HELCOM Monitoring Manual

http://www.helcom.fi/action-areas/monitoring-and-assessment/monitoring-manual

Introduction

Programme Topic Files *(with Subprogrammes)*

- Birds
- Mammals
- Fish, fisheries and shellfish
- Hydrography
- Hydrochemistry
- Phytoplankton
- Zooplankton
- Benthic community species distribution and abundance
- Seabed habitat distribution and extent
- Non-indigenous species
- Inputs
- Concentration of contaminants
- Contaminants in seafood
- Biological effects of contaminants
- Litter
- Underwater Noise
- Benthic physical loss and damage

Stand: 15. Oktober 2014

HELCOM Monitoring Manual

Introduction

15 October 2014

Contents

1. Background to the development of the HELCOM monitoring and assessment system

Monitoring is a well-established function of the Helsinki Convention. Coordinated monitoring of physical, chemical and biological variables of the open sea of the Baltic Sea has been carried out since 1979.

HELCOM monitoring is closely linked to environmental assessments and periodical assessment reports have been published since the 1980s. Since the 2000s the occasional production of reports evolved to regular publications of Baltic Sea thematic and holistic assessments. This development was supported by the first version of the HELCOM Monitoring and Assessment Strategy in 2005.

The Baltic Sea Action Plan (BSAP), adopted in 2007, further emphasizes the need to monitor and assess the change in the marine environment and the progress towards the visions, goals and objectives of the BSAP.

In 2010, the HELCOM Ministerial Meeting decided to establish, for those HELCOM Contracting Parties being also EU-Member States, the role of HELCOM as the coordinating platform for the regional implementation of the Marine Strategy Framework Directive (MSFD) in the Baltic Sea. The Meeting also agreed that a common understanding of Good Environmental Status (GES) should be based on joint indicators and coordinated monitoring providing the necessary data for regular assessment of the status of the Baltic Sea and of pressures and impacts affecting the status.

The HELCOM Monitoring and Assessment Strategy was revised in 2013 to support an indicator-based monitoring and assessment approach and a regionally coordinated implementation of the BSAP and the MSFD.

The HELCOM Monitoring Manual was first published in 2014 and contains the monitoring programmes, guidelines and manuals which translate the general principles of the HELCOM Monitoring and Assessment Strategy into concrete specifications and requirements.

The current monitoring programmes reflect the state of the art of the HELCOM indicator system and the varied maturity of the indicators. To meet the requirements of the BSAP and the MSFD, the associated revision of existing and establishment of new monitoring is a continuous process, which started in 2014 and is supported through ongoing projects. This includes the EU co-funded project "Progress with the Baltic Sea Pilot Project: Testing new concepts for integrated environmental monitoring of the Baltic Sea (BALSAM)" (2014-2015).

2. Structure of the HELCOM monitoring system

The HELCOM Monitoring Manual provides a detailed and transparent documentation of the monitoring programmes and activities in Baltic Sea region, the associated coordination among Contracting Parties and the state of coherence and consistency of monitoring across borders and regimes. The manual is intended to support HELCOM EU Member States in reporting information about monitoring programmes and activities relevant for the MSFD.

The HELCOM monitoring manual

The manual is organised along 11 monitoring programmes (Figure 1). The monitoring activities under the programmes are grouped thematically and presented in 16 programme topic files. In some cases a

programme topic file is equivalent to the monitoring programme (e.g. mammals, birds). A programme topic file may also summarise monitoring activities which support several monitoring programmes. The most detailed level of information is provided by 40 sub-programmes, which is a specific EU reporting level. At present, the Manual includes information on coordinated monitoring in the Baltic as well as national monitoring activities, not yet coordinated, that can support the monitoring programmes. It is the ambition to develop HELCOM coordinated monitoring for all programmes.

