HELCOM Monitoring Programme topic

Species distribution and abundance / Benthic community

Programme:

Softbottom flora

Contents

a. Metadata on monitoring strategies and monitoring programmes

a.1 Responsible HELCOM subsidiary body

Please indicate the relevant expert group/network if available, otherwise the responsible HELCOM Working Group.

	Permament Groups
☐	Gear – Group on the Implementation of the Ecosystem Approach
☐	Maritime – Maritime Working Group
☐	Pressure – Working Group on Reduction of Pressures from the Baltic Sea Catchment Area
☐	Response – Response Working Group
☒	State and Conservation – Working Group on the State of the Environmental and Natture Conservation
	Time-limited Groups
☐	Agri – Group on Sustainable Agricultural Practices
☐	Fish – Group on Ecosystem-based Sustainable Fisheries
☐	HELCOM-VASAB MSP WG - Joint HELCOM-VASAB Maritime Spatial Planning Working Group
	Expert Groups
☐	AIS EWG – Expert Working Group for Mutual Exchange and Deliveries of AIS data
☐	EN Hazardous Substances – Expert Network on hazardous substances
☐	EN Marine Litter – Expert Network on Marine Litter
☐	EN Noise – Expert Network on Underwater Noise
☐	ESA – Expert Network on Economic and Social Analyses
☐	EWG OWR – Expert Working Group on Oiled Wildlife Response
☐	EWG SHORE – Expert Working Group on Response on the Shore
☐	Green Technology and Alternative Fuels Platform for Shipping
☐	HELCOM/OSPAR TG BALLAST – Joint HELCOM/OSPAR Task Group on Ballast Management Convention Exemptions
☒	EN Benthic – Expert Network on benthic habitats

☐	IN-EUTROPHICATION - Intersessional Network on Eutrophication
☐	IWGAS – Informal Working Group on Aerial Surveillance
☐	JWG Bird – HELCOM-OSPAR-ICES Joint Working Group on Seabirds
☐	MORS EG – Expert group on monitoring of radioactive substances in the Baltic Sea
☐	PRF Cooperation Platform – Cooperation Platform on Port Reception Facilities in the Baltic Sea
☐	SAFE NAV – Group of Experts on Safety of Navigation
☐	SUBMERGED – Expert Group on Environmental Risks of Hazardous Submerged Objects

a.2 Regional Cooperation (RegionalCooperation)

The monitoring of this programme is:

☐ Fully coordinated

☒ Not 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.

b. Monitoring strategies

b.1 Descriptor

The programme supports the following obligatory MSFD Monitoring Strategies. 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 : Monitoring is to be carried out to fulfill assessment requirements of HELCOM ecological objectives that are specified through HELCOM core indicators. The requirements on monitoring can include number of stations, the sampling frequency and replication.

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):

In Germany, biomass is only monitored for eelgrass biotopes along the outer coastline, and even there not continuously along the depth gradient but only for certain depth intervals idenfied as appropriate for WFD purposes. For fjords, lagoons and bays no samples are taken (only estimates made in the field). As the visibility in the inner water bodies is often restricted the values can only be used qualitatively and the values for species composition are only rough estimates.

In Estonia softbottom flora is included in the monitoring of HD habitat type “Sandbanks”, not included in WFD coastal waters monitoring.

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
☐	☐	☒

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
☒ 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

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	☐ Birds	☐ Grazing birds
		☐ Wading birds
		☐ Surface-feeding birds
		☐ Pelagic-feeding birds
		☐ Benthic-feeding birds
	☐ Mammals	☐ Small toothed cetaceans

[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).

		☐ Deep-diving toothed cetaceans
		☐ Baleen whales
		☐ Seals
	☐ Reptiles	☐ Turtles
	☐ Fish	☐ Coastal fish
		☐ Pelagic shelf fish
		☐ Demersal shelf fish
		☐ Deep-sea fish
		☐ Commercially exploited fish and shellfish
	☐ Cephalopods	☐ Coastal/shelf cephalopods
		☐ Deep-sea cephalopods
Habitats	☒ Benthic habitats	☒ Benthic broad habitats
		☒ Other benthic habitats
	☐ Pelagic habitats	☐ Pelagic broad habitats
		☐ Other pelagic habitats
Ecosystems	☐ Physical and hydrological characteristics	
	☐ Chemical characteristics	
	☐ Ecosystems, including food webs	☒ Coastal ecosystems
		☐ Shelf ecosystems
		☐ 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	☐ Newly introduced non-indigenous species
	☐ Established non-indigenous species
	☐ Species affected by incidental by-catch
Physical and hydrological	☐ Hydrographical changes
	☐ Physical disturbance to seabed
	☐ Physical loss of the seabed
Substances, litter and energy	☐ Eutrophication
	☐ Contaminants - non UPBT substances
	☐ Contaminants - UPBT substances
	☐ Contaminants – in seafood

