

# HELCOM Monitoring Programme topic

## Mammals

Programme:

**Seal abundance**

## Contents

a.	Metadata on monitoring strategies and monitoring programmes.....	2
a.1	Responsible HELCOM subsidiary body .....	2
a.2	Regional Cooperation (RegionalCooperation) .....	2
b.	Monitoring strategies.....	2
b.1	Descriptor .....	2
b.2	BSAP segments .....	3
b.3	Monitoring strategy description .....	3
b.4	BSAP Ecological objectives.....	3
b.5	Gaps in monitoring .....	4
c.	Monitoring programmes .....	4
c.1	Purpose of monitoring .....	4
c.2	Other legislation.....	8
c.3	Implementation of Regional Cooperation (RegionalCooperation_implementation) .....	9
c.4	Monitoring concepts.....	10
c.5	Monitoring and assessment requirements .....	13
c.6	Data providers and access.....	15
c.7	MSFD Criteria (GES criteria) .....	18
d.	References .....	25

## a. Metadata on monitoring strategies and monitoring programmes

### a.1 Responsible HELCOM subsidiary body

HELCOM Expert Group on Marine Mammals (EG MAMA)

State & Conservation

### a.2 Regional Cooperation (Regional Cooperation)

The monitoring of this programme is:

- Fully coordinated;
- Partly coordinated. Indicate missing component(s):
- Coordinated monitoring is under development. Indicate by which group/project and by when a recommendation on coordinated monitoring can be expected.

EG MAMA

## b. Monitoring strategies

### b.1 Descriptor

The programme supports the following obligatory MSFD Monitoring Programmes. Tick one or more relevant boxes.

- D1** Biodiversity
- D2** Non-indigenous Species
- D3** Commercial fish and shellfish
- D4** Food webs
- D5** Eutrophication
- D6** Seafloor integrity
- D7** Hydrographical conditions
- D8** Contaminants
- D9** Contaminants in seafood
- D10** Marine litter
- D11** Energy including underwater noise

## b.2 BSAP segments

The sub-programme serves the following BSAP segments. Tick one or more relevant boxes.

- Eutrophication
- Hazardous substances
- Biodiversity
- Maritime activities

## b.3 Monitoring strategy description

**Monitoring strategy** :

## b.4 BSAP Ecological objectives

Choose only the most relevant option(s). Tick one or more boxes below.

---

### Eutrophication

- Concentrations of nutrients close to natural levels
- Clear water
- Natural level of algal blooms
- Natural distribution and occurrence of plants and animals
- Natural oxygen levels

---

### Hazardous substances

- Concentrations of hazardous substances close to natural levels
- All fish safe to eat
- Healthy wildlife
- Radioactivity at pre-Chernobyl levels

---

### Biodiversity

- Natural landscapes and seascapes
- Thriving and balanced communities of plants and animals
- Viable populations of species

---

### Maritime activities

- No illegal pollution
  - Safe maritime traffic without accidental pollution
  - Efficient response capability
  - No introductions of alien species from ships
  - Minimum air pollution from ships
  - Zero discharges from offshore platforms
-

## b.5 Gaps in monitoring

In relation to the GES criteria addressed, indicate when sufficient monitoring was in place or by when sufficient coverage will be in place ([Coverage\\_GEScriteria](#))

- Adequate monitoring was in place in 2014
- Adequate monitoring was in place by 2018
- Adequate monitoring is in place by July 2020
- Adequate monitoring will be in place by 2024
- Monitoring is not being put in place for this descriptor due to a low risk
- Monitoring for this descriptor is not relevant

Description of the implementation gaps and plans to complete the establishment and implementation of this descriptor monitoring strategy ([Gaps\\_Plans](#)):

Abundance and distribution of Grey seal and harbour seal represent time of moulting til at major haulouts and do not represent abundance and distribution during other periods of the year.

Monitoring is still not finally developed due to low abundance of species and missing regular haul out sites.

## c. Monitoring programmes

### c.1 Purpose of monitoring

#### *c.1a Assessment purpose in general*

The programme supports the assessment of:

Tick the relevant box.

Temporal trends	Spatial distribution	State classification
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

The **programme** supports the assessment of: ([MonitoringPurpose](#)).

Note that the answer to this question will be decisive for whether to answer upcoming questions e.g. upcoming questions on pressures should only be answered if the monitoring is defined as supporting the assessment of pressures.

Tick the relevant boxes.

Environmental state and impacts	Pressures in the marine environment	Pressures at source (land-based, riverine sea-based <sup>1</sup> and	Human activities causing the pressures	Effectiveness of measures
---------------------------------	-------------------------------------	--	--	---------------------------

<sup>1</sup> Sea-based 'Pressures at source' refers to monitoring pressures from sea-based activities where the monitoring is directly at the activity rather than at a distance from or time period after it is generated by the activity (e.g. D1 incidental

		atmospheric sources)		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
If this is selected fill in the following questions: c.1b	If this is selected fill in the following questions: c.1c, d	If this is selected fill in the following questions: c.1c, d	If this is selected fill in the following questions: c.1c, d	If this is selected fill in the following questions: c.1c, d

Give any other monitoring purpose e.g. if the programmes include supporting parameters for other monitoring programmes

Gives input to status assessments of seals under HD and in HELCOM Red List assessments. Data are also used in marine spatial planning and planning of MPAs.