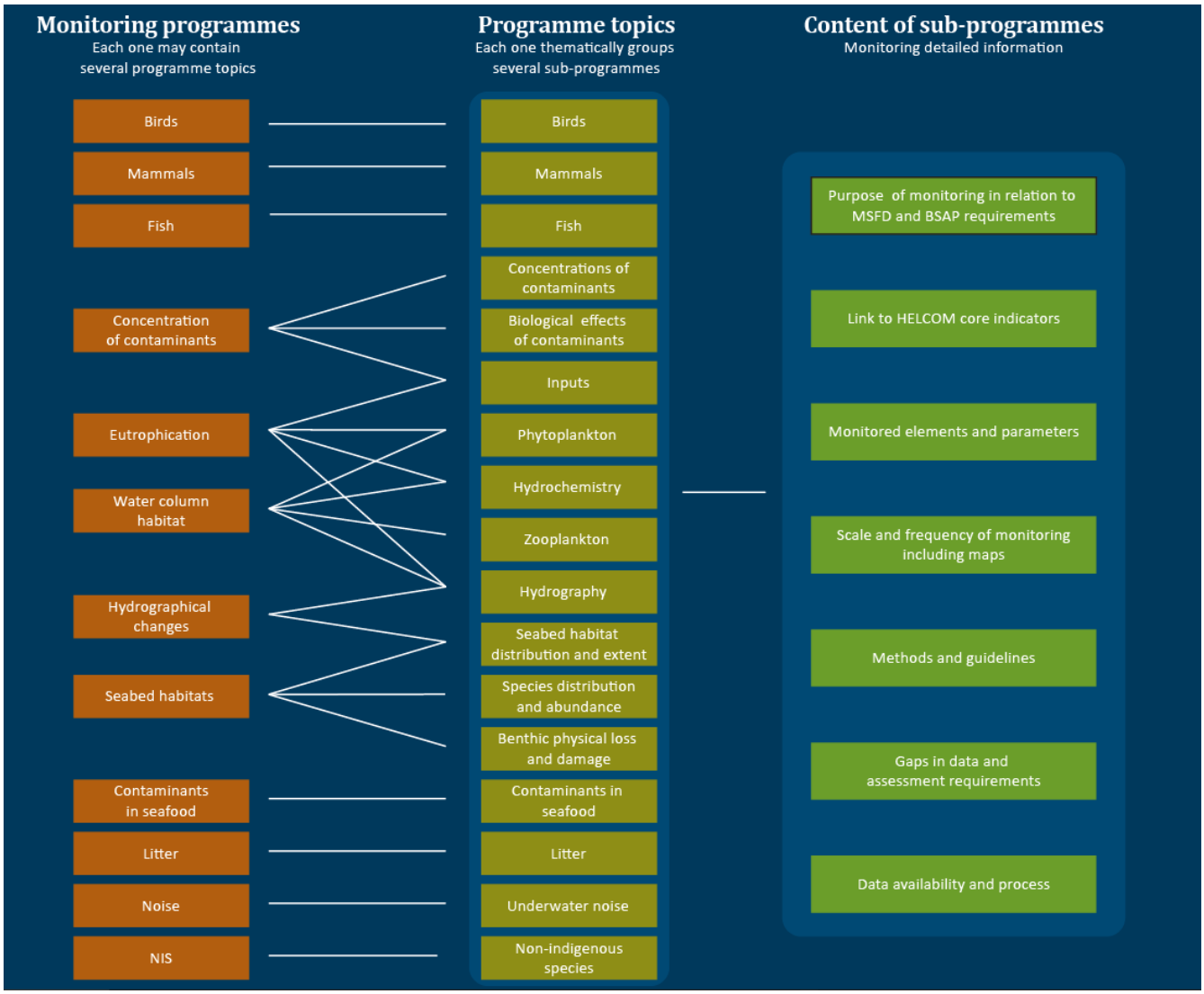

FIGURE 1 Structure of the HELCOM Monitoring Manual.

The description of the monitoring activities presented in the sub-programmes links to:

- the detailed technical guidelines, QA standards and data management arrangements agreed for coordinated monitoring,
- the data and map service with monitoring-related data products,

- the HELCOM core indicators and Baltic Sea Environment Fact Sheets for which the HELCOM monitoring system provides the data basis and which contribute to thematic and holistic assessments.

