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<b>Document title</b>	Outcome of the HELCOM BalticBOOST Workshop on Underwater Noise
<b>Code</b>	4-7
<b>Category</b>	DEC
<b>Agenda Item</b>	4 – Underwater noise
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<b>Reference</b>	Outcome of HOD 50-2016, para. 4.66

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The document is based on the agreed Outcome of the HELCOM BalticBOOST Workshop on Underwater Noise, held on 5-6 October 2016, which explains the late submission of this document.

## Background

HOD 50-2016 approved organizing a two-day workshop on underwater noise, with the support of the EU co-financed HELCOM led BalticBOOST project, theme 4 on underwater noise ([Outcome of HOD 50-2016](#), para. 4.66). The workshop, held 5-6 October 2016 in Copenhagen, Denmark, aimed to explore and recommend principles for defining levels of underwater noise that are consistent with good environmental status (GES) for noise-sensitive species in relation to underwater noise.

The workshop started with an introduction of the state of the art on underwater noise in the Baltic Sea, followed by three round tables on: (i) definitions of environmental targets and approach for defining maximum levels of noise for marine mammals and fish were discussed; (ii) principles for defining GES/develop environmental targets for noise to achieve GES for marine mammal priority species and (iii) for fish priority species.

The outcome of the workshop is attached.

The following recommendations have been made by the workshop:

1. There is a need to further develop the regional registry to consider, among other issues, the appropriateness of considering one activity as one harmful pulse block day, the assessment procedure (to avoid overestimating the number of pulse block days), and to update noise level categories. The HELCOM EN-Noise is to cooperate with ICES on this issue.
2. HELCOM members are encouraged to conduct sound measurements (monitoring) to estimate the anthropogenic noise events sources characteristics and level.
3. The benefit of reducing the pressure from noise, should not be exceeded by the negative environmental consequences of increasing another pressure (e.g. CO2 emissions increased during dredging activities using mitigation measures).
4. It may be relevant for HELCOM members to consider, in the future, other specific anthropogenic sound sources with higher frequency bands than 10 Hz to 10 kHz (such as scarers and navy sonars).
5. It is recommended to use available knowledge on PTS (Permanent hearing Threshold Shift) and death effects caused by impulsive noise for the establishment of thresholds.
6. The workshop recommended that the definition of guidance levels both for impulsive and continuous noise should be included in the Terms of Reference of the HELCOM EN-Noise 2017-2018 to be considered in the upcoming PRESSURE 5-2016.
7. To apply the decision support tree included in **Annex 3**, using a risk based approach, on a regular basis in the HELCOM area, for setting environmental targets when addressing impulsive noise events, noting a reservation from the Danish representative. The application of the decision support tree needs to be further developed.

8. The assessment area referred to in the decision tree to be applied for impulsive noise events is to be in agreement with the HELCOM sub-basins and also bearing in mind acoustic biological factors and maritime spatial planning considerations that may arise from the Directive 2014/89/EU establishing a framework for maritime spatial planning.
9. To apply the decision support tree included in **Annex 4**, using a risk based approach, on a regular basis in the HELCOM area, for setting environmental targets when addressing continuous noise, noting a reservation from the Danish representative. The application of the decision support tree needs to be further developed.
10. Guidance levels referred to in the decision support trees in **Annex 3** and **Annex 4** are to be defined in agreement with the principles for establishing GES included in **Annex 5** and **Annex 6**, for impulsive and continuous noise, respectively.
11. Further consideration of historical presence of species in relation to effects of continuous noise may be relevant.
12. There is a need to further study the stress effects of noise on mammals to be eventually considered for inclusion in the principles for establishing GES.
13. To further study the stress effects of noise on fish to be eventually considered for inclusion in the principles for establishing GES.

Additionally, the workshop identified topics for future consideration:

14. The workshop proposed that the link between underwater noise and the Maritime Spatial Planning Directive is to be considered in cooperation with the HELCOM VASAB working Group.
15. There is a need to further study the effects of ambient noise on bottom invertebrates to be eventually considered for inclusion in the principles for establishing GES for these species.

Finally, the workshop noted that PRESSURE 5-2016 is considering the Terms of Reference of the HELCOM EN-Noise that includes the election of the Chair of the network, and agreed to suggest Sweden as Chair of the network pending adoption of the Terms of Reference.