For questions 1b-1d, select when applicable for the sub-programme, the link from the Reporting on the 2020 update of Article 11 for the Marine Strategy Framework Directive ([MSFD Guidance Document 17, 2020](#)) (*Features*) to:

- Ecosystem components (relevant for monitoring and assessment for Article 8(1a) for D1C2-C5, D3, D4, D6C3-C5, D7C2)
- Pressures and impacts in the marine environment (relevant for monitoring and assessment for Article 8(1b) for D1C1, D2, D5, D6C1-C2, D7C1, D8, D9, D10, D11)
- Pressure inputs to the marine environment (relevant for monitoring and assessment for Article 10)
- Uses and human activities (relevant for monitoring and assessment for Article 8(1c) and 13)

**c.1b • Ecosystem components (Features)**

Choose only the most relevant option(s). Tick one or more boxes below.

Theme	Sub-theme	Label feature
Species	<input type="checkbox"/> Birds	<input type="checkbox"/> Grazing birds
		<input type="checkbox"/> Wading birds
		<input type="checkbox"/> Surface-feeding birds
		<input type="checkbox"/> Pelagic-feeding birds
		<input type="checkbox"/> Benthic-feeding birds
<input checked="" type="checkbox"/> Mammals		<input type="checkbox"/> Small toothed cetaceans
		<input type="checkbox"/> Deep-diving toothed cetaceans
		<input type="checkbox"/> Baleen whales
		<input checked="" type="checkbox"/> Seals
<input type="checkbox"/> Reptiles		<input type="checkbox"/> Turtles

by-catch when fishing, D2 ballast water discharges, D6 use of bottom fishing gear, D8 contaminant discharges and pollution events from a vessel or pipeline, D11 impulsive sound events from a vessel or platform).

	<input type="checkbox"/> Fish	<input type="checkbox"/> Coastal fish
		<input type="checkbox"/> Pelagic shelf fish
		<input type="checkbox"/> Demersal shelf fish
		<input type="checkbox"/> Deep-sea fish
		<input type="checkbox"/> Commercially exploited fish and shellfish
	<input type="checkbox"/> Cephalopods	<input type="checkbox"/> Coastal/shelf cephalopods
		<input type="checkbox"/> Deep-sea cephalopods
Habitats	<input type="checkbox"/> Benthic habitats	<input type="checkbox"/> Benthic broad habitats
		<input type="checkbox"/> Other benthic habitats
	<input type="checkbox"/> Pelagic habitats	<input type="checkbox"/> Pelagic broad habitats
		<input type="checkbox"/> Other pelagic habitats
Ecosystems	<input type="checkbox"/> Physical and hydrological characteristics	
	<input type="checkbox"/> Chemical characteristics	
	<input checked="" type="checkbox"/> Ecosystems, including food webs	<input checked="" type="checkbox"/> Coastal ecosystems
		<input type="checkbox"/> Shelf ecosystems
		<input type="checkbox"/> Oceanic/deep-sea ecosystems

***c.1c • Pressures and impacts in the marine environment (Features)***

Choose only the most relevant option(s). Tick one or more boxes below.

Theme	Label: Feature
Biological	<input type="checkbox"/> Newly introduced non-indigenous species
	<input type="checkbox"/> Established non-indigenous species
	<input type="checkbox"/> Species affected by incidental by-catch
Physical and hydrological	<input type="checkbox"/> Hydrographical changes
	<input type="checkbox"/> Physical disturbance to seabed
	<input type="checkbox"/> Physical loss of the seabed
Substances, litter and energy	<input type="checkbox"/> Eutrophication
	<input type="checkbox"/> Contaminants - non UPBT substances
	<input type="checkbox"/> Contaminants - UPBT substances
	<input type="checkbox"/> Contaminants – in seafood
	<input type="checkbox"/> Adverse effects on species or habitats
	<input type="checkbox"/> Acute pollution events
	<input type="checkbox"/> Litter in the environment
	<input type="checkbox"/> Impulsive sound in water

---

Continuous low frequency sound

---

*c.1d • Pressure inputs to the marine environment (Features)*

Theme	Label: Feature
Biological	<input type="checkbox"/> Input or spread of non-indigenous species
	<input type="checkbox"/> Input of microbial pathogens
	<input type="checkbox"/> Input of genetically modified species and translocation of native species
	<input type="checkbox"/> Loss of, or change to, natural biological communities due to cultivation of animal or plant species
	<input type="checkbox"/> Disturbance of species (e.g. where they breed, rest and feed) due to human presence
	<input type="checkbox"/> Extraction of, or mortality/injury to, wild species (by commercial and recreational fishing and other activities)
Substances, litter and energy	<input type="checkbox"/> Input of nutrients — diffuse sources, point sources, atmospheric deposition
	<input type="checkbox"/> Input of organic matter — diffuse sources and point sources
	<input type="checkbox"/> Input of other substances (e.g. synthetic substances, non-synthetic substances, radionuclides) — diffuse sources, point sources, atmospheric deposition, acute events
	<input type="checkbox"/> Input of litter (solid waste matter, including micro-sized litter)
	<input type="checkbox"/> Input of anthropogenic sound (impulsive, continuous)
	<input type="checkbox"/> Input of other forms of energy (including electromagnetic fields, light and heat)
	<input type="checkbox"/> Input of water — point sources (e.g. brine)

*c.1e • Uses and human activities (Features)*

Choose only the most relevant option(s). Tick one or more boxes below.