In 2015, the Monitoring Manual will gradually integrate the technical guidelines that provide for coordinated monitoring in HELCOM, while at present these are still available as separate entities. This include:

- The Pollution Load Compilation guidelines (PLC-Air and PLC-Water): on quantifying emissions of nutrients and hazardous substances to the air, discharges and losses to inland surface waters, and the resulting air and waterborne inputs to the sea.
- The COMBINE manual: including guidelines for measuring concentrations of nutrients and hazardous substances in marine compartments, eutrophication effects parameters, and coastal fish monitoring.
- Monitoring of radioactive substances (MORS): on quantifying the sources and inputs of artificial radionuclides, as well as the resulting trends concentrations in the various compartments of the marine environment (water, biota, sediment).
- The coordination of the surveillance of incidental and illegal oil spills around the Baltic Sea, and the assessment of the numbers and distribution of such spills on an annual basis.
- Guidelines for reporting of dredging and dumping of dredged material.

Updating of the Manual

The manual is updated once per year. Changes to be included in the manual should be considered by HELCOM STATE* and after its endorsement submitted to the HELCOM Secretariat not later than 1 June. These changes will be valid from 1 January of the following year. All changes will be highlighted by a separate note, section by section.

The official version of the manual is available electronically via the HELCOM home page. Users of pdf copies are requested to check against the official online version.

3. Aims of HELCOM monitoring

HELCOM joint monitoring provides the necessary data for regular assessments of the state of the Baltic Sea, the human pressures and their impacts affecting the state. It also enables evaluations of the extent to which measures are being effective.

Components

In accordance with the HELCOM Joint Coordinated Monitoring System (Attachment 1, HELCOM Monitoring and Assessment Strategy) it enables the assessment of the following components:

- **Biological diversity**: population trends, distribution and condition of species and changes in quality and quantity of habitats and biotopes

- **Non-indigenous species**: trends in arrival, quantities and impacts
- **Commercially exploited fish and shellfish**: trends in population, age and size structure
- **Marine food webs**: their occurrence at normal abundance and diversity; levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity
- **Human-induced eutrophication** and its effects such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters
- **Sea-floor integrity**: including benthic ecosystems
- **Contaminants**: concentrations and biological effects, including radioactive substances
- **Marine litter:** quantities and properties
- **Underwater noise**: levels

In addition, the monitoring system enables the assessment of pressures and impacts in terms of:

- **Physical loss of, or damage to, habitats**, e.g. through smothering, sealing, siltation, abrasion and selective extraction of living and non-living resources
- **Inputs of**:
    - heavy metals and synthetic hazardous substances
    - radioactive substances
    - nitrogen and phosphorus as well as organic matter
- **Introductions of**:
    - non-indigenous species
    - microbial pathogens
    - marine litter
    - energy, including underwater noise
- **Alteration of** hydrological and hydrographical conditions through human activities, including a change in salinity and temperature, as well as acidification
- **Selective extraction of** species, including incidental non-target catches (e.g. by commercial and recreational fishing)

HELCOM monitoring should also be arranged to **detect climate change and its impacts** on the Baltic Sea marine ecosystem over time. Therefore, sites with relevant long-term data records will be sustained, whilst accommodating improved data collection techniques where appropriate. National long-term data series should be integrated to this region-wide framework. This can enable assessment of the ability of the marine environment to cope, adapt to or recover from the effects climate change.

Regarding major environmental changes and emerging issues, the coordinated HELCOM monitoring aims to detect major changes in the state of the environment and pressures on the environment by including long-term monitoring stations in the monitoring network. The coordinated monitoring is also associated with national or international surveys to detect and study emerging issues.

In 2014, several of the components outlined in the Strategy were not yet monitored in a coordinated way while it is the aim of Contracting Parties to achieve coordinated monitoring through ongoing HELCOM activities. There is e.g. still no dedicated HELCOM programmes on **data/information collection for human activities**. Information on human activities was however used to assess pressures on the Baltic Sea in the first HELCOM holistic assessment (BSEP 122) and it is the ambition to widen the ad hoc gathering of information on human activities into an established programme.

