

HELCOM Monitoring Programme topic

Mammals

Programme:

Marine mammals health status

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a. Metadata on monitoring strategies and monitoring programmes

a.1 Responsible HELCOM subsidiary body

HELCOM Expert Group on Marine Mammals (EG MAMA)

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.

- Common monitoring guidelines.
- Common quality assurance programme: missing. National QA/QC exists.
- Common database: missing.

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](#)):

The funding for the health assessment in the different countries is not ensured thus it is difficult to collect and treat the basic data needed for the development of core indicators. The overall aim is to develop the indicators further so that all countries can contribute with their data.

Monitoring of the Baltic marine mammals started in the 1970s when the health of the seal populations was seriously threatened by contaminants, especially organochlorines. The populations have slowly recovered but new threats have arisen (e.g. other contaminants). There is lack of data, especially for harbor porpoises and harbor seals but also for ringed seals. Thus, knowledge of normal reproduction rate and blubber thickness does not exist for Baltic marine mammals. Data from outside the Baltic could be used to determine normal limits, but the possible issue here is that the ecosystem outside the Baltic Sea is different with dissimilar opportunities to forage. In the Baltic, grey seals also have a smaller body size than in the northeast Atlantic (UK and Norway), which in turn are smaller than in the northwest Atlantic (McLaren 1993).

Trends of the overall health status of the Baltic ringed seal are uncertain due to low numbers of necropsied whole animals. Health investigations have focused on female reproductive tracts, which have been collected systematically since the late 1970's. However, as an increasing amount of ringed seals are shot during the hunt in the Gulf of Bothnia, the number of investigated seals in recent time has increased. Data from the southern populations of ringed seals is scarce.

Data from investigations on the overall health status of the western population of harbor seals could probably serve as normal data also to determine GES in the Kalmarsund harbor seal population. Health parameters of harbor seals from the Swedish west coast are only monitored from hunted animals.

Data on harbour porpoises is insufficient to determine the overall health status and reproductive status at this time.

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 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 ¹ and atmospheric sources)	Human activities causing the pressures	Effectiveness of measures
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input 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

Accumulation of contaminants in foodwebs, impact to biota by hazardous substances.

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)

¹ 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 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).

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
<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 checked="" type="checkbox"/> Chemical characteristics	
	<input checked="" type="checkbox"/> Ecosystems, including food webs	<input 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
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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 checked="" 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
<input type="checkbox"/> 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 of other forms of energy (including electromagnetic fields, light and heat)

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 resources	<input type="checkbox"/> Extraction of minerals (rock, metal ores, gravel, sand, shell)
	<input type="checkbox"/> Extraction of oil and gas, including infrastructure
	<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	<input type="checkbox"/> Urban uses

industrial 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:

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 table²:

Current means of coordination	Elements	Parameter	Method	QA/QC	Frequency ³	Spatial resolution (density) of sampling	Link to HELCOM core indicators ⁴	Link to MSFD GES characteristics	Spatial scope	Monitoring started (year)	CPs monitoring ⁵
	Elements (Features) (Features_enum)	Parameters (Parameter) (ParametersOther)	MonitoringMethod (Monitoring Method) (MonitoringMethodOther)	(Free text)	MonitoringFrequency	(ProgrammeDescription)	(RelatedIndicator) (RelatedIndicator_name)		(SpatialScope)	(TemporalScope)	(CountryCode_Enum)
	Grey seal reproductive status	Pregnancy rate (gestation or postpartum pregnancy signs)	Post mortem procedures		Yearly		Reproductive status in marine mammals		Level 2 assessment units	Assessments done from 2011 and onwards	SE, FI
	Grey seal blubber thickness	Blubber thickness (mm)	Post mortem procedures		Yearly		Nutritional status of seals		Level 2 assessment units	Assessments done from 2002 and onwards	SE, FI

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

³ The option "Different for each country - see MORE overview" refers to the [overview](#) carried out in 2013

⁴ Give the name of HELCOM core indicators that are based on the monitoring parameter.

⁵ Provide information on the Contracting Partie(s) that are monitoring the parameter.

PARAMETER

Element/Parameter pair

Female reproductive status measured as pregnancy rate:

- proportion of females with presence of a fetus in the pregnancy period
- proportion of females showing post partum signs as ovarian corpus albicans and uterine scars between time for birth and implantation.

Nutritional status measured as blubber thickness (mm) at sternum in 1-3 years old.

METHOD (MonitoringDetails)

Element/parameter

Reproductive status: Data for the core indicators are received during seal necropsies. For reproductive status the uterus is examined for fetus or postpartum signs (uterine scars) and ovaries are examined for corpora albicans.

Nutritional status: Data for the core indicators are received during seal necropsies. For nutritional status the blubber thickness is measured to the nearest millimeter at the sternum between the muscle and the skin. Age is determined by teeth sections.

