



Document title	Review of synopses on potential new actions for the updated BSAP
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Agenda Item	3 – Implementation and update of the Baltic Sea Action Plan
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Submitted by	Secretariat

Background

In addition to the synopses on potential new measures and actions for the updated Baltic Sea Action Plan set out in document 3-6, a proposal on “Measures related to restoration of coastal habitats” includes actions of relevance for the Fish Group. More information can be found attached to this document.

Action requested

The Meeting is invited to consider the information and undertake a technical review of the synopses based on the common guidance.

Two additional proposals relevant for the Fish Group

In the proposal on “Measures related to restoration of coastal habitats”, actions nr 8 and 12 are considered to be of most relevance for the Fish Group. For ease of reference they are copied below. All proposals on measures on restoration of coastal habitats can be found via [this link](#).

Title	Submitted by	Considered also by Working Group
<p>Measures related to restoration of coastal habitats:</p> <ol style="list-style-type: none"> 1) Restoration of eelgrass, <i>Zostera marina</i> 2) Restoration of soft bottom macrophytes (other than eelgrass) 3) Restoration of brown macroalgae, mainly <i>Fucus vesiculosus</i> 4) Restoration of blue mussel reefs 5) Restoration of stony reefs 6) Restoration of soft bottoms free of vegetation 7) Restoration of coastal wetlands 8) Strengthening piscivorous fish to rehabilitate coastal ecosystem function 9) Reducing nutrient loading by farming and harvesting blue mussels 10) Rehabilitation of hypoxic areas by oxygen pumping 11) Reducing internal phosphorus loads by metal bounding 12) Biomanipulation to remove cyprinds and sticklebacks and rehabilitate coastal ecosystem function 13) Rehabilitation of anoxic, nutrient rich or polluted sediments by removal or coverage 14) Rehabilitation of hard bottoms by establishment of artificial reefs 15) Protection of habitats 16) Follow-up and knowledge sharing 	SLU Aqua, Sweden	State&Conservation

Title
8. Strengthening piscivorous fish to rehabilitate coastal ecosystem functioning
Submitted by: SLU Aqua, Swedish University of Agricultural Sciences, Sweden; HELCOM ACTION
Description of measure Protection of shallow coastal environments, applying fishing and boating regulations, restocking, stock enhancements, controlling seals and cormorants, etc. in order to restore populations of predatory fish.
Activity: This refers to past activities leading to loss of functions such as natural spawning habitats. Land claim Canalisation and other watercourse modifications (coastal dams, culverting, trenching, weirs, large-scale water deviation) Coastal defence and flood protection (seawalls, flood protection) Restructuring of seabed morphology (dredging, beach replenishment, sea-based deposit of dredged material) Fish and shellfish harvesting (bottom-touching towed gears, professional, recreational) Fish and shellfish harvesting (pelagic towed gears, stationary gears, professional, recreational) Aquaculture – marine, including infrastructure Agriculture Forestry
Pressure: <i>Loss of, or change to, natural biological communities due to cultivation of animal or plant species</i> <i>Disturbance of species: Visual, presence, boating, recreational activities, above-water noise</i> <i>Disturbance of species: Other (e.g. barriers, collision)</i> <i>Extraction of target fish and shellfish species and incidental fish catches</i> <i>Physical disturbance to seabed (temporary or reversible and recovers within 12 y)</i> <i>Physical loss (due to permanent change of seabed substrate or morphology and to extraction of seabed substrate)</i> <i>Changes to hydrological conditions</i> <i>Input of nitrogen</i> <i>Input of phosphorous</i> <i>Input of organic matter – diffuse sources and point sources</i> <i>Input of anthropogenic sound (impulsive, continuous)</i> <i>Input of other forms of energy (including electromagnetic fields, light and heat)</i>
State: The measures are undertaken to counteract decreased abundance and size of predatory fish which are present at a Baltic Sea wide scale. Fish
Extent of impact: The positive impacts are mainly local, within coastal areas, but with a potential for positive basin-wide effects.
Effectiveness of measure The goals are strengthened populations of predatory fish and of large individuals, which may also relieve eutrophication symptoms and serve to strengthen habitats through re-establishment of trophic control (see e.g. Östman et al. 2016 and references therein). Several measures can be considered out of which not all have been rigorously tested. For example, fisheries no-take areas can lead to strengthened populations of predatory fish (Egriell et al. 2007, Wikström et al. 2016, Bergström et al. 2019).
Cost, cost-effectiveness of measure:

Costs for protection measures by creating no-take areas are very low. Principally they can be established more or less for free unless bought land and water areas are included or some compensation fees need to be paid to former users.
Feasibility: Highly feasible in combination with fisheries management
Follow-up of measure: -
Background material: -
References Bergström, L., Karlsson, M., Bergström, U., Pihl, L., Kraufvelin, P., 2019. Relative impacts of fishing and eutrophication on coastal fish assessed by comparing a no-take area with an environmental gradient. <i>Ambio</i> 48:565-579. Egriell, N., Ulmestrand, M., Andersson, J., Gustavsson, B., Lundälv, T., Erlandsson, C., Jonsson, L., Åhsberg, T., 2007. Hummerrevsprojektet, slutrapport 2007. Konstgjorda rev i Göteborgs skärgård (år 2002–2007). Länsstyrelsen i Västra Götalands län. Rapport 2007:40, 128. (In Swedish). Wikström, A., Sundqvist, F., Ulmestrand, M., Wennhage, H., Bergström, U., 2016. Ett fiskefritt område för skydd av hummer och rovfisk i Göteborgs skärgård. S. 159-180 i: Bergström m.fl. 2016. Ekologiska effekter av fiskefria områden i Sveriges kust- och havsområden. Aqua reports 2016:20, Institutionen för akvatiska resurser, Sveriges lantbruksuniversitet, Öregrund. (In Swedish). Östman, Ö., Eklöf, J., Eriksson, B.K., Olsson, J., Moksnes, P.-O., Bergström, U., 2016. Top-down control as important as nutrient enrichment for eutrophication effects in North Atlantic coastal ecosystems. <i>J Appl Ecol</i> 53:1138-1147.

Title 12. Biomanipulation to remove cyprinids and sticklebacks and rehabilitate coastal ecosystem functioning
Submitted by: SLU Aqua, Swedish University of Agricultural Sciences, Sweden; HELCOM ACTION
Description of measure Biomanipulation through fisheries targeting mesopredators as cyprinids or sticklebacks aims at re-establishing or affecting trophic structures in ecosystems where these have been altered. The alterations may for example be due to overfishing of large predatory fish, eutrophication or beneficial conditions for mesopredators and lead to a dominance of mesopredators (i.e. small predators in the food web) such as cyprinids and stickleback in the Baltic Sea and wrasses, shore crabs and black goby in Kattegat. The measure can also be undertaken to reduce the amount of nutrients. Biomanipulation of planktivorous fish has been tested as a restoration method in lakes (Hansson et al. 1998, Lammens 2001, Mehner et al. 2004), but biomanipulation is a relatively untested measure in marine systems (but see Jokinen & Reinikainen 2011, Sandström 2011, https://johnnurmisenfaatiao.fi/en/projects/local-fishing-project/). On a general level, enhancing trophic regulation in coastal fish populations has been suggested as a potential measure for essential seagrass and seaweed areas of the Baltic Sea (Östman et al. 2016).
Activity: Not applicable
Pressure: <i>Extraction of target fish and shellfish species and incidental fish catches</i> <i>Changes to hydrological conditions</i>

<p><i>Input of nitrogen</i> <i>Input of phosphorous</i></p>
<p>State: Changed trophic structures call for measures to reduce the amount of mesopredators in the ecosystem. Eutrophication of coastal water bodies calls for measures targeting internal nutrient loading and excessive nutrients available in the water column. Fish Pelagic habitats Seabed habitats</p>
<p>Extent of impact: Mainly local and within coastal waters, but possibly some impacts could be achieved at the sub-basin level.</p>
<p>Effectiveness of measure Biomanipulation measures could be undertaken to counteract increased eutrophication symptoms and problems with trophic cascade effects (Östman et al. 2016). Biomanipulation by removing sticklebacks (http://balticsea2020.org/alla-projekt/rovfisken/12-rovfisken-pagaende-projekt/464-trala-efter-storspigg-i-bottenviken), for instance, could provide positive effects both through the trophic regulation of filamentous algae and decreased stickleback predation on the egg and larvae of predatory fish, although this has not been tested (Byström et al. 2015, Bergström et al. 2015). Biomanipulation targeting cyprinids is another alternative and this has been tested in Finland, however, without much success with regard to a decrease in total biomass of bream nor as improved water quality (Jokinen & Reinikainen 2011).</p> <p>As biomanipulation of ecosystems is very complicated with high risk of failures, the effects and possible successes are hard to perceive. Therefore, methods for biomanipulation, if they are considered relevant, should first be tested at a very small local scales. A positive side-effect of targeted biomanipulation would be that nitrogen and phosphorus also are removed from the ecosystem together with the caught fish (Hjerne & Hansson 2002). Biomanipulation through targeted fisheries is one of the few methods available that are capable of direct removal of nutrients already present in the marine ecosystem.</p>
<p>Cost, cost-effectiveness of measure: There is a general lack of details with regard to biomanipulation costs for Baltic Sea fish, but Sandström (2011) reported a cost of 160 euro per kg P in their biomanipulation study of cyprinid fishing in Östhammar, eastern Sweden. For the cyprinid fishing in the Archipelago Sea in Finland, it is estimated that 8 tonnes of phosphorus can be recycled from the sea on a yearly basis (https://johnnurmisensaatio.fi/en/projects/local-fishing-project/). This cyprinid fishing is also self-sustaining at the moment, i.e. the phosphorus reduction takes place for free as it results in a food product that is consumed by humans. All that was needed to get this going was some initial efforts to achieve a useful product and then find a market for it.</p>
<p>Feasibility: The measure is probably feasible only at small and highly controlled scales.</p>
<p>Follow-up of measure: -</p>
<p>Background material: Geographical areas where the measure has been tested in the small-scale: Pickalaviken, Gulf of Finland and the Archipelago Sea (southern Finland) and Östhammarsfjärden (Eastern Sweden) for testing reduction fishery of cyprinids; Åland (Finland), Gulf of Bothnia and Östergötland (Sweden) for testing biomanipulation targeting sticklebacks.</p>
<p>References</p>

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