Documents and presentations considered by the workshop are available on the [HELCOM BalticBOOST Noise WS 1-2016](#) meeting site on the HELCOM Meeting Portal.

## Action requested

The Meeting is invited to:

- take note of the Outcome of the workshop;
- agree on the recommended principles for establishing good environmental status (GES) for impulsive and continuous noise (**Annex 5** and **Annex 6** of the Outcome, respectively) noting that in the future they may need to be amended based on new knowledge (12, 13, 15);
- support improvement of the regional registry of impulsive events (point 1);
- agree on national testing of the recommended decision support trees for ambient and impulsive noise (**Annex 1** and **Annex 2** of the Outcome) and task the HELCOM EN-Noise to further develop them according to the conclusions from the workshop (points 5, 6, 7, 8, 9, 10 and 11);
- recommend the Contracting Parties to consider improvement of underwater noise monitoring (point 2 and 4);
- take note of the agreement of the HELCOM EN-Noise on the Chair for the HELCOM EN-Noise pending adoption of the Terms of Reference.



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<b>Document title</b>	Outcome of the HELCOM BalticBOOST Workshop on Underwater Noise
<b>Date of finalization</b>	12.10.2016

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## Outcome of the HELCOM BalticBOOST Workshop on Underwater Noise

### Introduction

**BalticBOOST** is an EU co-financed project coordinated by HELCOM, with a main objective of improving regional coherence in the implementation of marine strategies. This is to be achieved through improved data flow and assessments, and through acquiring a knowledge base for the development of measures. The theme has reviewed existing knowledge on impact of noise in the Baltic Sea, explored the possibility to determine acceptable levels of underwater noise for marine species, and surveyed possible measures to manage and mitigate relevant impacts on the Baltic Sea.

### Workshop

The Workshop was held on 5-6 October, 2016 at the premises of the Agency for Water and Nature Management, Copenhagen, Denmark.

The aim of the Workshop was to explore and recommend principles for defining levels of underwater noise that are consistent with good environmental status (GES) for noise-sensitive species. More specifically the workshop aimed to discuss:

- the possibility to use information on species specific tolerance to define noise levels that are consistent with GES;
- for which noise sources can such levels be set;
- the identification of possible canary/umbrella species in relation to noise in different parts of the Baltic Sea;
- how information on status at the population level should be considered when defining the need to develop environmental targets for noise;
- the use of a risk-based approach to identify areas and activities for which environmental targets for noise could be defined, also in the absence of a clear definition of GES.

The agenda of the Workshop is contained in **Annex 1**.

The Workshop was attended by representatives of Denmark, Estonia, Finland, Germany, Lithuania and Sweden, as well as ICES and BalticBOOST project partners. The list of Workshop Participants is contained in **Annex 2**.

Signe Jung-Madsen, from the Agency for Water and Nature Management, welcomed the participants to the workshop.

The Workshop was co-moderated by Mr. Peter Sigray, Sweden and Ms. Henriette Schack, HELCOM Secretariat under the HELCOM BalticBOOST project. Marta Ruiz, HELCOM Secretariat, acted as secretary to the workshop.

### State of the art on underwater noise in the Baltic Sea

1. Peter Sigray, BALTIC Boost project partner, presented the outcomes of the BIAS project in relation to its contribution to defining Good Environmental Status (GES) (**Presentation 1**). The project has produced soundscapes maps for management for 63, 125 and 2000 Hz at three different depth

ranges: from 0 to 15m; from 30m to the bottom; and the whole water column; also considering different percentiles (5, 25, 50, 75 and 90) of the occurrence of the continuous sound. Thus, a total of 757 maps were produced.

