a site.

The Meeting discussed that when restoration of habitats is addressed, protection from what is often left unsaid. The Meeting discussed that the protected areas are often protected only on paper. The Meeting discussed that restrictions in the MPAs are at the moment too low, and better MPAs are needed.

The Workshop discussed that it is important to identify what measures are effective at single MPA level, MPA network level and not at all with MPAs. The Meeting took note that CCB and WWF suggest that MPAs should cover 30% of the Baltic Sea. Within the MPAs, the area of no-take zones i.e. scientific reference zones should be 10 %.

The Workshop discussed that during restoration, the pressure that led to deteriorated status needs to be removed, and for this to succeed, the driving forces behind the pressure should be looked into. For example, in the coastal bays the root cause can be a summer house, which leads to chain of multiple activities, small constructions and small-scale dredging in the site. The Workshop discussed that small-scale dredging is not truly regulated and legislative measures should be reinforced.

The Workshop took note of the task to contribute to evaluation of effectiveness and feasibility of the 16 collated measures affecting benthic habitats. The Workshop took note of the excel table for scoring the measures (Document 2 Att.1), and the scoring made in the SLU Aqua as part of their work in the ACTION Project.

The Workshop agreed that the Workshop participants will introduce themselves to the provided synopses of measures, and that the tables will be filled e.g. pairwise or individually on the second day of the Workshop.

The Meeting discussed, why expert opinion is asked for, as there is scientific evidence existing for each of the listed measures. The Workshop took note that though part of the table could be filled based on literature, there is not sufficient scientific evidence for all measures, and hence complementing with expert evaluation is needed, and that the ranking needs expert evaluation. The Workshop discussed that the evaluation based on only scientific evidence is neither fully objective, as it is based on the interpretation made by the individual researcher.

The Workshop discussed that the level of certainty of the expert should be included in the evaluation.

The Workshop took note that all measures are not relevant for all countries and regions.

The Workshop discussed that the purpose of the evaluation is to support decision makers.

The Workshop considered that the cost effectiveness is important criteria for decision makers.

The Workshop noted that the evaluation supports selection of new measures, whereas SOM platform surveys address the existing measures.

The Workshop discussed that the expert evaluation by the Workshop will be biased, as the participants are all from the northern part of the Baltic Sea.

The Workshop took note that the evaluation request has been distributed to HELCOM contracting parties (including EN BENTHIC), but no responses have been received. The Workshop took note that a plan B is probably needed for areal evaluation of where the measures would be most efficient. This could be e.g. based on existing maps on habitats.

The Workshop took note that CCB and WWF which have members in all Baltic Sea countries can forward the evaluation and try to get expert responses also from the southern part of the Baltic Sea.

The Workshop discussed that lagoons should be included as well. The Workshop discussed that in part, results should be similar for lagoons and wetlands.

The Workshop discussed the evaluation criteria, and noted that some, such as the spatial scale have stronger effect on the effect of the measure, and they should weigh more. It was discussed that e.g. fish spawning areas might get a lower total score, though their significance for the ecosystem is wide.

The Workshop discussed that weighting would also result in a subjective decision. The Meeting further discussed whether the sum of scores should be removed, as the criteria are not comparable. The Workshop noted that some relevant criteria that should be taken into account when taking the sum may be missing. Looking at the overall table was considered more useful. The Workshop discussed that a traffic light plot would be good visualization for the evaluation.

The Workshop discussed the mode how to make the evaluation and how consensus evaluation should be formed. The Workshop agreed that the participants will first give scores individually.

The Workshop took note that it is not necessary to fill the whole table, and that the participants can fill only those parts that they feel comfortable with. The Workshop welcomed any contribution by the experts.

The Workshop participants filled individually the coastal restoration evaluation tables. The scores were combined and averaged. The average scores will be available in the Meeting Site (document 2 Att.1 rev.1). The Workshop took note of the table with combined responses.

The Workshop discussed the evaluation criteria “General significance of the measure from a threat perspective, i.e. does the measure concern e.g. habitat forming or immediately threatened species?”. The Meeting discussed that the target is narrow and an additional criteria for threat perspective might be needed.

The Workshop took note of the dispersion (standard deviation) between individual answers and discussed that the agreement was in many cases high.

The Workshop discussed that the wording of “general significance of the measure from an environmental risk perspective” may have caused misinterpretations.