Theme	Label: Feature
Physical restructuring of rivers, coastline or seabed (water management)	<input type="checkbox"/> Land claim
	<input type="checkbox"/> Canalisation and other watercourse modifications
	<input type="checkbox"/> Coastal defence and flood protection
	<input type="checkbox"/> Offshore structures (other than for oil/gas/renewables)
	<input type="checkbox"/> Restructuring of seabed morphology, including dredging and depositing of materials
Extraction of non-living	<input type="checkbox"/> Extraction of minerals (rock, metal ores, gravel, sand, shell)
	<input type="checkbox"/> Extraction of oil and gas, including infrastructure

resources	<input type="checkbox"/> Extraction of salt
	<input type="checkbox"/> Extraction of water
Production of energy	<input type="checkbox"/> Renewable energy generation (wind, wave and tidal power), including infrastructure
	<input type="checkbox"/> Non-renewable energy generation
	<input type="checkbox"/> Transmission of electricity and communications (cables)
Extraction of living resources	<input type="checkbox"/> Fish and shellfish harvesting (professional, recreational)
	<input type="checkbox"/> Fish and shellfish processing
	<input type="checkbox"/> Marine plant harvesting
	<input type="checkbox"/> Hunting and collecting for other purposes
Cultivation of living resources	<input type="checkbox"/> Aquaculture — marine, including infrastructure
	<input type="checkbox"/> Aquaculture — freshwater
	<input type="checkbox"/> Agriculture
	<input type="checkbox"/> Forestry
Transport	<input type="checkbox"/> Transport infrastructure
	<input type="checkbox"/> Transport — shipping
	<input type="checkbox"/> Transport — air
	<input type="checkbox"/> Transport — land
Urban and industrial uses	<input type="checkbox"/> Urban uses
	<input type="checkbox"/> Industrial uses
	<input type="checkbox"/> Waste treatment and disposal
Tourism and leisure	<input type="checkbox"/> Tourism and leisure infrastructure
	<input type="checkbox"/> Tourism and leisure activities
Security/defence	<input type="checkbox"/> Military operations (subject to Article 2(2))
Education and research	<input type="checkbox"/> Research, survey and educational activities

## c.2 Other legislation

The sub-programme links with the following other international legislation ([OtherPoliciesConventions](#)). Tick one or more relevant boxes.

- Bathing Water Directive
- Common Fisheries Policy – Data Collection Framework
- Habitats Directive
- Birds Directive
- Nitrates Directive



- Urban Waste Water Treatment Directive
- Water Framework Directive
- OSPAR Convention
- Trilateral Wadden Sea Convention
- Other, Specify: Bycatch information

### **c.3 Implementation of Regional Cooperation** **(RegionalCooperation\_implementation)**

Indicate the level of implementation by selecting one of the following:

- Agreed data collection methods
- Common monitoring strategy (spatial and temporal design of programme)
- Coordinated data collection (delivered separately by each country)
- Joint data collection (multinational delivery using same platform and/or algorithms)

## c.4 Monitoring concepts

Monitoring concepts table<sup>2</sup>:

Current means of coordination	Features or elements	Parameter	Method	QA/QC	Frequency <sup>3</sup>	Spatial resolution (density) of sampling	Link to HELCOM core indicators <sup>4</sup>	Spatial scope	Monitoring started (year)	CPs monitoring <sup>5</sup>
	Elements (Features) (Features_enum)	Parameters (Parameter) (ParametersOther)	MonitoringMethod (Monitoring Method) MonitoringMethodOther)	(Free text)	MonitoringFrequency	(ProgrammeDescription)	(RelatedIndicator) (RelatedIndicator_name)	(SpatialScope)	(TemporalScope)	(CountryCode_Enum)
HELCOM EG MAMA	Seals/Grey seal	Abundance, Distribution (range), Distribution (pattern)	HELCOM Guidelines for monitoring seal abundance and distribution in the HELCOM area	National/ HELCOM EG MAMA	Yearly	All haul outs	Population trends and abundance of seals  Distribution of Baltic seals	Coastal and territorial waters, EEZ	2000 (1975 in SE)	SE, FI, EE, DE  RU, DK, PL  PL yearly since 2016 – abundance in a haul-out (1 in PL so far)
HELCOM EG MAMA	Seals/Ringed seal	Abundance, Distribution (range), Distribution (pattern)	HELCOM Guidelines for monitoring seal abundance and distribution in the HELCOM area	National/ HELCOM EG MAMA	Yearly	Entire distribution	Population trends and abundance of seals  Distribution of Baltic seals	EEZ	1988/1996	SE, FI, EE, RU

<sup>2</sup> Needed codelists can be found on 2020 update of Article 11 for the Marine Strategy Framework Directive (MSFD Guidance Document 17, 2020).

<sup>3</sup> The option “Different for each country - see MORE overview” refers to the [overview](#) carried out in 2013

<sup>4</sup> Give the name of HELCOM core indicators that are based on the monitoring parameter.

<sup>5</sup> Provide information on the Contracting Partie(s) that are monitoring the parameter.

Current means of coordination	Features or elements	Parameter	Method	QA/QC	Frequency <sup>3</sup>	Spatial resolution (density) of sampling	Link to HELCOM core indicators <sup>4</sup>	Spatial scope	Monitoring started (year)	CPs monitoring <sup>5</sup>
HELCOM EG MAMA	Seals/Harbour seal, Kalmarsund	Abundance, Distribution (range), Distribution (pattern)	HELCOM Guidelines for monitoring seal abundance and distribution in the HELCOM area	National/ HELCOM EG MAMA	Yearly	Entire distribution	Population trends and abundance of seals  Distribution of Baltic seals	EEZ	1972	SE  PL once per year since 2016 (August) – abundance along the Polish coast
HELCOM EG MAMA	Seals/Harbour seal, Southern Baltic	Abundance, Distribution (range), Distribution (pattern)	HELCOM Guidelines for monitoring seal abundance and distribution in the HELCOM area	National/ HELCOM EG MAMA	Yearly	Entire distribution	Population trends and abundance of seals  Distribution of Baltic seals	Territorial waters	SE: 1979 DK: 1990	SE, DK
HELCOM EG MAMA	Seals/Harbour seal, Kattegatt	Abundance, Distribution (range), Distribution (pattern)	HELCOM Guidelines for monitoring seal abundance and distribution in the HELCOM area	National/ HELCOM EG MAMA	Yearly	Entire distribution	Population trends and abundance of seals  Distribution of Baltic seals	EEZ	1979	SE, DK

## PARAMETER

Element/Parameter pair
Grey seal/Abundance and distribution
Ringed seal/Abundance and distribution
Harbour seal/Abundance and distribution

## METHOD (MonitoringDetails)

Element/parameter
HELCOM Guidelines for monitoring seal abundance and distribution in the HELCOM area

## QA/QC

Element/Parameter pair
HELCOM Seal expert group coordinates and evaluates the data.