2. Ilona Büscher, German expert of the HELCOM EN-Noise, presented the German experience in relation to the regional registry of impulsive activities (**Presentation 2**). Noise threshold value regarding sound exposure level (SEL) for pile-driving events of 160dB (re 1  $\mu\text{Pa}^2\text{s}$  at 750m) for single events is established by the German Federal Maritime and Hydrographic Agency (BSH). To implement the threshold an Underwater Noise Information System (Hydoschall-FIS) has been established. There are national obligations to deliver information on impulsive noise events to this information system (pile driving events, detonations, naval data, ambient monitoring, and so on). The current situation of data delivery to the regional registry was also shown, which currently contains data reported by Denmark, German and Sweden. Denmark has delivered data on seismic and pile driving events that occurred in 2015 to the registry although they did not take place in the HELCOM area. Germany has reported pile driving events occurred in the years 2013 to 2015. Sweden has delivered data on sonar events, airguns and underwater explosions for events occurred in 2015.
3. The workshop recognised the need of HELCOM members to report data to the regional registry. The workshop noted that a document detailing the national reporting status to the regional registry has been submitted to PRESSURE 5-2016 (25-27 October 2016), and that countries are invited to provide additional information regarding upcoming data reporting to the registry.
4. The workshop noted the on-going discussion within the HELCOM EN-Noise on the required visualisation scale of the regional registry. The workshop noted that not all activities in the registry will be counted as a pulse block day. Additionally, the registry compiles data from the previous years, which may change in the future. It was clarified that, in addition to assess targets and GES for impulsive noise, the registry could in the future be used to coordinate future activities. The workshop also noted that there is a need to improve the registry in the sense that it may be currently overestimating the number of pulse block per days due to difference in reporting format and accuracy in background data in terms of geographical information.
5. HELCOM Secretariat presented the development of joint principles to define environmental targets for underwater noise for prioritized species in the Baltic Sea (Document 2 which is a proposal from BalticBOOST project, **Presentation 3**). Effects of noise on the level of population are not yet understood, and GES for populations has therefore not yet been defined for underwater noise. It is proposed that noise levels known to cause impact on single individuals are used as guiding principles for defining the maximum allowable noise levels in the environment that are consistent with GES. For particularly vulnerable populations (e.g. the Baltic proper harbour porpoise sub-population) these levels could potentially be used as proxy for maximum allowable noise levels, as some impacts at the level of individual could have implications for the population. Since there is a risk of significant degradation in environmental status, in particular in relation to activities known to cause significant pressures on the environment, e.g. pile driving, it is furthermore proposed that environmental targets are developed based on a risk based approach, even if the status and impacts are not fully known. The risk based approach involves first to identify areas where there is a current presence of species identified as noise sensitive. Second, the emergence of anthropogenic noise from natural background noise levels is considered. If the anthropogenic noise is above the naturally occurring background noise levels in an area important for a noise sensitive species, this pressure can be reduced by setting an environmental target.
6. HELCOM Secretariat introduced the report on Noise Sensitivity of Animals in the Baltic Sea (Document 4).
7. The workshop noted Document 2 and 4 to be considered when proposing how joint principles to define environmental targets for underwater noise for prioritized species in the Baltic Sea should be drafted.

*Recommendation from the workshop*

8. There is a need to further develop the regional registry to consider, among other issues, the appropriateness of considering one activity as one harmful pulse block day, the assessment procedure (to avoid overestimating the number of pulse block days), and to update noise level categories. The HELCOM EN-Noise is to cooperate with ICES on this issue.

*Round table 1: Discussion of definitions of environmental targets and approach for defining maximum levels of noise for marine mammals and fish*

9. The workshop discussed that different effects (i.e. Permanent hearing Threshold Shift (PTS), Temporary hearing Threshold Shift (TTS) and behavior) for different species should be considered separately.
10. The workshop discussed the possibility of defining a range of acceptable noise or guidance levels rather than a maximum allowable level, and proposed to focus the discussion on guidance levels.
11. The workshop noted that Denmark was of the opinion that definition of numerical values for maximum allowable levels of underwater noise should be scientifically well funded and would require further work so for the time being, focus should be on defining GES principles.
12. The workshop discussed whether a maximum allowable noise level for impulsive noise could be set from established noise levels known to cause displacement/injury for a certain species, with focus on areas around impulsive events and areas of significance for the species in question. The workshop noted the Finnish view that it is possible.
13. The workshop was of the view that development of guidance levels for continuous and impulsive noise needs to continue beyond the workshop.
14. The workshop discussed whether a maximum or minimum frequency limit could be used instead of a maximum allowable noise level (e.g. only use echo sounders operating above 200 kHz in areas of high importance for marine mammals).
15. The workshop noted the Finnish view that it is not possible, and that the use of certain frequencies by different industries/equipment is linked to a matter of safety. It is more relevant to focus on the energy than on the frequency.

