
Document title	Danish comments to the indicators in general (presented by MSFD Descriptor) and comment to preliminary priority set out at HELCOM Indicator WS1.
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Background

In preparation for the Second HELCOM Indicator Workshop a list of questions was sent out to relevant HELCOM Expert and Working Groups. The document below provides a compilation of general responses related to the HELCOM indicators and is presented as summaries per Marine Strategy Framework Directive Descriptor. In addition, information is also provided related to the preliminary priority setting that took place at the First HELCOM Indicator Workshop ([HELCOM Indicator WS1](#)).

Action requested

The Workshop is invited to take note of this information and use it as required during the discussion.

Danish comments to the indicators in general (presented by MSFD Descriptor) and comment to preliminary priority set out at HELCOM Indicator WS1.

Danish input regarding the indicator development

D1 - Biodiversity

- **Mammals** With regards to development and evaluation of health indicators. Denmark currently does not have the monitoring that is suggested to assess the secondary criteria of D1C3. A further discussion should be made nationally.

Denmark supports a prioritisation of developing fully functional indicators for distribution and abundance for both seals and porpoise first.

With regards to developing the indicator on distribution and abundance of porpoise the Danish experts inform that the group has discussed the content and methodology and next step is to develop a population model such as the one for seals to determine a GES threshold. This requires extra funding. The indicator group are in the progress of finding out who should do this and how it should be funded. Based on a prioritisation of this indicator help with funding may be required.

With regards to developing an indicator for habitat for marine mammals and setting thresholds for such an indicator will involve a very large work load.

- **Pelagic habitats:** There are currently no operational indicators for D1C6, pelagic habitats. This necessitates indicator development. It is essential, however, that solid indicators, with strong cause-effect chains are developed. There is need for significant amounts of development before any of the listed D1C6 indicators can be made operational. This clearly also involves setting aside funding for the task.

A description on issues from a Danish perspective with the relevant indicators is included in a separate document.

D2 – NIS

There may be a need for a more specific focus on NIS work outside of TG Ballast, or perhaps under TG ballast. A close link with OSPAR work on NIS would be advised by Denmark.

Data for NIS indicators: The NIS lists currently used for comparison are as far as I know the AquaNIS list and the recently published EASIN list. New species keeps occurring in European waters so these lists certainly needs to be maintained as these are essential for making regional assessment of NIS development.

Accessibility of data on NIS at regional level should clearly be identified. Here its important that the bases of these data is made clear, eg. if they are based on monitoring data including information on species abundance, or if they rely on inputs from taxonomic expert ect.

D4 – Foodwebs

At the indicator workshop, it was concluded that “Foodwebs should be addresses but with a longer-term perspective in mind”. Denmark agrees with that, but it should not be an excuse to postpone the work. We may not be able to complete full indicators for the assessment of food webs by 2021 (in accordance to the HELCOM timeline). However, according to the MSFD eg. thresholds should be established through regional cooperation and EU member states may like to use the regional status assessments (HOLAS III and QSR23)

for their national reporting on MSFD. Therefore we find that the work on how best to assess the conditions of the food web should be developed and prioritized in the coming years. A plan of work must be made which determine exactly what can be done for HOLAS III and what can't. For the topics that wont be ready for HOLAS III a plan for the work towards HOLAS IV should be completed.

- There are no indicators in HELCOM that covers the food web as a whole interconnected system nor the two primary criteria under MSFD; diversity within and total abundance between guilds. Only single elements of the food web are assessed. According to the MSFD, EU member states shall assess the diversity of species within the trophic guilds and the total abundance between guilds. In the MSFD draft art 8- guidance developed for EU MS to reach a common understading of the integration levels and methods, it is suggested to integrate food web to one assessment for D4D2 (abundance between guilds) and one assessment per throphic guild shared for D4C1, D4C3 and D4C4 together.

The regional approach has been to assess single measurable components. I believe that both HELCOM (and OSPAR) need to combine these single components under some kind of food web umbrella assessment fitting into the two primary criteria D4C1 - diversity (potentialle supported by D4C3 and D4C4) and D4C2 - abundance. OSPAR has earlier talked about two food web indicators; FW9 - Ecological Network Analysis diversity (D4C1) and FW8 - Biomass trophic Spectrum (D4C2).

A description on on expert input to relevant indicators is included in a separate document.