	☐ Adverse effects on species or habitats
	☐ Acute pollution events
	☐ Litter in the environment
	☐ Impulsive sound in water
	☐ Continuous low frequency sound

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

Theme	Label: Feature
Biological	☐ Input or spread of non-indigenous species
	☐ Input of microbial pathogens
	☐ Input of genetically modified species and translocation of native species
	☐ Loss of, or change to, natural biological communities due to cultivation of animal or plant species
	☐ Disturbance of species (e.g. where they breed, rest and feed) due to human presence
	☐ Extraction of, or mortality/injury to, wild species (by commercial and recreational fishing and other activities)
Substances, litter and energy	☐ Input of nutrients — diffuse sources, point sources, atmospheric deposition
	☐ Input of organic matter — diffuse sources and point sources
	☐ Input of other substances (e.g. synthetic substances, non-synthetic substances, radionuclides) — diffuse sources, point sources, atmospheric deposition, acute events
	☐ Input of litter (solid waste matter, including micro-sized litter)
	☐ 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)	☐ Land claim
	☐ Canalisation and other watercourse modifications
	☐ Coastal defence and flood protection
	☐ Offshore structures (other than for oil/gas/renewables)

	☐ Restructuring of seabed morphology, including dredging and depositing of materials
Extraction of non-living resources	☐ Extraction of minerals (rock, metal ores, gravel, sand, shell)
	☐ Extraction of oil and gas, including infrastructure
	☐ Extraction of salt
	☐ Extraction of water
Production of energy	☐ Renewable energy generation (wind, wave and tidal power), including infrastructure
	☐ Non-renewable energy generation
	☐ Transmission of electricity and communications (cables)
Extraction of living resources	☐ Fish and shellfish harvesting (professional, recreational)
	☐ Fish and shellfish processing
	☐ Marine plant harvesting
	☐ Hunting and collecting for other purposes
Cultivation of living resources	☐ Aquaculture — marine, including infrastructure
	☐ Aquaculture — freshwater
	☐ Agriculture
	☐ Forestry
Transport	☐ Transport infrastructure
	☐ Transport — shipping
	☐ Transport — air
	☐ Transport — land
Urban and industrial uses	☐ Urban uses
	☐ Industrial uses
	☐ Waste treatment and disposal
Tourism and leisure	☐ Tourism and leisure infrastructure
	☐ Tourism and leisure activities
Security/defence	☐ Military operations (subject to Article 2(2))
Education and research	☐ 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 and 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:

☒No coordination

☐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[2]:

Current means of coordination	Features or elements	Parameter	Method	QA/QC	Frequency[3]	Spatial resolution (density) of sampling	Link to HELCOM core indicators[4]	Spatial scope	Monitoring started (year)	CPs monitoring[5]
	Elements (Features) (Features_enum)	Parameters (Parameter) (ParametersOther)	MonitoringMethod (Monitoring Method) MonitoringMethod Other)	(Free text)	MonitoringFrequency	(ProgrammeDescription)	(RelatedIndicator) (RelatedIndicator_name	(SpatialScope)	(TemporalScope)	(CountryCode_Enum)

[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.

Current means of coordination	Features or elements	Parameter	Method	QA/QC	Frequency[3]	Spatial resolution (density) of sampling	Link to HELCOM core indicators[4]	Spatial scope	Monitoring started (year)	CPs monitoring[5]
National	Angiosperms (Zostera and others) DK: In addition to Zostera, only the angiosperm with the deepest distribution FI: all angiosperms	Species distributional range/ pattern Maximum depth limit Maximum depth of main distribution Coverage (%)	Assessment of depth limits by video recording or diving along transects (HELCOM COMBINE Manual, Part C, Annex C9) DK: National Technical guidelines TA M18	National	Yearly	One or several ”samples” (=locations) per WFD water body with 5 replicates per sample/location In DK, a minmum of three T-shaped transects per water body Within each transect: Registration in points of 2 m broad* 5 m lengt of transect 7-10 oberservations pr depth m Max 15-20 m between observations (Exept for very flat and long transects) Only zostera: At T-part of transect: zig-zag until 10 registrations of max depth At max depth of main distribution: zig-zag until 10 registrations at max depth of main distribution For other angiosperms than Zostera: Max depth limit and max depth of main distribution, each with 7-10 point registrations FI: circa 20 sites (4 in 5 subbasins), focus in coastal bays and sheltered areas		WFD CW	DE: 2006 DK: 1982 FI: 2021	DE, DK, FI