*Recommendation from the workshop*

16. HELCOM members are encouraged to conduct sound measurements (monitoring) to estimate the anthropogenic noise events sources characteristics and level.
17. The benefit of reducing the pressure from noise, should not be exceeded by the negative environmental consequences of increasing another pressure (e.g. CO<sub>2</sub> emissions increased during dredging activities using mitigation measures).
18. It may be relevant for HELCOM members to consider, in the future, other specific anthropogenic sound sources with higher frequency bands than 10 Hz to 10 kHz (such as scarers and navy sonars).
19. It is recommended to use available knowledge on PTS and death effects caused by impulsive noise for the establishment of thresholds.
20. The workshop recommended that the definition of guidance levels both for impulsive and continuous noise should be included in the Terms of Reference of the HELCOM EN-Noise 2017-2018 to be considered in the upcoming PRESSURE 5-2016.

*Identified topics for future consideration*

21. The workshop proposed that the link between underwater noise and the Maritime Spatial Planning Directive is to be considered in cooperation with the HELCOM VASAB working Group.

Round table 2: Exploring principles for defining GES/develop environmental targets for noise to achieve GES for marine mammal priority species. Discussion of possible thresholds/target levels

22. The workshop discussed the decision support tree as a method to identify areas where it is relevant to define environmental targets based on a risk based approach also if the environmental status and impacts are not fully known as outline in **Document 2**.
23. The workshop supported the scheme in general and proposed to develop separate schemes for continuous and impulsive noise.
24. The workshop supported the proposal from Sweden to link the scheme for impulsive noise to the regional registry of events as included in **Annex 3** to this document.
25. The workshop discussed principles for establishing GES for impulsive sounds and recommended the principles as included in **Annex 5** to this document.
26. The workshop discussed the scheme for ambient noise and:
  - supported the need to consider dredging as a source of ambient noise as proposed by Estonia;
  - was of the view that the link between the pressures (continuous noise) and impact is weak;
  - noted that there is a need to consider adaptation of animals to ambient noise when assessing the presence of noise sensitive species due to ambient noise.
27. The workshop recommended the scheme for ambient noise as included in **Annex 6** to this document.
28. The workshop noted that principles for establishing GES for underwater noise are to be set at a generic level, whereas environmental targets are to consider the differences between subpopulations.
29. The workshop recognised that at present there is a lack of knowledge linking ambient noise to population effects and it is therefore at present difficult to propose guideline values and environmental targets.

Recommendation from the workshop

The workshop made the following recommendations for further consideration in HELCOM:

30. To apply the decision support tree included in **Annex 3**, using a risk based approach, on a regular basis in the HELCOM area, for setting environmental targets when addressing impulsive noise events, noting a reservation from the Danish representative. The application of the decision support tree needs to be further developed.
31. The assessment area referred to in the decision tree to be applied for impulsive noise events is to be in agreement with the HELCOM sub-basins and also bearing in mind acoustic biological factors and maritime spatial planning considerations that may arise from the Directive 2014/89/EU establishing a framework for maritime spatial planning.
32. To apply the decision support tree included in **Annex 4**, using a risk based approach, on a regular basis in the HELCOM area, for setting environmental targets when addressing continuous noise, noting a reservation from the Danish representative. The application of the decision support tree needs to be further developed.
33. Guidance levels referred to in the decision support trees in **Annex 3** and **Annex 4** are to be defined in agreement with the principles for establishing GES included in **Annex 5** and **Annex 6**, for impulsive and continuous noise, respectively.
34. Further consideration of historical presence of species in relation to effects of continuous noise may be relevant.
35. There is a need to further study the stress effects of noise on mammals to be eventually considered for inclusion in the principles for establishing GES.

Round table 3: Exploring principles for defining GES/develop environmental targets for noise to achieve GES for fish priority species. Discussion of possible thresholds/target levels

36. The workshop discussed principles for establishing GES for noise for fish priority species.
37. The workshop noted the Swedish view that behavioural changes during sensitive periods (spawning) would be a better criteria, and that injury should not be used.

Recommendations from the workshop

38. To further study the stress effects of noise on fish to be eventually considered for inclusion in the principles for establishing GES.