D5 - Eutrophication:

In general eutrophication indicators are well-developed compared to indicators for other descriptors. However, there are still improvements to be made. Of particular high priority should be 1) development of the indicator '**Shallow-water bottom oxygen**', as the currently only other oxygen indicator is only relevant in deep waters, and 2) development of the indicator '**Phytoplankton spring bloom intensity based on chl.a**', as it potentially represents a cost effective, uniform indicator with high spatial and temporal coverage from satellite observations. Development of the first of these is important in reference to the primary criterion of the MFSD pertaining oxygen in the bottom waters (D5C5). Development work on both indicators would require significant amounts of work. There is ongoing work within OSPAR to further develop satellite-based chl.a observation, and there are possibilities for synergies and collaboration. See e.g. the recent report '*Markager, S., S. Upadhyay, P. Stæhr, H. Parner, H. Jakobsen, P. Walsham, K. Wesslander, D. Van der Zande, and L. Enserink (2019). Towards a joint monitoring and assessment programme for eutrophication in the North Sea. Activity 3 Report. 52pp.*'

D6 – Seabed

Regarding the seabed coherence with the upcoming work – thresholds and defintions in TG Seabed is important. Similarly there is a need for a thorough focus on GES criteria when planning and developing indicators.

D8 – D9 Hazardous substances

Please see attached document on issues regarding Danish study reservations, and other comments to the D8 indicators.

D10 Marine Litter

Denmark prioritises producing one or more indicators for marine litter for HOLAS III. The indicator work in HELCOM hinges on work and in particular on thresholds set by TG Litter. Close cooperation with OSPAR is also important for Denmark.

Denmark prioritises a focus on litter in sediments over litter in the watercolumn.

D11 – Noise

There are substantial gaps in the knowledge about actual impact of underwater noise on populations of marine mammals, fish and invertebrates and similar substantial efforts are required in the coming years to close the largest gaps and develop robust methods for assessment of impact. This will likely require considerable support in the form of dedicated projects, both national and regional. Until now, the work in TG-Noise on developing functional indicators and establishing a framework for determination of thresholds has progressed very slowly. On the other hand, OSPAR (ICG-NOISE) has been very active in developing functional indicators for D11C1 (primarily UK and the Netherlands), whereas HELCOM (EN-Noise) has a leading role in developing functional indicators for D11C2, due to the head-start gained through the BIAS project. It is thus suggested that the main effort of EN-Noise is devoted to continuing this work on the continuous noise, while leaving OSPAR with the lead on the impulsive noise. It should be noted in this context that the work with the continuous noise indicators is impeded to some extent by the relative inactivity of the lead country (Poland) on this issue.

For HOLASII a preliminary indicator was derived, based on the spatial maps from the BIAS project. Work needs to continue to develop and mature these indicators, both the pressure indicators and possible impact indicators, where information about distribution and sensitivity of selected species is included.

There is a need to discuss if additional indicators are required, as well as modifications to existing indicators, in order to close the gaps already identified in the current indicators (cf. also comments to document 1). These gaps include:

Impulsive sources above 10 kHz currently not included in any indicator, despite some significant sources are known to be present in the Baltic, such as sonars (military, as well as civilian), various other marine geological survey equipment and seal scarers. All are loud sources known, or suspected of being able to affect animals at considerable distance. Furthermore, there is a need to address and study the possible impact from echosounders on fish and marine mammals. Although less powerful than the other impulsive sources and highly directional, they are extremely abundant and the cumulative pressure from these sources could be appreciable. There are substantial challenges involved in regulating the use of echosounders, but these challenges should not prevent an assessment of the magnitude of the possible impact.

Pleasure boats without AIS-transmitters. Currently the assessment of continuous noise relies heavily on modelling of noise emissions from ships on the basis of AIS information. This means that contributions from ships without AIS, such as most recreational boats and smaller fishing vessels, are not included in the assessment. As these ship types are often more coastal than commercial ships, this means that there is a bias in the current assessment towards the contributions from the main shipping lanes and an underestimation of the impact from ships in the coastal waters. Work should be undertaken to assess the magnitude of this bias and develop methods to include the coastal ships in future assessments.