The Workshop noted that in the evaluation, the lowest scores had highest dispersion and hence lowest confidence. The Workshop discussed that the same topics are more controversial also in literature.

The Workshop discussed that protected areas are often considered as “no take areas”, but most of them only restrict industrial use. In some protected areas, regulated activities are not necessarily affecting the target species or habitats. The Workshop discussed that there are very few no fishing areas. It was further discussed that regarding some coastal fish species, recreational fishing catches are higher than the commercial fishing catches.

The Workshop discussed restrictions on fishing and information collected on the recreational fishing in Finland and Sweden.

The Workshop considered what are the most important criteria in the score card in determining how efficient the measures are. The Workshop discussed that the spatial and temporal scales and cost effectiveness very important, in addition to the combination of the criteria.

The Workshop discussed the need for complementary measures. The Workshop discussed that the measures treating only symptoms always need complementary measures.

The Workshop discussed cost-effectiveness of measures. The Workshop discussed that for those measures that got high cost-efficiency scores there is literature available. It was further discussed that those measures cover a lot of aspects of the environment and affect longer temporal scales and wider spatial scales.

The Workshop noted the low cost-efficiency score for measures targeting key species. The Workshop discussed that those measures are generally highly work intensive.

The Workshop discussed that biomanipulation is generally a risky measure.

The Workshop discussed that based on the exercise, the measures cannot probably be ordered, as the order is case specific, and the pros and cons differ. The Workshop however considered that there occurs mutual agreement for those evaluations, where high scores were obtained with low deviation.

The Workshop discussed the need to complement measures with other measures. The Workshop discussed that most measures work better when combined with other measures, which should not affect negatively the evaluation of the measure.

The Workshop discussed circulating the evaluation to WWF. The Workshop discussed that the occupation of the people responding to the evaluation should be given for transparency.

Agenda Item 3. Fisheries management activities and potential impacts on Good Environmental Status

The Workshop took note of the results from the ACTION project work related to spatial fisheries management, and the potential for such approaches to support the achievement of Good Environmental Status for benthic habitats as presented by Francois Bastardie. The work done covers several potential management scenarios, includes a comparative assessment and evaluates the potential for application of the approach (the DISPLACE model) related to by-catch. (The presentation and draft project report, document 3, will not be publicly available. Publication will be added to the Meeting site when available).

The Meeting took note that the manuscript will be submitted within a week and will most likely be available by the end of the year.

The Workshop noted the outcome of the analyses, that spatial closures, starting from the peripheral areas of existing fishing grounds, did not improve the status of benthos in the central Baltic, whereas in the Kattegat the same actions clearly improve the state of the benthos. The Workshop took note that this can be explained by the much higher fishing effort in the Kattegat compared to the Baltic Sea, higher natural disturbance affecting pristine areas in the Baltic Sea e.g. due to variations in the salinity and temperature, and the longevity of species in the Kattegat compared to the Baltic Sea.

The Workshop discussed that based on the results, bottom trawling is not a high direct pressure in the Baltic Sea, though it has strong affect to the ecosystem via removal of fish. It was discussed that in the Kattegat closure of parts of fishing areas has high potential for protection of benthic communities.

The Workshop further discussed that in addition to longevity, the communities in Kattegat are more sensitive to fishing disturbance as large share of the species are sessile, whereas in the Baltic Sea most species are mobile. It was discussed that mussels are adversely affected also in the Baltic Sea.

The Workshop discussed that having longevity as the sole metric for quality of benthic community is a weakness of the model. It was however noted that life span correlates with other central qualities such as motility.

The Workshop noted the result of the analyses, that in the Kattegat closure areas also benefitted fishing, whereas in the Baltic Sea, fishing was adversely affected.

The Workshop noted that in the Kattegat, also harbour porpoises were positively affected, as the time used for fishing decreased when the catches were improved as a result of closures.

The Workshop took note that Natura 2000 sites mainly designed for protecting breeding zones of bird populations were assumed in the simulations to be where the birds distribute, as there was no data on bird distribution available.

The Workshop discussed that also protection areas designed for protecting harbour porpoises could be used in the analyses.

The Workshop discussed that it needs to be kept in mind that it is difficult to find comparable pristine reference areas, as the non-fished areas normally have different substrate. The Meeting took note that in the simulations, areas with fishing activity under a threshold were used as reference.

The Workshop discussed the chosen five-year simulation period used the analyses, and whether the period is too short for detecting recovery of habitats. The Meeting took note that the period cannot be extended further without increasing too much the uncertainties.

