



Baltic Marine Environment Protection Commission

Underwater noise in the Baltic Sea

Principles for Defining Levels of Underwater Noise Consistent with GES for Noise-sensitive Species in the Baltic and Decision Support Trees for Establishing Environmental Targets for Ambient and Impulsive Noise

Henriette Schack

HELCOM Secretariat



Anthropogenic noise sources

Impulsive noise sources (e.g.):

- Explosions
- Pile driving
- Seismic explorations
- Low frequency sonars



Continuous noise sources (e.g.):

- Energy installations
- Continuous dredging
- Shipping
- Renewable energy operations

Criteria and identified priority species

- Hearing sensitivity
- Impact of noise
- Threat status
- Commercial value
- Data availability

Harbour porpoise <i>(Phocoena phocoena)</i>	Cod <i>(Gadus morhua)</i>
Harbour seal <i>(Phoca vitulina vitulina)</i>	Burbot <i>(Lota lota)</i>
Baltic ringed seal <i>(Pusa hispida botnica)</i>	Herring <i>(Clupea harengus)</i>
Grey seal <i>(Halichoerus grypus)</i>	Sprat <i>(Sprattus sprattus)</i>
	European eel <i>(Anguilla anguilla)</i>



Priority species based on the proposed criteria

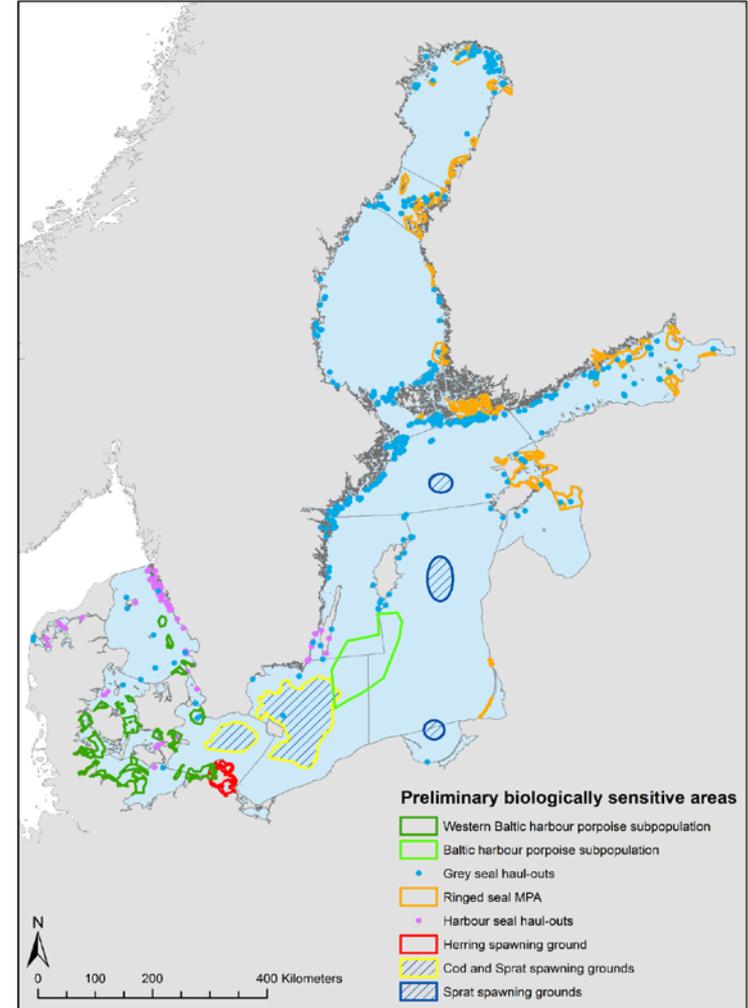
	Hearing sens.	Impact	Threat status	Com. value	Data
Harbour porpoise (<i>Phocoena phocoena</i>)	HIGH	HIGH	CR/VU	NEGLIG.	MED.
Harbour seal (<i>Phoca vitulina vitulina</i>)	HIGH	HIGH	VU/LC	NEGLIG.	MED.
Baltic ringed seal (<i>Pusa hispida botnica</i>)	HIGH	MED.	VU	NEGLIG.	MED.
Grey seal (<i>Halichoerus grypus</i>)	MED.	MED.	LC	NEGLIG.	MED.
Cod (<i>Gadus morhua</i>)	MED.	MED.	VU	HIGH	MED.
Herring (<i>Clupea harengus</i>)	MED.	MED.	LC	HIGH	MED.
Sprat (<i>Sprattus sprattus</i>)	MED.	MED.	UNKNOW.	HIGH	MED.