With regards to the sectioning made for aims and prioritisation as well as the general work carried out in MAMA and NOISE There is a need for better communication and coordination of efforts between the two groups and the relevant expert networks (EN-MAMA and EN-Noise). Underwater noise is thus not listed as a relevant impact for marine mammals under these marine mammals, whereas this is considered a major impact in group 6 (under the collective term 'biological impacts component'). It is optimal, if there can be a division of responsibilities between the two networks, such that EN-MAMA supplies the relevant information about spatiotemporal distribution and sensitivity of the relevant species, whereas EN-Noise supplies the methodologies for combining the pressure layers with this biological information. Same issues relate to fish and the lack of coordination with fish experts.

Comments related to preliminary priority areas or specific indicators (comments in this table correspond directly to sections in the excel sheet 'HELCOM indicator match and scoring tables')

Item	Preliminary priority aspect	Indicator specific aspect
Biodiversity		
<p>Number of drowned mammals and waterbirds in fishing gear</p>	<p>Bycatch indicator has high priority for HOLAS III. This reflects e.g. the requirement for monitoring bycatch under MSFD (D1C1), and the current state where no operational indicator exists. The high priority is thus fully appropriate. It is perhaps dubious whether it will be possible to have an operational indicator ready by autumn 2021, given the current almost complete lack of standardised data collection. The OSPAR/HELCOM workshop 3-5 September 2019 in Copenhagen will help clarify the ways forward.</p> <p>Based on the september OSPAR-HELCOM workshop on bycatch status for this indicator should be reconsidered. Hopefully that workshop will lead to a better understanding of possible practical or political issues still remaining, and the need for additional resources and expertise.</p>	<p>The geographical extent of the calculated bycatch rate (from number of bycatch and fishing effort) should be aligned with the extent of the porpoise populations, since it will otherwise be impossible to assess how the bycatch effects the population.</p> <p>With regard to threshold setting for bycatch indicator we should not, that this is not straightforward. At the 'MSFD D1 Species Workshop on Methods for Setting Threshold Values' in Varano Borghi in January 2019, the subgroup on birds had the following recommendation for the bycatch indicator (D1C1 under MSFD):</p> <p><i>'Need to step back from setting thresholds</i> <i>The First Step is to set regionally agreed conservation objectives, based on existing agreements and legislation:</i></p> <p><i>Birds Directive – it is illegal to kill wild birds except under a derogation</i></p> <p><i>EU PoA on Seabird</i> <i>Bycatch – aims to minimise or eliminate where possible seabird bycatch</i> <i>Second step – monitor bycatch in fisheries to estimate levels of bycatch.</i> <i>Third step– Use modelling (some of the threshold setting methodologies) to report on the significance of the estimated levels of bycatch. We could model how much growth rate would be affected by levels of bycatch mortality (e.g. stochastic pop models/PVA). 1% of natural mortality could be used as an approximation of zero bycatch (ref: Judicial review)</i> <i>Fourth step– use significance of bycatch to advise on level of mitigation measures required. This could incorporate the setting of</i></p>

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		<p><i>'triggers' and 'limits' (ASCOBANS 2015). Triggers' could sit below environmental limits and be used to signal the need for certain kinds of management action: e.g. low impact – bycatch prevention measures (e.g. weighted lines, streamers) e.g. high impact – fishery closure'</i></p>
Mammals (overall)	Should integration into an assessment on a species/population level (integration) across abundance, distribution and health not also be attempted for a short term aim?	
Abundance of waterbirds in the breeding season	There is a need for inclusion of offshore survey data into the indicator of abundance of waterbirds in the wintering season, as well as issues of data availability and access for the breeding abundance indicator	<p>Breeding waterbirds indicator has high priority according to experts. Outstanding issues mainly relate to data access and availability. Addressing this should be possible in time for HOLAS III.</p> <p>It is important to be aware of some insufficient monitoring in the onward work with the indicators for birds, both concerning indicators on abundance of waterbirds in the breeding season and breeding success we are lacking data and monitoring. This is also the case for waterbird population structure and in general for offshore birds.</p>
Abundance of waterbirds in the wintering season		<p>Wintering waterbirds indicator has high priority according to experts. The main outstanding issue is inclusion of offshore survey data into the indicator. Addressing this should be possible in time for HOLAS III</p>
Waterbird breeding success*4		<p>For waterbird breeding success, few or no data are currently available from the HELCOM area (in contrast to OSPAR, where an equivalent indicator is operational). Denmark does not consider it realistic to have an indicator ready for HOLAS III.</p> <p>It is important to be aware of some insufficient monitoring in the onward work with the indicators for birds, both concerning indicators on abundance of waterbirds in the breeding season and breeding success we are lacking data and monitoring. This is also the case for waterbird population structure and in general for offshore birds.</p>