Identified topics for future consideration

39. There is a need to further study the effects of ambient noise on bottom invertebrates to be eventually considered for inclusion in the principles for establishing GES for these species.

Any other business

40. The workshop noted that the upcoming PRESSURE 5-2016 is considering the Terms of Reference of the HELCOM EN-Noise that includes the election of the Chair of the network.
41. The workshop noted the Danish proposal to nominate Sweden as Chair of the network. The workshop noted the German support of the proposal.
42. The workshop agreed to suggest Sweden as Chair of the network pending adoption of the Terms of Reference.
43. The workshop thanked Denmark for hosting the workshop.

## Annex 1 Workshop Agenda

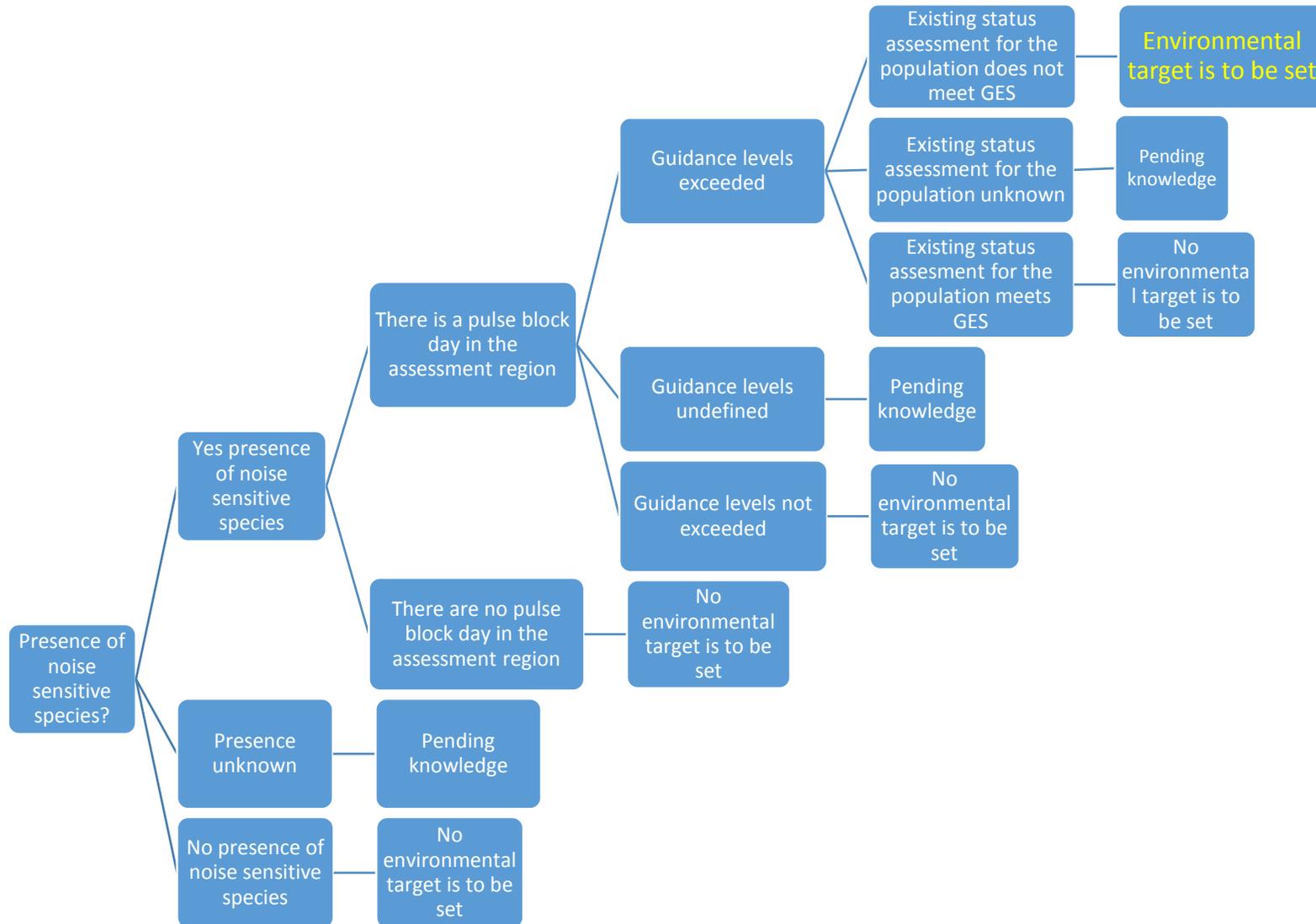
Wednesday 5 October	
10:00-10:15	Welcoming words
10:15-10:50	<p><b>State of the art on underwater noise in the Baltic Sea:</b></p> <ul style="list-style-type: none"> <li>- Ambient noise: <ul style="list-style-type: none"> <li>o Outcomes of BIAS project &amp; proposal of a regional monitoring programme for continuous noise within BalticBOOST (Peter Sigray, 10 min.)</li> </ul> </li> <li>- Impulsive noise: <ul style="list-style-type: none"> <li>o Regional registry of impulsive activities (Ilona Büscher, 10 min.)</li> </ul> </li> <li>- Development of joint principles to define environmental targets for underwater noise for prioritized species in the Baltic Sea (Henriette Schack, 10 min.)</li> </ul>
10:50-11:00	Introduction to round tables (Moderators, 5 min)