## FREQUENCY

### Frequency

Element/Parameter pair
Harbour seal/abundance and distribution: double (Denmark) or triple surveys carried out annually during moult in August covering the entire area of distribution.
Grey seal/abundance and distribution: coordinated surveys in end of May-early June annually.
Ringed seal/abundance and distribution: annual line transect surveys in the Bothnian Bay and Archipelago Sea, sporadic in the Gulf of Finland and the Gulf of Riga. Under poor ice conditions alternative boat survey is used.

## SPATIAL SCOPE

### Spatial Scope

Element/Parameter pair
The programme covers the haul-out range of each seal species within the HELCOM area

## SPATIAL RESOLUTION (DENSITY) OF SAMPLING

### Spatial resolution

Element/Parameter pair
------------------------

Kattegat, Great Belt, The Sound, Kiel Bay, Bay of Mecklenburg, Arkona Basin, Bornholm Basin, Eastern Gotland, Basin, Western Gotland Basin, Gulf of Riga, Northern Baltic Proper, Gulf of Finland, Åland Sea, Bothnian Sea, The Quark, Bothnian Bay.

For grey seals and harbour seals all significant seal haul-outs are covered.

For ringed seals, at least 13% of the ice-covered sea area is monitored. In poor ice conditions all known concentration areas on land will be monitored.

**Provide considerations for the scale of aggregation of data for an indicator-based assessment** Tick one or more relevant boxes below:

- HELCOM assessment unit Level 4: Subbasins with coastal WFD division
- HELCOM assessment unit Level 3: Subbasins with coastal and offshore division
- HELCOM assessment unit Level 2: Subbasin
- HELCOM assessment unit Level 1: Baltic Sea
- MSFD Region
- EU
- Other (specify)
- Unknown

## c.5 Monitoring and assessment requirements

### Monitoring requirements:

To assess seal abundance and trends over 5-year periods, annual surveys of each management unit are required to obtain the necessary power of detection. The survey efforts must be coordinated regionally to ensure that every management unit is surveyed by simultaneous surveys covering its range of distribution. The aerial surveys only contribute distribution data on land distribution. In order to obtain distribution at sea data for seals, other measures, such as periodical telemetry studies must be implemented.

With the current methodology, absolute abundances cannot be estimated for any of the species, as correction factors taking into account the proportion of the population that is hauled out during the surveys do not exist for any of the species in the Baltic. Studies to address this gap need to be performed.

### Ringed seal:

Warmer winters in recent years have resulted in reduced ice cover, making estimates in such years unreliable. This compromises the power to detect trends and calls for design of alternative methods.

Data for ringed seal southern populations is insufficient due to poor ice conditions. Alternative methods are being developed.

Due to climate change-driven fluctuations and reduction in ice distribution monitoring methods will need to be assessed and adapted.

Sweden is currently testing an alternative method for estimating the number of ringed seal seals in the Gulf of Bothnia, based on genetic information from individual seals (close-kin mark-recapture).

Alternative information on the number of ringed seals supplement the uncertainty in existing monitoring data and at the same time improve the knowledge regarding the genetic structure of the ringed seal population in the Baltic Sea.

**Grey seal:**

The grey seal range is expanding. While currently insignificant in regard to the general abundance, they may grow to become significant in the future. In Denmark, the grey seals are only surveyed once during the moulting season, while each locality is surveyed twice in Sweden, Finland, Russia and Estonia. This makes the counts from Denmark less robust. There is also ongoing monitoring in German and Poland.

During 2019, surveillance cameras has been tested as a complement to aerial surveys. In 2020, this method will be carried out continuously during the moulting period in several areas of the Baltic Sea to get a better estimate of seal abundance calculated from the aerial surveys, which depend on the number of seals on land during the moulting period.

With an increased number of haulouts in the Southern Baltic Sea and the North Sea, Sweden plans to achieve a more comprehensive national program for the entire distribution area.

**Harbour seal:**

During 2019, surveillance cameras has been tested as a complement to aerial surveys. In 2020, this method will be carried out continuously during the moulting period in both Kattegat and Skagerrak to get a better estimate of seal abundance calculated from the aerial surveys, which depend on the number of seals on land during the moulting period. In Denmark, each locality is only covered twice during the moulting surveys, making Danish counts less robust. There is also ongoing monitoring in Poland.

**Adequacy for assessment of GES:**

Monitoring should provide adequate data and information to enable the periodic assessment of environmental status, and distance from and progress towards GES as required by MSFD under Article 9 and Article 11.

	Yes	No
Adequate data?*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Established methods for assessment?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Adequate understanding of GES?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Adequate capacity to perform assessments?	<input checked="" type="checkbox"/>	<input type="checkbox"/>

\*Adequate data is available for some species/areas but might not be available for all species and all areas covered by the programme.

### Assessment of natural variability

Quantitative and Qualitative. Population trends are achieved by the time series of seal counts. Analyses are exemplified in Teilmann et al. 2010.