The Workshop discussed the approach of having small vessels included as one super vessel. The Workshop noted that all relevant vessel size classes were included in the analyses, and that the fishing area for small vessels was covered.

The Workshop discussed that when using the results to support BSAP, the limitations of the approach should be communicated. The Meeting noted that the analyses are robust. The Meeting took note that new input data can be added to the model. The Meeting discussed that including biodiversity, life cycles etc. could be of interest.

The Meeting took note that the model will be rerun for harbor porpoises and could be rerun to include e.g. wintering bird areas.

Agenda item 4: Potential new measures and actions to support the update of the Baltic Sea Action Plan

1. Implement appropriate barriers for the deposition of dredged material to prevent dispersal and spread.

Paragraph of text: Deposition of dredged material can result in extensive dispersal of material (material that may contain other associated toxic compounds) outside of the main dumping target area. Best available technologies and barriers should be implemented to ensure that dispersal is limited and that deposited materials impact on the smallest area possible. Improvements in the procedures for the disposal of dredged material should also be explored, such as land-based disposal (and cleaning where relevant). Improved processes and technologies to de-water such materials and handle them should also be supported to facilitate improvements in land-based disposal.

2. Implement appropriate protective curtains for the dredging operations to prevent dispersal and spread of material

Paragraph of text: Dredging operations can result in dispersal of material (material that may contain other associated toxic compounds) outside of the main area of the activity. Best available technologies and barriers, such as protective curtains, should be implemented to ensure that dispersal is limited to a smallest area possible. A protective curtain was used in the Vuosaari harbor, Finland during dredging in order to reduce turbidity in nearby areas. The curtain was built between two embankments and it had a gate through which vessels could enter the harbour area. (Vatanen et al. 2012.) The effects of the curtain were studied by Vatanen (2006). Increased turbidity was found in nearby areas outside the curtain, but the amount of turbidity was substantially lower than inside the protective structure. A part of the curtain was removed for autumn 2005 which substantially increased turbidity in nearby areas. (Vatanen 2006). Thus, it was deduced that the curtain reduced turbidity in nearby areas during dredging (Vatanen et al. 2012).

3. Improved regulation and reporting of small-scale dredging

Paragraph of text: New regulations should be implemented to require the reporting of small-scale dredging. An equivalent approach as EIAs should be developed to require application, approval and monitoring effects for small-scale dredging and deposition of the dredged material. While small-scale dredging may appear to impact only very localised areas the regularity, commonality and impacts on sensitive and often fragmented ecosystem components can be severe. Such changes should go hand in hand with a public awareness drive. Small scale improvements would have impacts on sub-regional and regional connectivity and improve status of the seabed habitats and e.g. fish spawning areas.

4. Mixing within deeper water layers to encourage oxygenation at the benthic-pelagic interface.

Paragraph of text: Anoxia is a significant factor in the Baltic Sea and both deeper and shallow areas are commonly impacted. The mixing of water within salinity (halocline) or temperature (thermocline) layers can improve the oxygen level and availability at the benthic-pelagic interface, thereby improved the status of benthic habitats. The mixing of water could be done by encouraging the vertical mixing by pumping oxygen-rich water within/inside the water column. There has been very small scale try outs of oxygen pumping in shallow inner bays both in Sweden and Finland with inconsistent success.

5. Speed limits for recreational boating in shallow coastal areas and larger boats near shore.

Paragraph of text: Large commercial vessels in near-shore areas and localised but regular recreational boating in shallow coastal areas can cause a significant disturbance on benthic habitats. Speed of travel is a major factor in the level of physical disturbance. Slow steaming of commercial vessels in near-coast areas or sections of their journeys should be reviewed and made more stringent, and speed limitations for recreational boats in coastal, especially shallow or sensitive areas, should be implemented and managed.

6. Harvesting of reed and excessive vegetation (plants and macroalgae) and harvesting drifting macroalgae (e.g. from shallow bays and via beach clean up).

Paragraph of text: Removal of excessive biomass in the form of rooted vegetation and drifting macroalgae from shallow coastal waters and the coastal zone will prevent later breakdown of biomass from resulting in the oxygen depletion and potential formation of anoxic environments

(Harlén & Zachrisson 2001). It may also support fish nursery areas, increase biodiversity and contribute to a broader use of the areas in question.