QA/QC

Element/Parameter pair

HELCOM EG MAMA health team coordinates and evaluates. During monitoring 1977- 2016, two persons in Sweden (veterinarian and pathobiologist) have conducted the necropsies (Bergman, 1999). And after 2016 another veterinarian and the patho-biologist. In Finland several people (veterinarians, seal biologists) have performed necropsies. In Germany and Poland necropsies are performed by veterinarians. In Denmark a limited number of animals are dissected, under the drop game contract, being a veterinarian who performs the dissections. National consultations and synchronisations are made continuously between people indifferent countries. Age determinations of the grey seals, harbour seals and ringed seals are performed by counting growth layer groups (GLGs) in the cementum of teeth according to a well-established methods. Readings of tooth sections are made independently by two persons.

FREQUENCY

Frequency

Element/Parameter pair

All by-caught and stranded seal species are sampled all year round and hunted seals in different periods depending on country and species. The

number of seals collected are also dependent of how the collection is financed nationally and on people collecting and sending them.

In Denmark, the animals are collected by AU and FIMUS. Some animals are collected by DTU Aqua.

SPATIAL SCOPE

Spatial Scope

Element/Parameter pair

The female reproductive status of all three seal species is assessed on available material in Level 2 assessment units. Most of the grey and ringed seals data on reproduction is from the Gulf of Bothnia. Most of the grey and ringed seal data on reproduction has previously been from the northern parts of the Baltic sea, but the aim is to include data from all parts of the Baltic (i.e. all countries). For harbor seals the assessment area is Kattegat.

The nutritional status is assessed for all three seal species based on available data originating from bycatch and hunting. The nutritional status is assessed at Level 2 assessment units.

In Denmark seals derive from live catches, regulated (shot), bycaught and stranded (unknown cause of death). Maximum 30 per year (both grey and harbour seals), and max 7 harbour porpoises are dissected under *Faldvildtkontrakten*, which is an extremely low number in relation to the sizes of the Danish marine mammal populations. In years with PDV the number of dissected seals double (see below).

Dissekerede dyr			
år	Gråsæl	Spættet sæl	Marsvin
2008	0	10	1
2009	0	18	5
2010	2	6	1
2011	0	21	0
2012	2	20	4
2013	1	21	4
2014	10	44*	5
2015	3	18	2
2016	4	22	5
2017	2	16	7
2018			5

SPATIAL RESOLUTION (DENSITY) OF SAMPLING

Spatial resolution

Element/Parameter pair

Baltic Sea

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:

The health core indicators for seals are female reproductive status and nutritional status. The female reproductive status is sensitive for contaminants and starvation and the nutritional status is sensitive for ecological changes in the fish community. Changes in female reproduction, is closely linked to PCB-contamination and the pregnancy rate dropped to 17% in female ringed seals and similar for grey seals during the 1970s. During the same time period there were no indices of starvation in seals. The reproductive status includes measurements of pregnancy rate:

- Gestation rate measured as percent \pm CI sexually mature females having a macroscopically visible fetus after implantation up until parturition.
- Postpartum pregnancy signs rate measured as percent \pm CI females with uterine scar and a corpus albicans during the period after parturition up until the expected implantation period of the next pregnancy.

Female reproduction is measured from hunted, by-caught seals and from stranded seals. At present the assessment of female reproduction depends on hunted seals for sufficiency of data. GES is set to 90% for grey seals, and tentatively for ringed seals. There is no set GES for harbour seals or harbour porpoises.

The nutritional status is currently measured as geometric mean \pm CI of blubber thickness in 1-3 years old females and males during the fattest time of the year, the pregnancy period. The monitoring of nutritional status is currently confined to by-caught and hunted seals and these two categories should be assessed separately since bycaught seals are usually leaner. In areas without seal hunting the monitoring can be carried out based on bycaught seals only. GES is set to 40 mm (for hunted seals), 35 mm (for by-caught seals) or 25 mm (if the population is assessed to be at carrying capacity).

In Denmark threshold values for the nutritional condition have not been established due to data limitations; with the current collection strategy of a maximum of around 30-40 animals per year,

it will take a long time before it is possible to apply one sex, one age-class and time of year. The dissections, under the fall wild contract, have until now not examined reproduction.

For both reproductive status and blubber thickness the age of the seal is important to determine.

Data compilation:

Data is assessed and also presented as trends. Reproductive data is presented in five year intervals and blubber thickness in 3 year intervals for grey seals. The intervals (GES) for ringed seals (nutritional status) and harbor seals (reproductive status and nutritional status) have not yet been decided.

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 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"/>

Assessment of natural variability

Pregnancy rate is measured as presence or absence of a foetus in the pregnancy period in 6–24-year-old grey seals and from the proportion of 7–25-year-old females with corpus albicans and a placental scar in spring. GES is proposed to be assessed every third year (pooling the data for each 3-year period) for 6–24-year-olds, and every sixth year pooling the data for each 6-year period, separately for young (4–5-year-old) and adult (≥ 6 -year-old) females. For ringed seals, a period of 10 years to get enough data may be needed. The same GES boundary has been proposed for the ringed seal. Data should also be presented as trends.