## c.6 Data providers and access

From which database the data can be made available? Tick the relevant boxes below:

HELCOM    HELCOM PLC    HELCOM MORS  
COMBINE

Other:

If the previous answer is "Other" please fill in the next questions (In case the answer is a HELCOM database, the HELCOM Secretariat will do it)

**Data type** Tick the relevant boxes below:

- Unprocessed/raw Data  
 Processed Data sets  
 Data Products  
 Modelled data

**Data management: General description of data management** ([DataManagement](#), Free text)

**What method/mechanism will be used to make the data available?** Tick the relevant boxes below and provide location ([DataAccess](#)):

- Providing URL to view data:  
 Providing URL to download data:  
 Provide location of data in national data centre: [Click here to enter text](#).  
 Provide location of data in international data centre (e.g. RSC, ICES, EEA, EMODnet):

**When will the data first become available?** ([DataPublicationDate](#))

Enter the date of reporting, or even a past date if desired (MM/YYYY):

**How frequently are the data expected to be updated thereafter?** Tick the relevant box below:

- Every 6 years    Weekly

- |  |  |
|--|--|
| <input type="checkbox"/> Every 3 years     | <input type="checkbox"/> Daily           |
| <input type="checkbox"/> Every 2 years     | <input type="checkbox"/> Hourly          |
| <input checked="" type="checkbox"/> Yearly | <input type="checkbox"/> Continually     |
| <input type="checkbox"/> 6-monthly         | <input type="checkbox"/> One-off         |
| <input type="checkbox"/> 3-monthly         | <input type="checkbox"/> As needed       |
| <input type="checkbox"/> Monthly           | <input type="checkbox"/> Other (specify) |
| <input type="checkbox"/> 2-weekly          | <input type="checkbox"/> Unknown         |

**List providing contact points in the Contracting Parties**

Seal Population Team aiming at developing and coordinating abundance and trend monitoring and undertake abundance and trend estimations:

Country	Name
Estonia	Ivar Jussi (Team Lead)
Denmark	Finn Larsen
Denmark	Morten Olsen
Denmark	Anders Galatius
Finland	Penina Blankett
Finland	Mervi Kunnasranta
Finland	Mikko Toivola
Germany	Alexander Liebschner
Germany	Linda Westphal
Poland	Iwona Pawliczka
Russia	Mikhail Verevkin
Sweden	Markus Ahola
Sweden	Susanne Viker

Seal distribution team:

Country	Name
Estonia	Mart Jussi (Team Lead)
Estonia	Märt Kesküla
Denmark	Finn Larsen
Denmark	Morten Olsen
Denmark	Anders Galatius
Finland	Mervi Kunnasranta
Finland	Penina Blankett
Germany	Alexander Liebschner



Germany	Michael Dähne	
Poland	Iwona Pawliczka	
Russia	Mikhail Verevkin	
Sweden	Markus Ahola	
Sweden	Susanne Viker	
WWF	Antti Halkka	

**Has the data been used or is it planned to be used in HELCOM assessments?** Tick the relevant box below:

Yes       No

**Select if data is used in the following Baltic Sea Environment Fact Sheets (BSEF)** Tick the relevant boxes below:

### **Biodiversity**

- Abundance and distribution of marenzelleria species
- Abundance and distribution of Round goby
- Abundance and distribution of the Zebra mussel
- Biopollution level index
- Observed non-indigenous and cryptogenic species in the Baltic Sea
- Population development of Great Cormorant
- Population development of Sandwich Tern
- Population development of Southern Dunlin
- Population Development of White-tailed Sea Eagle
- Temporal development of Baltic coastal fish communities and key species

### **Eutrophication**

- Bacterioplankton growth
- Chlorophyll-a concentrations, temporal variations and regional differences from satellite remote sensing
- Cyanobacteria biomass
- Cyanobacterial blooms in the Baltic Sea
- Cyanobacteria bloom index
- Impacts of invasive phytoplankton species on the Baltic Sea ecosystem in 1980-2008
- Nitrogen atmospheric deposition to the Baltic Sea
- Nitrogen emissions to the air in the Baltic Sea area
- Phytoplankton biomass and species succession
- Shifts in the Baltic Sea summer phytoplankton communities in 1992-2006

- Spatial distribution of the winter nutrient pool
- Unusual phytoplankton event

**Hazardous substances**

- Atmospheric deposition of heavy metals on the Baltic Sea
- Atmospheric deposition of PCDD/Fs on the Baltic Sea
- Atmospheric emissions of heavy metals in the Baltic Sea region
- Atmospheric emissions of PCDD/Fs in the Baltic Sea region
- Cesium-137 in Baltic Sea sediments
- Temporal trends in contaminants in Herring in the Baltic Sea in the period 1980-2010
- Emissions from Baltic Sea shipping
- Illegal discharges of oil in the Baltic Sea
- Liquid discharges of Cs-137, Sr-90 and Co-60 into the Baltic Sea
- Trace metal concentrations and trends in Baltic surface and deep waters

**Hydrography**

- Development of Sea Surface Temperature in the Baltic Sea
- Hydrography and Oxygen in the Deep Basins
- Ice season
- Total and regional runoff to the Baltic Sea
- Water Exchange between the Baltic Sea and the North Sea, and conditions in the Deep Basins
- Wave climate in the Baltic Sea

**c.7 MSFD Criteria (GES criteria)**

Choose only the most relevant option(s). Tick one or more boxes below.