Spatial coverage

For the purposes of regional monitoring and assessments, the Baltic Sea is sub-divided into sub-basins as depicted in HELCOM sub-divisions of the Baltic Sea (Attachment 4, HELCOM Monitoring and Assessment Strategy). Different hierarchical sub-division levels can be used depending on the needs:

- the whole Baltic Sea
- dividing of the Baltic Sea into 17 sub-basins
- further dividing each of the 17 sub-basins into coastal areas (extending to 1 NM seaward from the baseline) and off-shore area (waters beyond 1 NM seaward from the baseline)
- further dividing the coastal areas into water bodies or types according to the WFD.

Other sub-divisions can be agreed and used provided they remain within the boundaries and use the nomenclature of the described hierarchical system. The scale of sub-division to be chosen may differ depending on the monitoring and assessment purpose.

To maximise their use for national purposes, regional monitoring and assessment results are also presented in formats (e.g. point/station maps) that allow displaying them within national boundaries (EEZ, 12 nm) and showing hot spots.

Transboundary impacts and features

HELCOM coordinated monitoring provides the basis for consideration of transboundary impacts, such as eutrophication, and the state of transboundary features such as mobile species. The different assessment scales and nested approach further allow considering features and impacts in a transboundary context at the relevant scale and adjusting monitoring activities/requirements to the needs of the assessment scale concerned.

Modeling complements monitoring in order to identify transboundary impacts and help directing targeted measures. Such an activity exists for nutrient fluxes in the context of transboundary eutrophication problems. Appropriate approaches for investigating into priority transboundary impacts and features (through monitoring, modeling, one-off studies, etc.) will need to be addressed in the framework of the continued implementation of the HELCOM monitoring and assessment system.

4. Contracting Parties' commitments

The Monitoring and Assessment Strategy sets out the basis for how the HELCOM Contracting Parties commit themselves to design and carry out their national monitoring programmes and work together to produce and update joint assessments.

Indicators and assessment

The HELCOM coordinated monitoring programme is driven by assessment needs arising from the BSAP and the MSFD as well as the production of regional HELCOM assessment products (Attachment 3, HELCOM Assessment System of the Monitoring and Assessment Strategy). These assessment needs are intended to be mainly covered through the HELCOM core indicators, which are subject to continued development. HELCOM coordinated monitoring also covers additional parameters and information e.g. relating to climate change. The Contracting Parties' monitoring commitment is associated with the different types of HELCOM indicators and parameters (for a detailed description see Annex 1, Glossary of terms):

- **Core indicators** are commonly agreed among the HELCOM Contracting Parties and measure the progress towards BSAP goals and/or MSFD descriptors. Parameters required for the core indicators are monitored in a coordinated way on a routine basis. Whenever ecologically relevant, monitoring is done Baltic-wide.
- **Pre-core indicators** have been identified as required for the BSAP/MSFD purposes, but are still not fully developed and/or there is no common agreement among the HELCOM Contracting Parties. Contracting Parties should aim to monitor the relevant parameters for the pre-core indicators in order to support their operationalization and to prepare for their future monitoring.
- **Supplementary indicators** are only applied in a limited area, such as a sub-basin, and are commonly agreed among the countries in that area. Parameters required in the supplementary indicator are monitored in a coordinated way on routine basis by the Contracting Parties in the relevant area.
- **Supporting parameters** are commonly agreed complementing parameters to core indicator information, but do not measure progress towards a BSAP objective and/or a MSFD descriptor. They are monitored in a coordinated way and provide supplementary information to the core indicators.

Additional parameters relevant for periodic regional assessments can be monitored or investigated by individual Contracting Parties or groups of Contracting Parties in a project- or campaign-like manner. These investigations include e.g. baseline studies, screening studies, process studies and tests of new methods and techniques.

Coordinated monitoring

HELCOM monitoring programmes are considered 'coordinated' when the following requirements are established:

- common technical guidelines
- common quality assurance tools

- agreed data submission and data management arrangements.

HELCOM joint coordinated monitoring and preparation of the various assessment products require that the Contracting Parties allocate adequate resources and commit to agreed schedules of activities. This includes ensuring that needed resources are available nationally, e.g. ships, laboratories, personnel, data management and analysis capacities and expertise.

The national monitoring is coordinated within and between Contracting Parties in order to use resources in an efficient way. Shared monitoring stations and activities, information and data are part of the coordinated monitoring. The aim is to use limited resources as efficiently as possible and to seek added value from HELCOM coordination and collaboration as a return to the Contracting Parties.