In the Baltic, the causes of death have been shown to influence the result of the blubber measurements. Stranded seals often show a thin blubber layer (starvation due to disease or old age) and by-caught seals are often thinner than seals received from hunt. Therefore, these groups have been suggested to be presented separately since their proportions will influence the GES determination. Recent discussions within the Health team have focused on including seals from all year round.

GES limits for blubber thickness in ringed seals and harbour seals are still being investigated. Data for harbour porpoises is insufficient.

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

Every 3 years

Daily

Every 2 years

Hourly

Yearly

Continually

6-monthly

One-off

3-monthly

As needed

- Monthly

 Other (specify) 3/6 years
 2-weekly

 Unknown

List providing contact points in the Contracting Parties

EG MAMA Health Team:	
Germany	Ursula Siebert (Team Lead)
Denmark	Morten Tange Olsen
Denmark	Heidi Huus Petersen
Denmark	Line Kyhn
Denmark	Rune Dietz
Denmark	Anders Galatius
Estonia	Ivar Jussi
Estonia	Mart Jussi
Finland	Marja Isomursu
Finland	Kaarina Kauhala
Germany	Kristina Lehnert
Germany	Michael Dähne
Latvia	Valdis Pilats
Lithuania	Ignas Kazlauskas
Lithuania	Vaida Surviliene
Poland	Iwona Pawliczka
Russia	Mikhail Verevkin
Sweden	Sara Persson
Sweden	Karin Hårding
Sweden	Britt-Marie Bäcklin

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	<p><input type="checkbox"/> D1C1 – Primary:</p> <p>The mortality rate per species from incidental by-catch is below levels which threaten the species, such that its long- term viability is ensured.</p> <p>Member States shall establish the threshold values for the mortality rate from incidental by-catch per species, through regional or subregional cooperation.</p> <p><input type="checkbox"/> D1C2 – Primary:</p> <p>The population abundance of the species is not adversely affected due to anthropogenic pressures, such that its long-term viability is ensured.</p> <p>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 Favourable Reference Population values established by the relevant Member States under Directive 92/43/EEC.</p> <p><input checked="" 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 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>
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	<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>

<p>Descriptor 4</p>	<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 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"> (a) in coastal waters, the values set in accordance with Directive 2000/60/EC; (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 <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"> (c) in coastal waters, the values set in accordance with Directive 2000/60/EC; (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. <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>

D5C4 — Secondary:

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.

The threshold values are as follows:

- (e) in coastal waters, the values set in accordance with Directive 2000/60/EC;
- (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.

D5C5 — Primary (may be substituted by D5C8):

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.

The threshold values are as follows:

- (g) in coastal waters, the values set in accordance with Directive 2000/60/EC;
- (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.

D5C6 — Secondary:

The abundance of opportunistic macroalgae is not at levels that indicate adverse effects of nutrient enrichment.

The threshold values are as follows:

- (a) in coastal waters, the values set in accordance with Directive 2000/60/EC;
- (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.

D5C7 — Secondary:

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:

- (a) in coastal waters, the values set in accordance with Directive 2000/60/EC;
- (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.

D5C8 — Secondary: (except when used as a substitute for D5C5):

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:

- (a) in coastal waters, the values for benthic biological quality elements set in accordance with Directive 2000/60/EC;

	<p>(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.</p>
<p>Descriptor 6</p>	<p><input type="checkbox"/> D6C1 – Primary: Spatial extent and distribution of physical loss (permanent change) of the natural seabed.</p> <p><input type="checkbox"/> D6C2 – Primary: Spatial extent and distribution of physical disturbance pressures on the seabed.</p> <p><input type="checkbox"/> D6C3 – Primary: 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: 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: 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>
<p>Descriptor 7</p>	<p><input type="checkbox"/> D7C1 – Secondary: 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>
<p>Descriptor 8</p>	<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"> (a) for contaminants set out under point 1(a) of criteria elements, the values set in accordance with Directive 2000/60/EC; (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; (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. <p>Beyond territorial waters, the concentrations of contaminants do not exceed the following threshold values:</p> <ul style="list-style-type: none"> (a) for contaminants selected under point 2(a) of criteria elements, the values as applicable within coastal and territorial waters; (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><input checked="" 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>
<p>Descriptor 9</p>	<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</p>

	<p>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>
<p>Descriptor 10</p>	<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>
<p>Descriptor 11</p>	<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.

Bergman, A. 1999. Health condition of the Baltic grey seal (*Halichoerus grypus*) during two decades: Gynaecological health improvement but increased prevalence of colonic ulcers. *APMIS*, 107:270-82.

Nyman M, Koistinen J, Fant ML, Vartiainen T, Helle E 2002. Current levels of DDT, PCB and trace elements in the Baltic ringed seals (*Phoca hispida baltica*) and grey seals (*Halichoerus grypus*). *Environmental Pollution* 119:399–412.

Routti H. 2009. Biotransformation and endocrine disruptive effects of contaminants in ringed seals-implications for monitoring and risk assessment. PhD Dissertation, University of Turku.