Descriptor 1	<input type="checkbox"/> D1C1 – Primary: The mortality rate per species from incidental by-catch is below levels which threaten the species, such that its long- term viability is ensured.  Member States shall establish the threshold values for the mortality rate from incidental by-catch per species, through regional or subregional cooperation.  <input checked="" type="checkbox"/> D1C2 – Primary: The population abundance of the species is not adversely affected due to anthropogenic pressures, such that its long-term viability is ensured.  Member States shall establish threshold values for each species through regional or subregional cooperation, taking account of natural variation in population size and the mortality rates derived from D1C1, D8C4 and D10C4 and other relevant pressures. For species covered by Directive 92/43/EEC, these values shall be consistent with the
--------------	---

	<p>Favourable Reference Population values established by the relevant Member States under Directive 92/43/EEC.</p> <p><input type="checkbox"/> D1C3 – Primary for commercially- exploited fish and cephalopods and secondary for other species:</p> <p>The population demographic characteristics (e.g. body size or age class structure, sex ratio, fecundity, and survival rates) of the species are indicative of a healthy population which is not adversely affected due to anthropogenic pressures.</p> <p>Member States shall establish threshold values for specified characteristics of each species through regional or subregional cooperation, taking account of adverse effects on their health derived from D8C2, D8C4 and other relevant pressures.</p> <p><input checked="" type="checkbox"/> D1C4 – Primary for species covered by Annexes II, IV or V to Directive 92/43/EEC and secondary for other species:</p> <p>The species distributional range and, where relevant, pattern is in line with prevailing physiographic, geographic and climatic conditions.</p> <p>Member States shall establish threshold values for each species through regional or subregional cooperation. For species covered by Directive 92/43/EEC, these shall be consistent with the Favourable Reference Range values established by the relevant Member States under Directive 92/43/EEC.</p> <p><input type="checkbox"/> D1C5 – Primary for species covered by Annexes II, IV and V to Directive 92/43/EEC and secondary for other species:</p> <p>The habitat for the species has the necessary extent and condition to support the different stages in the life history of the species.</p> <p><input type="checkbox"/> D1C6 – Primary</p> <p>The condition of the habitat type, including its biotic and abiotic structure and its functions (e.g. its typical species composition and their relative abundance, absence of particularly sensitive or fragile species or species providing a key function, size structure of species), is not adversely affected due to anthropogenic pressures.</p> <p>Member States shall establish threshold values for the condition of each habitat type, ensuring compatibility with related values set under Descriptors 2, 5 and 8, through regional or subregional cooperation.</p>
Descriptor 2	<p><input type="checkbox"/> D2C1 – Primary:</p> <p>The number of non-indigenous species which are newly introduced via human activity into the wild, per assessment period (6 years), measured from the reference year as reported for the initial assessment under Article 8(1) of Directive 2008/56/EC, is minimised and where possible reduced to zero.</p> <p>Member States shall establish the threshold value for the number of new introductions of non-indigenous species, through regional or subregional cooperation.</p> <p><input type="checkbox"/> D2C2 – Secondary:</p> <p>Abundance and spatial distribution of established non-indigenous species, particularly of invasive species, contributing significantly to adverse effects on particular species groups or broad habitat types.</p> <p><input type="checkbox"/> D2C3 – Secondary:</p>

	<p>Proportion of the species group or spatial extent of the broad habitat type which is adversely altered due to non-indigenous species, particularly invasive non-indigenous species.</p> <p>Member States shall establish the threshold values for the adverse alteration to species groups and broad habitat types due to non-indigenous species, through regional or subregional cooperation.</p>
Descriptor 3	<p><input type="checkbox"/> D3C1 — Primary:</p> <p>The Fishing mortality rate of populations of commercially-exploited species is at or below levels which can produce the maximum sustainable yield (MSY). Appropriate scientific bodies shall be consulted in accordance with Article 26 of Regulation (EU) No 1380/2013.</p> <p><input type="checkbox"/> D3C2 — Primary:</p> <p>The Spawning Stock Biomass of populations of commercially-exploited species are above biomass levels capable of producing maximum sustainable yield. Appropriate scientific bodies shall be consulted in accordance with Article 26 of Regulation (EU) No 1380/2013.</p> <p><input type="checkbox"/> D3C3 — Primary:</p> <p>The age and size distribution of individuals in the populations of commercially-exploited species is indicative of a healthy population. This shall include a high proportion of old/large individuals and limited adverse effects of exploitation on genetic diversity.</p> <p>Member States shall establish threshold values through regional or subregional cooperation for each population of species in accordance with scientific advice obtained pursuant to Article 26 of Regulation (EU) No 1380/2013.</p>
Descriptor 4	<p><input type="checkbox"/> D4C1 — Primary:</p> <p>The diversity (species composition and their relative abundance) of the trophic guild is not adversely affected due to anthropogenic pressures.</p> <p>Member States shall establish threshold values through regional or subregional cooperation.</p> <p><input checked="" type="checkbox"/> D4C2 — Primary:</p> <p>The balance of total abundance between the trophic guilds is not adversely affected due to anthropogenic pressures.</p> <p>Member States shall establish threshold values through regional or subregional cooperation.</p> <p><input type="checkbox"/> D4C3 — Secondary:</p> <p>The size distribution of individuals across the trophic guild is not adversely affected due to anthropogenic pressures.</p> <p>Member States shall establish threshold values through regional or subregional cooperation.</p> <p><input checked="" type="checkbox"/> D4C4 — Secondary (to be used in support of criterion D4C2, where necessary):</p> <p>Productivity of the trophic guild is not adversely affected due to anthropogenic pressures.</p>