11:00-12:30	<p><b>Round table 1:</b> Discussion of definitions of environmental targets and approach for defining maximum levels of noise for <b>marine mammals</b> and <b>fish</b>:</p> <ul style="list-style-type: none"> <li>- Could a maximum allowable noise level for impulsive noise be set from established noise levels known to cause displacement/injury for a certain species, with focus on areas around impulsive events and areas of significance for the species in question?</li> <li>- For some sound sources could a maximum or minimum frequency limit be used instead of a maximum allowable noise level (e.g. only use echo sounders operating above 200 kHz in areas of high importance for marine mammals)?</li> <li>- Could a maximum allowable noise level for continuous noise be to establish a maximum range reduction for communication/detection in areas of significance for the species in question (e.g. max 25% reduction in range)?</li> </ul>
12:30 – 13:30	<i>Lunch break</i>
13:30 – 15:00	<b>Round table 1 continues</b>
15:00 – 15:30	<i>Coffee break</i>
15:30 – 17:00	<p><b>Round table 2:</b> Exploring principles for defining GES/develop environmental targets for noise to achieve GES for <b>marine mammal priority species</b>. Discussion of possible maximum allowable noise levels:</p> <ul style="list-style-type: none"> <li>- Would a decision support tree for identifying areas where it is relevant to define environmental targets based on a risk based approach also if the environmental status and impacts are not fully known be appropriate? (see background document)</li> <li>- Based on existing knowledge of noise impacts on different species (see background documents) what maximum allowable noise levels could be set?</li> <li>- What would be an acceptable reduction in communication/detection range for the different marine mammals (e.g. 10% or 25%), and should it change with e.g. mating vs. non-mating season?</li> </ul>
Thursday 6 October	
9:00 – 10:00	<b>Round table 2 continues</b>
10:00 – 11:00	<b>Conclusions</b> drafting of the <b>round table 2</b>
11:00 - 11:30	<i>Coffee break</i>