Current means of coordination	Features or elements	Parameter	Method	QA/QC	Frequency[3]	Spatial resolution (density) of sampling	Link to HELCOM core indicators[4]	Spatial scope	Monitoring started (year)	CPs monitoring[5]
National	Macroalgae (Charophytes) DK: Charophytes	Species distributional range/ pattern Maximal depth limit	Assessment of depth limits by diving along transects (HELCOM COMBINE Manual, Part C, Annex C9)	National	Yearly	One or several ”samples” (=locations) per WFD water body with 5 replicates per sample/location In DK, a minmum of three T-shaped transects per water body Within each transect: Registration in points of 2 m broad* 5 m lengt of transect 7-10 oberservations pr depth m Max 15-20 m between observations (Exept for very flat and long transects) At T-part of transect (max depth): zig-zag until 7-10 registrations of max depth		WFD CW	DE 2006 DK since 1982	DE, DK

Current means of coordination	Features or elements	Parameter	Method	QA/QC	Frequency[3]	Spatial resolution (density) of sampling	Link to HELCOM core indicators[4]	Spatial scope	Monitoring started (year)	CPs monitoring[5]
National	Angiosperms and macroalgae	Species distributional range/ pattern Zostera If no Zostera, the angiosperm with the deepest distribution Drifting/loose lying dominating opportunistic macroalgae Drifting/loose lying other macroalgae	Assessment of depth limits by video recording or assessment of species specific cover by divers (HELCOM COMBINE Manual, Part C, Annex C9)	National	Yearly	One or several ”samples” (=locations) per WFD water body with 5 replicates per sample/location In Poland 4 replicates per sample In DK, a minmum of three transects per water body In DK, a minmum of three T-shaped transects per water body Within each transect: Registration in points of 2 m broad* 5 m lengt of transect 7-10 oberservations pr depth m Max 15-20 m between observations (Exept for very flat and long transects) At T-part of transect (max depth): zig-zag until 7-10 registrations of max depth		WFD CW	DE: 2006 PL: 2002 DK: 1982 EE: 2014 (regular researches since 1959)	DE, PL, SE, DK, EE
National	Angiosperms and macroalgae	Species abundance (biomass)	Sampling by divers and analysis of species specific dry weight in the laboratory (HELCOM COMBINE Manual, Part C, Annex C9)	National	Yearly	One or several ”samples” (=locations) per WFD water body with 5 replicates per sample/location In Poland 4 replicates per sample		WFD CW	DE: 2006 PL: 2002	DE, PL, SE, EE

Current means of coordination	Features or elements	Parameter	Method	QA/QC	Frequency[3]	Spatial resolution (density) of sampling	Link to HELCOM core indicators[4]	Spatial scope	Monitoring started (year)	CPs monitoring[5]
National	Angiosperms and macroalgae	Species present (whole community or selected species only)	Assesment of species specific cover by divers and/or biomass sampling (HELCOM COMBINE Manual, Part C, Annex C9)	National	Yearly	One or several ”samples” (=locations) per WFD water body with 5 replicates per sample/location		WFD CW	2006	DE
National	Sediment vegetation	Presence and coverage		National		Presence and coverage within 5 x 5 m squares = 25 m^2 at different depths (1 m, 2,5 m and 5 m)	Baltic Proper		2019	SE
National	Zostera	Species depth distribution	Assessment of coverage at depth by visual observation and ecosounder	National	Low frequency cyclical monitoring every 3 years	Three locations per WFD water body	Kattegat and the Sound	WFD CW	2019	SE

PARAMETER

Element/Parameter pair
Angiosperms (Zostera and others)/Distributional pattern (depth limits)
Macroalgae (only Charophytes)/Distributional pattern (depth limits)
Angiosperms and macroalgae/Species abundance (number or cover)
Angiosperms and macroalgae/Species abundance (biomass)
Angiosperms and macroalgae/Species abundance (species present)

METHOD (MonitoringDetails)

Angiosperms (Zostera and others)/Distributional pattern (depth limits)

Method Line transects at selected locations along depth gradient (across the currently existing depth limit of the species, not the whole depth range) assessed using a towed video sledge or by divers. See Part C, Annex C9 of HELCOM COMBINE Manual.