	<p>Member States shall establish threshold values through regional or subregional cooperation.</p>
<p>Descriptor 5</p>	<p><input type="checkbox"/> D5C1 — Primary:</p> <p>Nutrient concentrations are not at levels that indicate adverse eutrophication effects.</p> <p>The threshold values are as follows:</p> <ul style="list-style-type: none"> <li>(a) in coastal waters, the values set in accordance with Directive 2000/60/EC;</li> <li>(b) beyond coastal waters, values consistent with those for coastal waters under Directive 2000/60/EC. Member States shall establish those values through regional or subregional cooperation</li> </ul> <p><input type="checkbox"/> D5C2 — Primary:</p> <p>Chlorophyll a concentrations are not at levels that indicate adverse effects of nutrient enrichment.</p> <p>The threshold values are as follows:</p> <ul style="list-style-type: none"> <li>(c) in coastal waters, the values set in accordance with Directive 2000/60/EC;</li> <li>(d) beyond coastal waters, values consistent with those for coastal waters under Directive 2000/60/EC. Member States shall establish those values through regional or subregional cooperation.</li> </ul> <p><input type="checkbox"/> D5C3 — Secondary:</p> <p>The number, spatial extent and duration of harmful algal bloom events are not at levels that indicate adverse effects of nutrient enrichment.</p> <p><input type="checkbox"/> D5C4 — Secondary:</p> <p>The photic limit (transparency) of the water column is not reduced, due to increases in suspended algae, to a level that indicates adverse effects of nutrient enrichment.</p> <p>The threshold values are as follows:</p> <ul style="list-style-type: none"> <li>(e) in coastal waters, the values set in accordance with Directive 2000/60/EC;</li> <li>(f) beyond coastal waters, values consistent with those for coastal waters under Directive 2000/60/EC. Member States shall establish those values through regional or subregional cooperation.</li> </ul> <p><input type="checkbox"/> D5C5 — Primary (may be substituted by D5C8):</p> <p>The concentration of dissolved oxygen is not reduced, due to nutrient enrichment, to levels that indicate adverse effects on benthic habitats (including on associated biota and mobile species) or other eutrophication effects.</p> <p>The threshold values are as follows:</p> <ul style="list-style-type: none"> <li>(g) in coastal waters, the values set in accordance with Directive 2000/60/EC;</li> <li>(h) beyond coastal waters, values consistent with those for coastal waters under Directive 2000/60/EC. Member States shall establish those values through regional or subregional cooperation.</li> </ul> <p><input type="checkbox"/> D5C6 — Secondary:</p> <p>The abundance of opportunistic macroalgae is not at levels that indicate adverse effects</p>

	<p>of nutrient enrichment.</p> <p>The threshold values are as follows:</p> <ul style="list-style-type: none"> <li>(a) in coastal waters, the values set in accordance with Directive 2000/60/EC;</li> <li>(b) should this criterion be relevant for waters beyond coastal waters, values consistent with those for coastal waters under Directive 2000/60/EC. Member States shall establish those values through regional or subregional cooperation.</li> </ul> <p><input type="checkbox"/> D5C7 – Secondary:</p> <p>The species composition and relative abundance or depth distribution of macrophyte communities achieve values that indicate there is no adverse effect due to nutrient enrichment including via a decrease in water transparency, as follows:</p> <ul style="list-style-type: none"> <li>(a) in coastal waters, the values set in accordance with Directive 2000/60/EC;</li> <li>(b) should this criterion be relevant for waters beyond coastal waters, values consistent with those for coastal waters under Directive 2000/60/EC. Member States shall establish those values through regional or subregional cooperation.</li> </ul> <p><input type="checkbox"/> D5C8 – Secondary: (except when used as a substitute for D5C5):</p> <p>The species composition and relative abundance of macrofaunal communities, achieve values that indicate that there is no adverse effect due to nutrient and organic enrichment, as follows:</p> <ul style="list-style-type: none"> <li>(a) in coastal waters, the values for benthic biological quality elements set in accordance with Directive 2000/60/EC;</li> <li>(b) beyond coastal waters, values consistent with those for coastal waters under Directive 2000/60/EC. Member States shall establish those values through regional or subregional cooperation.</li> </ul>
Descriptor 6	<p><input type="checkbox"/> D6C1 – Primary:</p> <p>Spatial extent and distribution of physical loss (permanent change) of the natural seabed.</p> <p><input type="checkbox"/> D6C2 – Primary:</p> <p>Spatial extent and distribution of physical disturbance pressures on the seabed.</p> <p><input type="checkbox"/> D6C3 – Primary:</p> <p>Spatial extent of each habitat type which is adversely affected, through change in its biotic and abiotic structure and its functions (e.g. through changes in species composition and their relative abundance, absence of particularly sensitive or fragile species or species providing a key function, size structure of species), by physical disturbance.</p> <p>Member States shall establish threshold values for the adverse effects of physical disturbance, through regional or subregional cooperation.</p> <p><input type="checkbox"/> D6C4 – Primary:</p> <p>The extent of loss of the habitat type, resulting from anthropogenic pressures, does not exceed a specified proportion of the natural extent of the habitat type in the assessment area.</p>