11.30 – 12.30	<p><b>Round table 3:</b> Exploring principles for defining GES/develop environmental targets for noise to achieve GES for <i>fish priority species</i>. Discussion of possible maximum allowable noise levels.</p> <ul style="list-style-type: none"><li>- What would be an appropriate maximum allowable noise level, can no-injury be viewed as GES for impulsive noise?</li><li>- What would be an acceptable reduction in communication/detection range for the different fish species (e.g. 10% or 25%), and should it change with e.g. spawning vs. non-spawning season?</li></ul>
12.30 – 13.30	<i>Lunch break</i>
13.30 – 14.30	<b>Round table 3 continues</b>
14.30 – 15:15	<b>Conclusions</b> drafting of the <b>round table 3</b>
15:15 – 16:00	<i>Coffee break</i>
16:00 – 16:30	Report of the Workshop

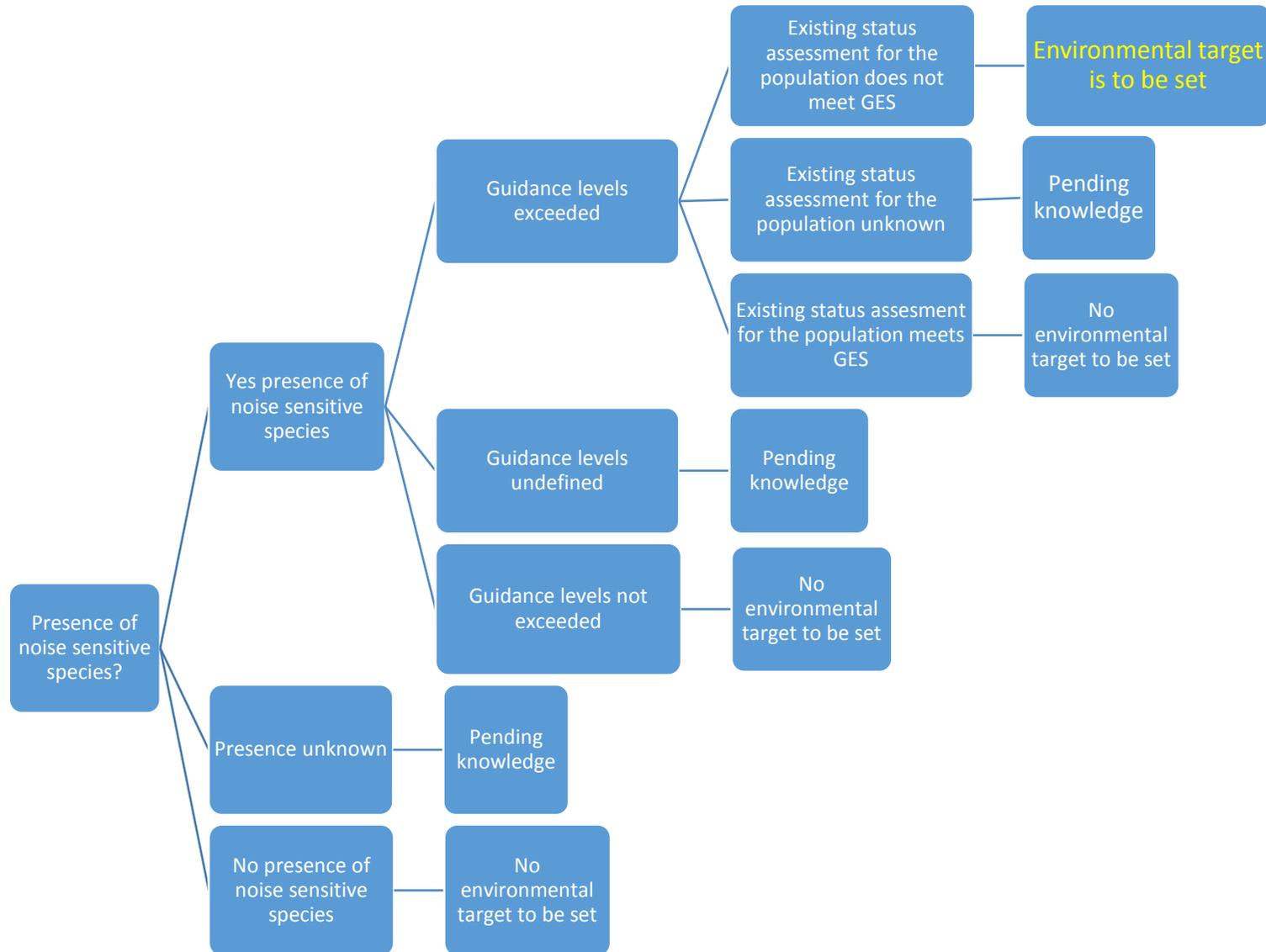
## Annex 2 List of participants

Representing	Name	Organisation	Email address
<b>Moderators</b>			
	Ms. Henriette Schack	HELCOM Secretariat	<a href="mailto:Henriette.Schack@helcom.fi">Henriette.Schack@helcom.fi</a>
	Mr. Peter Sigray	Swedish Defence Research Agency	<a href="mailto:peter.sigray@foi.se">peter.sigray@foi.se</a>
<b>Contracting Parties</b>			
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Denmark	Ms. Signe Jung-Madsen	Agency for Water and Nature Management	<a href="mailto:sijun@svana.dk">sijun@svana.dk</a>
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Sweden	Mr. Mathias Andersson	Swedish Defence Research Agency	<a href="mailto:mathias.andersson@foi.se">mathias.andersson@foi.se</a>
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ICES	Mr. Neil Holdsworth	ICES	<a href="mailto:neilh@ices.dk">neilh@ices.dk</a>
ICES	Mr. Carlos Pinto	ICES	<a href="mailto:carlos@ices.dk">carlos@ices.dk</a>
<b>HELCOM Secretariat</b>			
Secretariat	Ms. Marta Ruiz	HELCOM Secretariat	<a href="mailto:Marta.Ruiz@helcom.fi">Marta.Ruiz@helcom.fi</a>

Annex 3 Decision support tree to be used for setting environmental targets for impulsive noise events



Annex 4 Decision support tree to be used for setting environmental targets for continuous noise events



Annex 5 Principles for defining levels of impulsive underwater noise consistent with GES for sound-sensitive species

Species	Principles
<b>Harbour porpoise</b> <i>(Western Baltic and Baltic Proper subpopulations)</i>	<ul style="list-style-type: none"> <li>– Individuals should not be exposed to anthropogenic noise levels high enough to induce permanent hearing loss.</li> <li>– Significant loss of habitat through displacement for a significant period of time that is likely to affect population should be avoided.</li> <li>– Noise level should not affect the energy budget of individual animals nor breeding to a degree likely to affect the population significantly; particular emphasis should be on calving and nursing grounds.</li> </ul>