Denmark and Finland:

- Method Line transects at selected locations along depth gradient (across the currently existing depth limit of the species, not the whole depth range) assessed using a towed video sledge or by divers. National Technical Directions (TA M18).

Denmark:

- Depth limit of main distribution (only Zostera, defined as >10% cover) and depth limit of maximum distribution (Zostera and others, defined as deepest finding of species) defined in 7-10 points, along the end of a T shaped transect – extending 300 m to each side along the coast at the end of a transect perpendicular to the coast.

Macroalgae (only Charophytes)/Distributional pattern (depth limits)

Method Line transects at selected locations along depth gradient. See Part C, Annex C9 of HELCOM COMBINE Manual

Denmark: Same as above for maximum depth limit.

Angiosperms and macroalgae/Species abundance (number or cover)

In Denmark cover estimations are made by videotransects or divers along a transect perpendicular to the coast. Cover (% of bottom) of angiosperms, Charophycea and drifting macroalgae (dominating opportunistic and other) is determined in areas/points of 2 m (width of transect) times 5 m (along transect), approximately 7-10 points pr . depth meter, and with max 15-20 between each point.

Angiosperms and macroalgae/Species abundance (biomass)

Angiosperms and macroalgae/Species abundance (species present)

Cover estimations are made by divers at fixed stations at certain depths in an area of 20-25 m^2 and in frames (1 m^2), frames with 5 replicates per location, covering all species (or other relevant taxonomical group) that are identifiable under water. Biomass and taxonomy is determined though sampling by divers at fixed stations in certain depth intervals (densest parts of the eelgrass biotope) in frames (0,25m^2) with 5 replicates per location, taxa-specific determination of dry weight in the laboratory. See Part C, Annex C9 of HELCOM COMBINE Manual.

In Poland and Estonia, sampling is done by divers along line transects at selected locations along depth gradient until the depth limit of the vegetation. Sample in frames 0,25 m^2 with 4 replicates per each depth interval in Poland.

QA/QC

Angiosperms (Zostera and others)/Distributional pattern (depth limits)
NationalNational
Macroalgae (only Charophytes)/Distributional pattern (depth limits)
National
Angiosperms and macroalgae/Species abundance (number or cover)
Angiosperms and macroalgae/Species abundance (biomass)
Angiosperms and macroalgae/Species abundance (species present)
National

FREQUENCY

Frequency

Angiosperms (Zostera and others)/Distributional pattern (depth limits)
Yearly. Season: mid-June to mid-September. Denmark: 1st of June to 30th of September. Finland: yearly, but rotating sites in 3 year cycles.
Macroalgae (only Charophytes)/Distributional pattern (depth limits)
Yearly. Season: mid-June to mid-September. Denmark: 1st of June to 30th of September
Angiosperms and macroalgae/Species abundance (number or cover)
Denmark: Yearly. Season: 1st of June to 30th of September
Angiosperms and macroalgae/Species abundance (biomass)
Angiosperms and macroalgae/Species abundance (species present)
Yearly. Season: mid-June to mid-September

SPATIAL SCOPE

Spatial Scope

Angiosperms (Zostera and others)/Distributional pattern (depth limits)
Germany: densest and largest eelgrass biotopes along the outer coastline of the Baltic Sea.
Denmark: inner fjords, outer fjords, coastal waters and Limfjorden
Finland: coastal bays and sheltered coastal areas.
Macroalgae (only Charophytes)/Distributional pattern (depth limits)
Germany: only in fjords, bays and coastal lagoons, where charophytes are usually distributed
Denmark: inner fjords, outer fjords, coastal waters and Limfjorden