In many inner archipelagos, narrow sounds and in flads, overgrowth of some macrophyte species, especially reed can prevent fish migration and reduce biodiversity and contribute with a high amount of excessive biomass (Sandström 2003, Pitkänen et al. 2013, Altartouri et al. 2014, Meriste & Kirsimäe 2014). Even though the vegetation also may be important by contribution of nursery areas and refugia for e.g. fish and invertebrates (Härmä et al. 2008, Lappalainen et al. 2008, Snickars et al. 2010, Nilsson et al. 2014), a very dense vegetation may be negative (Kneib & Wagner 1994, Weinstein & Balletto 1999, Sandström 2003).

Mass occurrences of drifting macroalgae can disturb the natural vegetation of an area and their associated communities of invertebrates (Harlén & Zachrisson 2001, Heikkilä & Mattila 2001, Pihl 2001). In many areas, for instance in the Åland archipelago, in Gotland and in southern and western Sweden, the problem of drift algae is locally considerable and at some places, drifting macroalgae may cover 30–50% of the nursery areas for some fish species (Harlén & Zachrisson 2001, Heikkilä & Mattila 2001, Pihl 2001, Bisther 2015). Different ways of mechanical harvesting of the macroalgae have been used. Macroalgal harvest leads to decreased problems with rotting algae and overgrowth of shores and also a net removal of nutrients and availability of material for bioenergy (Risén et al. 2014, 2017). The harvest and use of macroalgae may also constitute a problem as many species such as bladder-wrack may contain heavy metals (Söderlund et al. 1988, Bisther 2015), whereas several species of red algae may contain organic pollutants (Malmvärn et al. 2008).

7. Public awareness of potential impact of human activities on coastal ecosystems.

Paragraph of text: Many activities taking place in coastal areas at the local and private scales are simply behaviour or practical solutions that have been carried out without a broader understanding of their impacts (e.g. local dredging, dumping of that material, fishing). With increasing use of the coastal environment and expanding/increasing populations, the aspect of public awareness is critical. Not only is it vital that the public are aware of the impact of their own actions, even at the local or small scale, but such awareness will be a significant factor in the acceptance and following of any other measure targeting activities and requiring behavioural changes. Awareness, for example, of the best available practices for dredging, any new requirements (if implemented), the impact of activities, habitats and species that are under pressure, or fish species that should preferentially be eaten (others not), would all provide a basis for local action and acceptance of new measures. Comprehending that small actions can support an improvement of status, and the larger knock-on effect of local action at the sub-regional/regional scale (especially for mobile species), can only be beneficial.

8. Elimination of invasive plant *Elodea*.

Paragraph of text: *Elodea* is an invasive waterweed that can rapidly colonise extensive areas of shallow coastline. The degradation of the abundant biomass formed can subsequently create problems with anoxia. Elimination or control of this invasive plant would be an effective way to manage potential degradation of oxic conditions but also to remove excess nutrients. However, the success of the elimination should be carefully planned and implemented as in some cases the uncaredful elimination has resulted in increased abundance (studied in Finnish lake conditions in Karjalainen et al 2017). Outside Umeå in Sweden, two non-indigenous invasive *Elodea*-species (*Elodea canadensis* and *Elodea nuttallii*) have established in the Gulf of Bothnia and these species are causing eutrophication-like problems when they die and are broken down. Covering (shadowing)

the plants (killing by darkness) has been suggested as a "restoration measure", although this may also cause damage to indigenous aquatic macrophytes.

9. No further expansion of fishing effort to areas not already impacted by existing fishing activities.

Paragraph of text: The DISPLACE model indicates that in the Baltic Sea the dominance of short-lived benthic species means that little significant evidence is found for improvements in the benthic community by the displacement of fisheries activity away from peripheral areas. There are however certain caveats that need to be considered. The longevity trait is utilised as the primary factor on which the model assesses the fragility of the benthic species, and this may overlook other significant factors (e.g. the importance of a few long-lived keystone benthic species for predators and food web function, or more historic/pristine conditions where the benthic community may have included other species). However, a precautionary approach based on the currently available analysis would suggest that fishing effort should be limited to existing trawled areas so that non-impacted areas are not exposed to activities that could result in a dramatic degradation of their current status.

10. Reduction of fishing pressure and development of Good Environmental Status delineation, supported by no go areas to determine benthic species recovery and potentially natural communities.