Item	Preliminary priority aspect	Indicator specific aspect
Waterbird population structure*4		We have no knowledge of this indicator
Waterbird habitat quality*4		Waterbird habitat quality is currently not on the board as an indicator. Such an indicator would require substantial further thought, and is not realistic for HOLAS III.
Diatom / Dinoflagellate index		It is questionable whether this indicator can be linked to nutrients.
Seasonal succession of dominating phytoplankton groups		Danish experts have some reservations regarding this indicator.
Pelagic habitats (MSFD D1C6)	<p>Agree, that pelagic habitat and food web has to be assessed as two independent components. However, an initial way forward regarding food webs could be to produce some kind of "umbrella" assessment, that assesses the food web more as a whole system - maybe focused on the two primary criteria in MSFD - D4C1 diversity within trophic guilds and D4C2 balance of abundance between guilds. Possibly based on top of existing indicators on seabed and biodiversity.</p> <p>It would also be helpful to discuss the establishment of an official regional list of trophic guilds that will be assessed.</p> <p>Maybe it would be an idea to cooperate with OSPAR, since they are having the same discussions on how to assess food web.</p>	<p>There are several proposed indicators for D1C6 (pelagic habitats). None of these are, however, operational yet. Thus This criterion from the GES decision is not currently covered by any indicator. Development work is needed.</p> <p>With relation to plankton a focus on continuing work a few useful indicators (in relation to the criteria) would be beneficial, rather than having several indicators in progress.</p>
Benthic habitats/seafloor (general)	<p>Clarify the short- and longer-term aims of the work. In addition other more general aspects such as interlinkages between themes.</p> <p>This is important for D6C5, however it is difficult, and experts question the ability to do this by HOLAS III. A lot of work remains on seabed indicators, and work should therefore be prioritised</p>	
Trends in arrival of new non-indigenous species	<p>It is important to link work in HELCOM to work in OSPAR.</p> <p>Denmark supports the rehousing of NIS work, either as a temporary group to develop indicators or as a more focused issue under the umbrella of TG Ballast.</p>	<p>It is recommended that similar to OSPAR, an indicator which compares the change in NIS relative to the total species number is used, rather than the absolute numbers of NIS. For groups where abundance data exists, data should be examined with the</p>

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	There are clear definitions of the indicators associated with NIS assessment. Although the text in the 'Topic Summary Aims' seems to refer to these, (D2C1 – primary and D2C2 and D2C3 – secondary indicators) this needs to be clarified.	intention of developing and testing indicators of impact (D2C2 and D2C3)
Pollution		
Beach litter	Should also be prioritised as high	Beach litter ok. However, still an issue if the Baltic-wide assessments should be based on the total data set or splitted into types of beaches, e.g. urban/peri-urban and rural/reference beaches. To our knowledge, TG-ML has also now proposed an EU-wide threshold value submitted to WG-GES, although the applied derivation method needs to be approved
Distribution in time and space of loud low- and mid- frequency impulsive sounds	For HOLASII a preliminary indicator was derived, based on the spatial maps from the BIAS project. Work needs to continue to develop and mature these indicators, both the pressure indicators and possible impact indicators, where information about distribution and sensitivity of selected species is included.	Substantial efforts is ongoing in OSPAR (ICG-NOISE) related to developing this particular indicator and it is expected that most of this work can be readily applied to the HELCOM assessments as well.
Continuous low frequency anthropogenic sound	Work should be undertaken to develop methods to include boats without AIS in the assessments.	
Underwater noise (general)	There is a need for better communication and coordination of efforts between the two groups and the relevant expert networks (EN-MAMA and EN-Noise). Underwater noise is thus not listed as a relevant impact for marine mammals under group 1, whereas this is considered a major impact in group 6 (under the collective term 'biological impacts component'). It is optimal, if there can be a division of responsibilities between the two networks, such that EN-MAMA supplies the relevant information about spatiotemporal distribution and sensitivity of the relevant species, whereas EN-Noise supplies the methodologies for combining the pressure layers with this biological information. Same issues	