Noise sensitivity of animals in the Baltic Sea report

Species	Calving/Pupping period	Mating/spawning period	Nursing Period	Moulting period
Harbour porpoise (<i>Phocoena phocoena</i>)	June-July	August	June/July through the fall months	N.A
Harbour seal (<i>Phoca vitulina</i>)	June	July-August	4 weeks	August
Ringed seal (<i>Phoca hispida botnica</i>)	February-March	Thought to occur immediately after weaning of the pup	4-6 weeks	Mid-April – early May
Grey seal (<i>Halichoerus grypus</i>)	February-March	March-April	2 weeks	June
Cod (<i>Gadus morhua</i>)	N.A	March-December	N.A	N.A
Herring (<i>Clupea harengus</i>)	N.A	Spring and autumn	N.A	N.A
Sprat (<i>Sprattus sprattus</i>)	N.A	March-August	N.A	N.A

Periods of biological significance for each of the identified priority noise sensitive species



- **Aim:** to explore the possibility to determine acceptable levels of underwater noise for marine species according to the Regional Baltic Underwater Noise Roadmap 2015-2017 adopted by HELCOM 37-2016
- **Dates:** 5-6 October 2016
- **Outcome:**
 - ✓ recommended principles for establishing good environmental status (GES) for impulsive and continuous noise (in the future they may need to be amended based on new knowledge);
 - ✓ there is a need to improve the regional registry of impulsive events;
 - ✓ recommend national testing of the recommended decision support trees for ambient and impulsive noise and task the HELCOM EN-Noise to further develop them