Paragraph of text: Instead of displacing the fishing pressure, an overall reduction of fishing pressure (e.g., by reducing the contact of the fishing gears with the seafloor) would likely enable areas impacted by fishing activities to develop more stable and natural (undisturbed) habitat characteristics. While it does not appear to bring any immediate benefit from diminishing the fishing effort on already trawled areas (based on modelled predictions from the DISPLACE), the model does suggest that providing areas where the fishing impact is reduced could be most relevant in areas impacted by intermediate level of fishing pressure. Such an approach could maintain a balanced level of fisheries activities in the highly productive zones without risking the displacement of higher activity to areas already less strongly impacted by bottom contacting trawling. Therefore, an overall reduction of fishing pressure associated no-go areas to maintain a network of untrawled areas, particularly associated with an appropriate network of well-connected habitat types, may also enable a stable and 'natural' benthic community to develop, thereby providing some guidance in setting threshold values for good status.

11. Maintain areas around windfarm construction free from fishing activities, particularly those impacting the seafloor, to support benthic habitats and communities and the associated food web. The role of such areas, particularly within a broader network of benthic habitats or protected zones, should be regulated and researched to understand the potential benefit in supporting Good Environmental Status.

Paragraph of text: Construction of windfarms create an initial and often immediate impact on the benthic habitats, the footprint of the structures clearly creating a loss of habitat. These areas, however, may subsequently attract and provide refugia for species, mobile (e.g., pelagic) and more sedentary (e.g., benthic species). In addition, the new constructions provided by hard structures could perceivably represent habitat for certain species associated with hard substrates. More significantly, these areas may represent important staging points for certain species and the associated food webs, and processes linked with them. These areas should be tightly regulated to prevent activities (e.g., prevention of fishing or shipping) that cause disturbance of the seafloor and pelagic habitats (and associated biota), and the biodiversity and status of these zones should be

monitored and researched to fully understand their potential contribution to Good Environmental Status in the Baltic Sea region.

12. Specific measures to address and protect all biogenic structures.

Paragraph of text: Biogenic structures on the seafloor should be explicitly protected and be off limits for activities that cause physical disturbance. The slow recovery or irreversible loss of such structures require strict measures to protect them.

13. Limit and preclude dredging/extraction near protected areas and increased buffer zones round sensitive areas.

Paragraph of text: Dredging and extraction should be prohibited in and around sensitive and/or protected areas. Both activities cause direct physical disturbance to the habitat and the resident biota in the areas are directly impacted by the activity. In addition, disturbance due to the spread of suspended particles and other materials/substances had the potential to impact on a much wider spatial areas than the directly extracted/dredges point. Moreover, persistent activities in the same or nearby locations can prevent recovery of biota and can alter the habitat type by successively altering the physical structure of the substrate (e.g. removal of fine sand may result in loss of that habitat). These activities can thus alter the physical and biotic components of benthic habitats and may entirely remove a habitat type. Prevention of these activities in protected/sensitive areas and increased buffer zones around them (i.e. no dredging or extraction activities in the buffer zone) will prevent disturbance and loss due to the direct and indirect effects of the activities. Applying buffer zones have been applied and tested successfully in the U.S (Michel et al 2013).

14. Removal of unnecessary dams and migration barriers, especially in small waterways.

Paragraph of text: Dams and barriers in small waterways prevent natural flows and processes, and can interfere with migratory fish. Removing unnecessary obstructions, particularly in small waterways, should provide better habitat formation and has the potential to improve water quality in coastal areas. Such improvements would contribute to green infrastructure benefits such as the potential for fish nurseries and wetland areas to form.

15. Improved coastal planning to concentrate movement of smaller vessels in sensitive and shallow coastal areas.

Paragraph of text: Coastal areas are often well utilised by recreational boating. These shallow areas are susceptible to disturbance by boating activities (e.g. displacement on the move, anchoring) especially where no clear regulations apply. Shallow coastal areas are important productive zones, commonly providing food and shelter for juvenile fish. Coastal environments are also impacted by cumulative pressures, for example multiple stressors due to terrestrial inputs, and the additional disturbance from recreational boating can be a significant compounding issue due to both traffic and mooring (Sagerman et al 2020). Providing public outreach in combination with guidance to concentrate boating routes in appropriate channels should release significant areas of the coastal benthic habitat from additional disturbance. Small guidance buoys could provide indication of appropriate pathways in popular or heavily trafficked areas.

Agenda Item 5. Estimating effectiveness of measures

This agenda item was covered under agenda item 2.

Annex 1 List of Participants

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