SPATIAL RESOLUTION (DENSITY) OF SAMPLING

Spatial resolution

Angiosperms (Zostera and others)/Distributional pattern (depth limits)
Macroalgae (only Charophytes)/Distributional pattern (depth limits)
Angiosperms and macroalgae/Species abundance (number or cover)
Denmark: inner fjords, outer fjords, coastal waters and Limfjorden. Total of 84 transects annually (79 in WFD, 5 in HD)
Finland: circa 20 sites (4 sites in 5 subbasins). Each sites consists of several transects.
Angiosperms and macroalgae/Species abundance (biomass)
Angiosperms and macroalgae/Species abundance (species present)
Germany: HELCOM Assessment Unit 4, within a 6-year time period the whole vegetated area of fjords, bays and lagoons will be attempted to cover by several line transects. The number of transects differs between WFD water bodies due to their different spatial area and natural conditions. Some line transects are fixed and investigated several times in a 6-year time period (if possibly yearly). Others are only investigated once in a 6-year time period.

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) EE: HD sandbanks habitatsEE: HD sandbanks habitats

☐Unknown

c.5 Monitoring and assessment requirements

Monitoring requirements:

In Germany, monitoring will concentrate on WFD coastal types (HELCOM Level 4 assessment unit). In Denmark, monitoring is grouped into four groups: innerfjords, outer fjords, coastal waters and the Limfjorden). In Finland, the monitoring targets at coastal bays and shelteres areas. The number of stations per unit varies according to the natural gradient and the natural occurrences of the monitoring species within each unit. Therefore no fixed number of assessment stations can be chosen. The station number is type (assessment unit) and species specific. At each station at least three transects are assessed as "pseudo-replication" for small scale variation.

In Estonia softbottom flora is monitored in connection to assessment of structure and function of HD habitat types (Torn et al 2017).

Monitoring data includes species-specific coverage and substrate data along the depth gradient (bathymetry data are supplementary, giving an impression of the bottom slope). The depth gradient has to be followed below the type- and species-specific defined GES value (~ GES depth + 2-meter depth). In Denmark, the depth gradient extends to cover the maximal depth distribution.

Seasonal timing of the programme is the main vegetation period between July and August. Assessments are conducted once within a 6-year time period for the whole depth gradient and yearly within the currently existing depth limit of the respective species (current depth limit ± 2 m depth range). In Denmark, seasonal timing of the programme is the main vegetation period between 1st of June and 30th of September. Assessments are conducted annually.

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? -Yes for eutrophication, not so clear for biodiversity	☒	☐
Established methods for assessment? -Yes for eutrophication, not so clear for biodiversity	☒	☐
Adequate understanding of GES? -Yes for eutrophication, not so clear	☒	☐

for biodiversity		
Adequate capacity to perform assessments? -Yes for eutrophication, not so clear for biodiversity	☒	☐

Assessment of natural variability

Quantitave. Natural variability is taken into account by taking replicate samples in similar sampling areas and using time series data.

c.6 Data providers and access

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

☐ HELCOM COMBINE ☐ HELCOM PLC ☐HELCOM MORS

☒Other: National databases, ICES

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)

Denmark: National Environmental Protection Agency collects data. DCE National Center for Environment and Energy, Aarhus University, QA. Estonia: Estonian Environment Agency (processed data, QA), Estonian Marine Institute of Tartu University (raw data

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):

In Denmark, data are available approximately 1-1½ year after data collection, once QA is terminated.In Denmark, data are available approximately 1-1½ year after data collection, once QA is terminated.

EE: March next year after monitoring.

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)
☐2-weekly	☐Unknown

List providing contact points in the Contracting Parties

EE: Estonian Environment Agency

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	☐ 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. ☐ 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 Favourable Reference Population values established by the relevant Member States under Directive 92/43/EEC. ☐ D1C3 – Primary for commercially- exploited fish and cephalopods and secondary for other species: 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. 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. ☐ D1C4 – Primary for species covered by Annexes II, IV or V to Directive 92/43/EEC and secondary for other species: The species distributional range and, where relevant, pattern is in line with prevailing physiographic, geographic and climatic conditions. 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. ☐ D1C5 – Primary for species covered by Annexes II, IV and V to Directive 92/43/EEC and secondary for other species: The habitat for the species has the necessary extent and condition to support the different stages in the life history of the species. ☐ D1C6 – Primary 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. 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.
Descriptor 2	☐ D2C1 – Primary: 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 asessment under Article 8(1) of Directive 2008/56/EC, is minimised and where possible reduced to zero. Member States shall establish the threshold value for the number of new introductions of non-indigenous species, through regional or subregional cooperation. ☐ D2C2 — Secondary: 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. ☐ D2C3 — Secondary: 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. 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.
Descriptor 3	☐ D3C1 — Primary: 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. ☐ D3C2 — Primary: 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. ☐ D3C3 — Primary: 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. 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.
Descriptor 4	☐ D4C1 — Primary:

	The diversity (species composition and their relative abundance) of the trophic guild is not adversely affected due to anthropogenic pressures. Member States shall establish threshold values through regional or subregional cooperation. ☐ D4C2 — Primary: The balance of total abundance between the trophic guilds is not adversely affected due to anthropogenic pressures. Member States shall establish threshold values through regional or subregional cooperation. ☐ D4C3 — Secondary: The size distribution of individuals across the trophic guild is not adversely affected due to anthropogenic pressures. Member States shall establish threshold values through regional or subregional cooperation. ☐ D4C3 — Secondary (to be used in support of criterion D4C2, where necessary): Productivity of the trophic guild is not adversely affected due to anthropogenic pressures. Member States shall establish threshold values through regional or subregional cooperation.
Descriptor 5	☐ D5C1 — Primary: Nutrient concentrations are not at levels that indicate adverse eutrophication effects. The threshold values are as follows: (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 ☐ D5C2 — Primary: Chlorophyll a concentrations are not at levels that indicate adverse effects of nutrient enrichment. The threshold values are as follows: (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. ☐ D5C3 — Secondary: The number, spatial extent and duration of harmful algal bloom events are not at levels that indicate adverse effects of nutrient enrichment. ☐ 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; (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.

Descriptor 6	☐ D6C1 – Primary: Spatial extent and distribution of physical loss (permanent change) of the natural seabed. ☐ D6C2 – Primary: Spatial extent and distribution of physical disturbance pressures on the seabed. ☐ 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. Member States shall establish threshold values for the adverse effects of physical disturbance, through regional or subregional cooperation. ☐ 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. 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. ☒ 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. 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.
Descriptor 7	☐ 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. ☐ D7C2 – Secondary: Spatial extent of each benthic habitat type adversely affected (physical and hydrographical characteristics and associated biological communities) due to permanent alteration of hydrographical conditions.

Descriptor 8	☐ D8C1 – Primary: Within coastal and territorial waters, the concentrations of contaminants do not exceed the following threshold values: (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. Beyond territorial waters, the concentrations of contaminants do not exceed the following threshold values: (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. ☐ D8C2 – Secondary: 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. Member States shall establish those adverse effects and their threshold values through regional or subregional cooperation. ☐ D8C3 – Primary: The spatial extent and duration of significant acute pollution events are minimised. ☐ D8C4 – Secondary (to be used when a significant acute pollution event has occurred): 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.
Descriptor 9	☐ D9C1 – Primary: 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: (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;

	(b) for additional contaminants, not listed in Regulation (EC) No 1881/2006, threshold values, which Member States shall establish through regional or subregional cooperation.
Descriptor 10	☐ D10C1 – Primary: 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. Member States shall establish threshold values for these levels through cooperation at Union level, taking into account regional or subregional specificities. ☐ D10C2 — Primary: 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. Member States shall establish threshold values for these levels through cooperation at Union level, taking into account regional or subregional specificities. ☐ D10C3 — Secondary: 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. ☐ D10C4 — Secondary: 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.
Descriptor 11	☐ D11C1 – Primary: The spatial distribution, temporal extent, and levels of anthropogenic impulsive sound sources do not exceed levels that adversely affect populations of marine animals. Member States shall establish threshold values for these levels through cooperation at Union level, taking into account regional or subregional specificities. ☐ D11C2 – Primary: The spatial distribution, temporal extent and levels of anthropogenic continuous low-frequency sound do not exceed levels that adversely affect populations of marine animals. Member States shall establish threshold values for these levels through cooperation at Union level, taking into account regional or subregional specificities.

d. References

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

Krause-Jensen D, Greve TM, Nielsen K. 2005. Eelgrass as a bioindicator under the Water

Framework Directive. Water Resources Management 19: 6375.

Torn, K.; Herkül, K.; Martin, G.; Oganjan, K. (2017). Assessment of quality of three marine benthic habitat types in northern Baltic Sea. Ecological Indicators, 73, 772−783.10.1016/j.ecolind.2016.10.037