Proposed principles for impulsive underwater noise

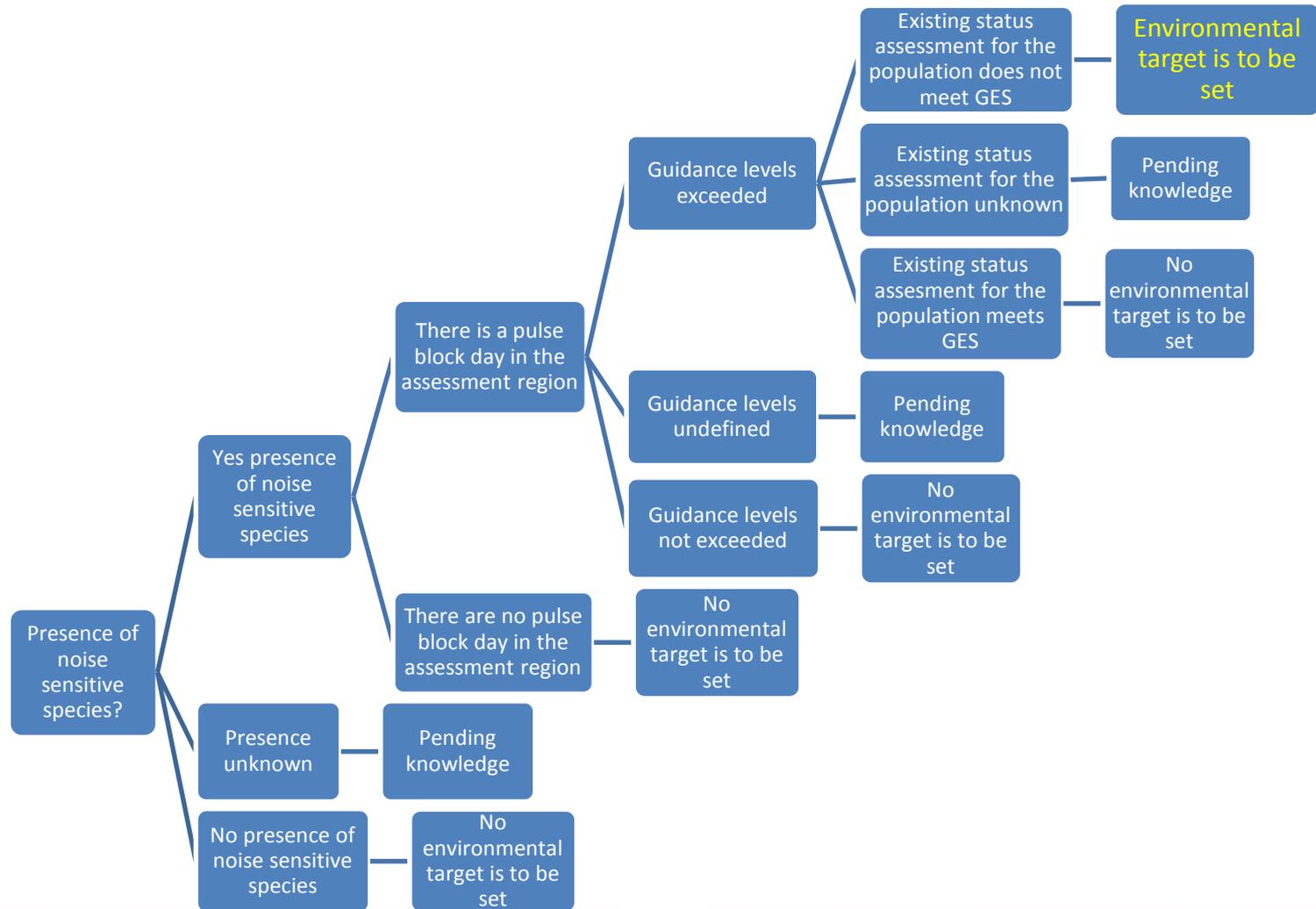
<p>Harbour porpoise (Western Baltic and Baltic Proper subpopulations)</p>	<ul style="list-style-type: none"> – Individuals should not be exposed to anthropogenic noise levels high enough to induce injury. – Significant loss of habitat through displacement for a significant period of time that is likely to affect population should be avoided. – 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.
<p>Harbour seal (Western Baltic and Kalmarsund subpopulations)</p>	<ul style="list-style-type: none"> – Individuals should not be exposed to anthropogenic noise levels high enough to induce permanent hearing loss. – Significant loss of habitat through displacement for a significant period of time that is likely to affect population should be avoided. – 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.
<p>Ringed seal</p>	<ul style="list-style-type: none"> – Individuals should not be exposed to noise levels high enough to induce permanent hearing loss. – Significant loss of habitat through displacement for a significant period of time that is likely to affect population should be avoided. – 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.
<p>Grey seal</p>	<ul style="list-style-type: none"> – Individuals should not be exposed to noise levels high enough to induce permanent hearing loss. – Significant loss of habitat through displacement for a significant period of time that is likely to affect population should be avoided. – 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.
<p>Cod</p>	<ul style="list-style-type: none"> – Noise levels high enough to induce significant behavioural disruption at a population level should be avoided in spawning areas at critical timing.
<p>Sprat</p>	<ul style="list-style-type: none"> – Noise levels high enough to induce significant behavioural disruption at a population level should be avoided in spawning areas at critical timing.
<p>Herring</p>	<ul style="list-style-type: none"> – Noise levels high enough to induce significant behavioural disruption at a population level should be avoided in spawning areas at critical timing.

Proposed principles for continuous underwater noise

Harbour porpoise	<ul style="list-style-type: none">– 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– Noise should not be at levels that induce masking leading to significant negative change in population growth rate
Harbour seal/Ringed seal/Grey seal	<ul style="list-style-type: none">– 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– 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.
Cod/herring/sprat	<ul style="list-style-type: none">– 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.