Item	Preliminary priority aspect	Indicator specific aspect
	<p>relate to fish and the lack of coordination with fish experts.</p> <p>Additionally there is a need to discuss if additional indicators are required, as well as modifications to existing indicators, in order to close the gaps already identified in the current indicators.</p>	
Eutrophication		
Total nitrogen (TN)		Important
Total phosphorus (TP)		Thresholds values for some areas still need to be agreed on.
Dissolved inorganic nitrogen / DIN		<p>The concentration as such is not a useful indicator. Low values during the growth season can occur both due reduced loading or higher growth and hence uptake by phytoplankton. We have tried many time to relate DIN concentrations to loadings and state of the environment in Denmark, without succes. Winter DIN concentration do indicate the available pool of DIN for the coming growth season, but it is difficult to set good limitations for the period. The best indikator is the number of days during the growth deason where the DIN concentration is below a threshold concideres limiting for phytoplankto growht.</p>
Dissolved inorganic phosphorus / DIP		Same as for DIN
Inputs of nutrients to the subbasins		Important
Chlorophyll-a	<p>If this further development concerns including satellite data, then there is need to develop algorithms to estimate concentration in coastal waters based on satellite data as project EU financed project 'JMP EUNOSAT' for the North Sea including Kattegat has shown that the quality for estimating chl. Concentration in coastal waters needs to be improved.</p> <p>Phosphorus is mainly limiting for growth during spring and not during summer, and therefore, it will useful to include a chl. A indicator for spring months. Danish experts recommend to develop a chl a indicator regarding the spring months.</p>	<p>If satellite data wants to be included, there is a need to develop algorithms for estimating chl. Concentrations in coastal waters based on sateliite data as the current quality is too low.</p>

Item	Preliminary priority aspect	Indicator specific aspect
Phytoplankton spring bloom intensity based on chl-a*3		Agree that it is highly relevant to include an indicator for chlorophyll a conc during spring months. However, a specific indicator for the intensity of the spring bloom is not useful for Danish areas. The intensity of the spring bloom decrease with increasing eutrophication is in Kattegat and the Belt Sea.
Cyanobacterial bloom index		A key issue here is that the threshold must be estimated with the same type of data as the data used for the indicator. The values of an indicator totally depends onm the type of data (collected in situ, from ferry box or by satellite). See report no 3 from the JMP Eunosat project.
Water clarity		Probably the most relevant indicator of all the proposed indicators. Water clarity is the indicator that best summarized all negative effects of eutrophicator. The problem, however, is that it react rather slowly to changes in loadings, is it mainly reflect the total pool of organic matter in the system accumulated over decades.
Oxygen debt	Currently the only operational oxygen indicator covers only deep waters. In DK that is only relevant in the Dansih part of the Baltic Proper.	Low priority from DK experts view.
Shallow-water bottom oxygen*3	Development work is needed concerning shallow-water oxygen indicator.	Highly relevant to develop this indicator as can be applied to all Danish areas. Danish AU expert (Jens Würgler) already have expressed that he is interested in being involved in this work. Currently this awaits GER. MFVM can consider if DK should take lead on this, but this should be cleared with DK expert.
Biomass ratio of opportunistic and perennial macroalgae*3	D5C6 and C7 and currently not covered by any operational indicators. This requires	The knowledge about this is low and will require some work.
Lower depth limit distribution of the macrophyte community*3	development work.	The depth limit and area covered by eelgrass is a key indicator in Danish areas. Danish marine areas a shallow with a sandy bottum. In such ecosystems eelgrass is the key organism forming the habitat. Water clarity is the main factor there determinate the coverage by eelgrass.
State of the soft-bottom macrofauna community		An important indicator, however it is affected by both eutrophycation through anoxia and by bottum trawling. Thus it is difficult to

Item	Preliminary priority aspect	Indicator specific aspect
		separate the two affects, with the concequence that we don't have a clear pressure>effect relationship
Baltic Sea acidification		According to Danish experts there is a lack of models that can seperate effects of climate and nutrient inputs. Not considered relevant
Eutrophication (overall)	Adjustment of the HEAT tool should also be a high priority. It is Danish experts opinion that the grouping of the indicators need to be adjusted i.e. chl. A and water clarity should not be aggregated together.	
	Addressing interlinkkages between themes (e.g. biodiversity-eutrophication) may not be an easy task and may require a high work load.	
	Suggest to change text in the 'Topic Summary Aims' to 'e.g. nutrients, chlorophyll, oxygen and water clarity' as no core indicators on eutrophication exists for the entire Baltic Sea area. Suggest to write only '...that have relevance to the ecosystem.' i.e. to delete '...and effeects on biota' (relates to the comment above).	