<b>Harbour seal</b> <i>(Western Baltic and Kalmarsund subpopulations)</i>	<ul style="list-style-type: none"> <li>– Individuals should not be exposed to anthropogenic noise levels high enough to induce permanent hearing loss.</li> <li>– Significant loss of habitat through displacement for a significant period of time that is likely to affect population should be avoided.</li> <li>– Noise level should not affect the energy budget of individual animals nor breeding to a degree likely to affect the population significantly; particular emphasis should be on haul-outs sites.</li> </ul>
<b>Ringed seal</b>	<ul style="list-style-type: none"> <li>– Individuals should not be exposed to noise levels high enough to induce permanent hearing loss.</li> <li>– Significant loss of habitat through displacement for a significant period of time that is likely to affect population should be avoided.</li> <li>– Noise level should not affect the energy budget of individual animals nor breeding to a degree likely to affect the population significantly; particular emphasis should be on haul-outs sites.</li> </ul>
<b>Grey seal</b>	<ul style="list-style-type: none"> <li>– Individuals should not be exposed to noise levels high enough to induce permanent hearing loss.</li> <li>– Significant loss of habitat through displacement for a significant period of time that is likely to affect population should be avoided.</li> <li>– Noise level should not affect the energy budget of individual animals nor breeding to a degree likely to affect the population significantly; particular emphasis should be on haul-outs sites.</li> </ul>
<b>Cod/herring/sprat</b>	<ul style="list-style-type: none"> <li>– Noise levels high enough to induce significant behavioural disruption at a population level should be avoided in spawning areas at critical timing.</li> </ul>

Annex 6 Principles for defining levels of continuous underwater noise consistent with GES for sound-sensitive species

<b>Species</b>	<b>Principles</b>
<b>Harbour porpoise</b>	<ul style="list-style-type: none"> <li>– Noise level should not affect the energy budget nor breeding to a degree likely to affect the population significantly; particular emphasis should be on calving and nursing grounds</li> <li>– Noise should not be at levels that induce masking leading to significant negative change in population growth rate</li> </ul>
<b>Harbour seal/Ringed seal/Grey seal</b>	<ul style="list-style-type: none"> <li>– Noise level should not affect the energy budget nor breeding to a degree likely to affect the population significantly; particular emphasis should be on breeding and areas around haul outs</li> <li>– Noise should not be at levels that induce masking leading to significant negative change in population growth rate; particular emphasis should be on mating sites and areas around haul outs.</li> </ul>
<b>Cod/herring/sprat</b>	<ul style="list-style-type: none"> <li>– Noise in spawning areas at critical timing should not be at levels that induce significant behavioural disruption and/or masking leading to significant negative change in population growth rate.</li> </ul>