Setting environmental targets for impulsive noise



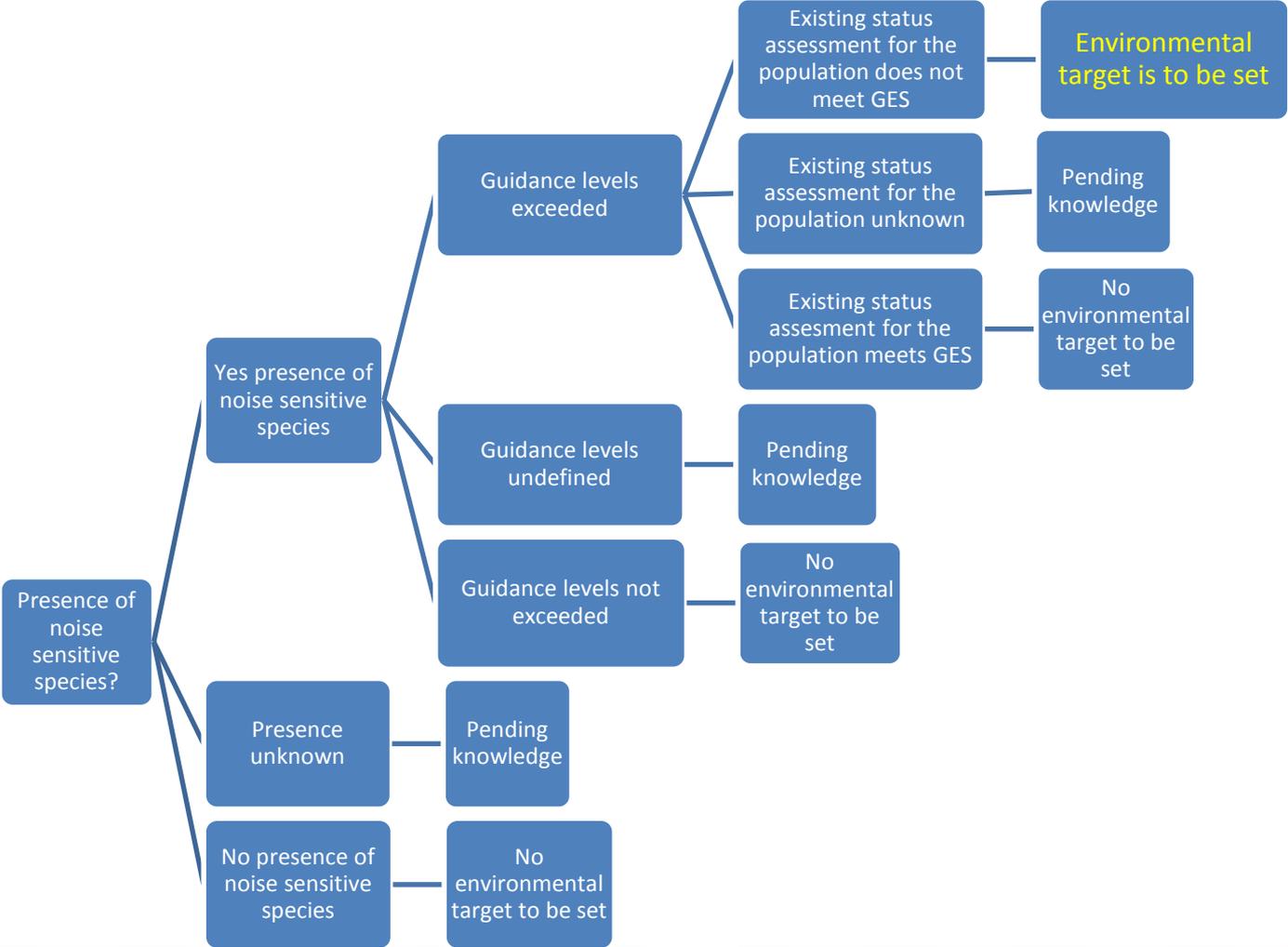
Underwater noise guidance level

Example:

Harbour porpoises

1. Part of the proposed principles for defining GES for both impulsive and continuous noise – ***“Noise level should not affect the energy budget of individual animals to a degree likely to affect the population significantly”***.
2. Current scientific research investigating acoustic foraging behaviour (e.g. Wisniewska et al., 2016), and possible noise effects on this behaviour (e.g. Sarnocińska et al. (in prep.)). **New findings are continuously emerging.**
3. **Scientific research is to be used in setting underwater noise guidance levels/ranges** i.e. noise levels of a defined number of dB re $1\mu\text{Pa}^2\text{s}$ SEL received level above which the energy budget of individual animals is affected to a degree likely to affect the population significantly.

Setting environmental targets for continuous noise



The Meeting is invited to:

- provide feed-back to the recommended principles for defining levels of underwater noise that are consistent with GES for noise-sensitive species and agree what should be the next appropriate action; and
- support the national testing of the recommended decision support trees for establishing environmental targets for ambient and impulsive noise and task the HELCOM EN-Noise to further develop them according to the conclusions from the workshop and note the study reservation by Russia on the decision support trees to be clarified by 11 November 2016.



Baltic Marine Environment Protection Commission

Setting Environmental targets

Example for pile-driving:

Guidance level:

X dB re 1 μ Pa RL

For Baltic Sea harbour porpoise within the Midsjöbanken area during summer months May/Jun. to Aug./Sep.–Oct.