	<p>Member States shall establish the maximum allowable extent of habitat loss as a proportion of the total natural extent of the habitat type, through cooperation at Union level, taking into account regional or subregional specificities.</p> <p><input type="checkbox"/> D6C5 – Primary:</p> <p>The extent of adverse effects from anthropogenic pressures on the condition of the habitat type, including alteration to its biotic and abiotic structure and its functions (e.g. its typical species composition and their relative abundance, absence of particularly sensitive or fragile species or species providing a key function, size structure of species), does not exceed a specified proportion of the natural extent of the habitat type in the assessment area.</p> <p>Member States shall establish threshold values for adverse effects on the condition of each habitat type, ensuring compatibility with related values set under Descriptors 2, 5, 6, 7 and 8, through cooperation at Union level, taking into account regional or subregional specificities. Member States shall establish the maximum allowable extent of those adverse effects as a proportion of the total natural extent of the habitat type, through cooperation at Union level, taking into account regional or subregional specificities.</p>
Descriptor 7	<p><input type="checkbox"/> D7C1 – Secondary:</p> <p>Spatial extent and distribution of permanent alteration of hydrographical conditions (e.g. changes in wave action, currents, salinity, temperature) to the seabed and water column, associated in particular with physical loss(1) of the natural seabed.</p> <p><input type="checkbox"/> D7C2 – Secondary:</p> <p>Spatial extent of each benthic habitat type adversely affected (physical and hydrographical characteristics and associated biological communities) due to permanent alteration of hydrographical conditions.</p>
Descriptor 8	<p><input type="checkbox"/> D8C1 – Primary:</p> <p>Within coastal and territorial waters, the concentrations of contaminants do not exceed the following threshold values:</p> <ul style="list-style-type: none"> <li>(a) for contaminants set out under point 1(a) of criteria elements, the values set in accordance with Directive 2000/60/EC;</li> <li>(b) when contaminants under point (a) are measured in a matrix for which no value is set under Directive 2000/60/EC, the concentration of those contaminants in that matrix established by Member States through regional or subregional cooperation;</li> <li>(c) for additional contaminants selected under point 1(b) of criteria elements, the concentrations for a specified matrix (water, sediment or biota) which may give rise to pollution effects. Member States shall establish these concentrations through regional or subregional cooperation, considering their application within and beyond coastal and territorial waters.</li> </ul> <p>Beyond territorial waters, the concentrations of contaminants do not exceed the following threshold values:</p> <ul style="list-style-type: none"> <li>(a) for contaminants selected under point 2(a) of criteria elements, the values as applicable within coastal and territorial waters;</li> </ul>

	<p>(b) for contaminants selected under point 2(b) of criteria elements, the concentrations for a specified matrix (water, sediment or biota) which may give rise to pollution effects. Member States shall establish these concentrations through regional or subregional cooperation.</p> <p><input type="checkbox"/> D8C2 – Secondary:</p> <p>The health of species and the condition of habitats (such as their species composition and relative abundance at locations of chronic pollution) are not adversely affected due to contaminants including cumulative and synergetic effects.</p> <p>Member States shall establish those adverse effects and their threshold values through regional or subregional cooperation.</p> <p><input type="checkbox"/> D8C3 – Primary:</p> <p>The spatial extent and duration of significant acute pollution events are minimised.</p> <p><input type="checkbox"/> D8C4 – Secondary (to be used when a significant acute pollution event has occurred):</p> <p>The adverse effects of significant acute pollution events on the health of species and on the condition of habitats (such as their species composition and relative abundance) are minimised and, where possible, eliminated.</p>
Descriptor 9	<p><input type="checkbox"/> D9C1 – Primary:</p> <p>The level of contaminants in edible tissues (muscle, liver, roe, flesh or other soft parts, as appropriate) of seafood (including fish, crustaceans, molluscs, echinoderms, seaweed and other marine plants) caught or harvested in the wild (excluding fin-fish from mariculture) does not exceed:</p> <p>(a) for contaminants listed in Regulation (EC) No 1881/2006, the maximum levels laid down in that Regulation, which are the threshold values for the purposes of this Decision;</p> <p>(b) for additional contaminants, not listed in Regulation (EC) No 1881/2006, threshold values, which Member States shall establish through regional or subregional cooperation.</p>



Descriptor 10	<p><input type="checkbox"/> D10C1 – Primary:</p> <p>The composition, amount and spatial distribution of litter on the coastline, in the surface layer of the water column, and on the seabed, are at levels that do not cause harm to the coastal and marine environment.</p> <p>Member States shall establish threshold values for these levels through cooperation at Union level, taking into account regional or subregional specificities.</p> <p><input type="checkbox"/> D10C2 – Primary:</p> <p>The composition, amount and spatial distribution of micro-litter on the coastline, in the surface layer of the water column, and in seabed sediment, are at levels that do not cause harm to the coastal and marine environment.</p> <p>Member States shall establish threshold values for these levels through cooperation at Union level, taking into account regional or subregional specificities.</p> <p><input type="checkbox"/> D10C3 – Secondary:</p> <p>The amount of litter and micro-litter ingested by marine animals is at a level that does not adversely affect the health of the species concerned. Member States shall establish threshold values for these levels through regional or subregional cooperation.</p> <p><input type="checkbox"/> D10C4 – Secondary:</p> <p>The number of individuals of each species which are adversely affected due to litter, such as by entanglement, other types of injury or mortality, or health effects. Member States shall establish threshold values for the adverse effects of litter, through regional or subregional cooperation.</p>
Descriptor 11	<p><input type="checkbox"/> D11C1 – Primary:</p> <p>The spatial distribution, temporal extent, and levels of anthropogenic impulsive sound sources do not exceed levels that adversely affect populations of marine animals.</p> <p>Member States shall establish threshold values for these levels through cooperation at Union level, taking into account regional or subregional specificities.</p> <p><input type="checkbox"/> D11C2 – Primary:</p> <p>The spatial distribution, temporal extent and levels of anthropogenic continuous low-frequency sound do not exceed levels that adversely affect populations of marine animals.</p> <p>Member States shall establish threshold values for these levels through cooperation at Union level, taking into account regional or subregional specificities.</p>

## d. References

Make a list of cited references and literature for further supportive information.

Teilmann J., Riget F., Härkönen T. 2010. Optimising survey design in Scandinavian harbour seals: Population trend as an ecological quality element. ICESJournal of Marine Science, 67: 952–958. Härkönen T., Stenman O., Jüssi M., Jüssi I., Sagitov R., Verevkin M. 1998. Population size and distribution of the Baltic ringed seal (*Phoca hispida botnica*). In: Ringed Seals (*Phoca hispida*) in the

North Atlantic. Edited by C.Lydersen and M.P. Heide-Jørgensen. NAMMCO Scientific Publications, Vol.1, 167-180.Härkönen T. and Lunneryd S.G. 1992. Estimating abundance of ringed seals in the Bothnian Bay. *Ambio* 21:497-510.