From the perspective of sub-basins, the main responsibilities for carrying out coordinated monitoring activities in the HELCOM area are as follows:

- **Northern Baltic Proper, Eastern Gotland Basin, Western Gotland Basin, Bornholm Basin, Arkona Basin**: Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Sweden and Russia
- **Bothnian Bay, The Quark, Bothnian Sea, Åland Sea**: Finland and Sweden
- **Gulf of Finland**: Finland, Estonia and Russia
- **Gulf of Riga:** Estonia and Latvia
- **Sound and Kattegat:** Denmark and Sweden
- **Great Belt:** Denmark
- **Kiel Bay and Mecklenburg Bay:** Germany

Apart from their main responsibilities, however, the Contracting Parties are encouraged to participate in coordinated monitoring in other regions of the Baltic Sea area whenever practicable.

The monitoring programmes are periodically reviewed. For the development of revised or new coordinated monitoring, the following initial requirements should be met:

- development of a strategy that enables the endorsement to prepare new or revised monitoring programmes by appropriate HELCOM Working groups,
- identification of gaps in monitoring coverage that need to be filled,
- joint planning of activities in space and time.

Data and reporting

Deadlines for reporting data from coordinated monitoring are presented in Table 1. They refer to reporting deadlines agreed in HELCOM COMBINE, MORS, PLC and for illegal oils spills (see section 5: HELCOM working structure in support of regionally coordinated monitoring). For new sub-programmes deadlines for reporting has not been agreed yet.

HELCOM coordinated monitoring also embrace cruise cooperation. This section of the HELCOM Monitoring Manual is currently under development.

TABLE 1 Deadlines for reporting data from coordinated monitoring.

Programme topic	Sub-programme	Deadline of reporting previous years data
Hydrography	Water column hydrological characteristics	May
	Water column physical characteristics	-
	Ice	-
Hydrochemistry	Water column chemical characteristics	May
	Nutrients	May
Phytoplankton	Phytoplankton – Pigments	May
	Phytoplankton - Species composition, abundance and biomass	May
Zooplankton	Zooplankton - Species composition, abundance and biomass	May
Fish shellfish and fisheries	Fish - Coastal fish	-
	Fish - Migratory fish	DCF Data reported to DG MARE annually
	Fish - Offshore fish	Data are available annually at different times for different surveys
	Commercial shellfish	DCF Data reported to DG MARE annually
	Fisheries bycatch	DCF Data reported to DG MARE annually
Birds	Birds - Marine breeding birds abundance and distribution	-
	Birds - Marine bird health	-
	Birds - Marine wintering birds abundance and distribution	-
Mammals	Mammals - Seal abundance	Not operational yet, annual reporting planned from 3/2015 onwards
	Mammals - Health status	-
	Mammals - Harbor porpoise bundance	-
Concentrations of contaminants	Contaminants in water	30 October
	Radioactive substances in water	1 September
	Contaminants in sediment	1 September
	Radioactive substances in sediment	1 September
	Contaminants in biota	1 September
	Radioactive substances in biota	1 September
Inputs	Nutrient inputs from atmosphere	Modeling results approved at the EMEP steering group meetings in September (2 years in arrears)
	Contaminant inputs from atmosphere	Modeling results approved at the EMEP steering group meetings in September (2 years in arrears)
	Nutrient inputs from landbased sources	31 October Modelled results reported 31 December.
	Contaminant inputs from landbased sources	31 October
	Nutrient inputs from seabased sources	-
	Contaminant inputs from seabased sources	-
	Acute pollution	15 February
Biological effects of contaminants	TBT /imposex	-
	Other biological effects monitoring to be developed	-
Litter	Macrolitter characteristics and abundance/volume	-
	Microlitter particle abundance and	-

Programme topic	Sub-programme	Deadline of reporting previous years data
	characteristics	
Underwater noise		-
Non indigenous species		(See phytoplankton and Zooplankton)
Seabed habitat distribution and extent	Habitat-forming species and substrates Seabed habitat physical characteristics	- -
Species distribution and abundance / Benthic community	Hardbottom Species Softbottom fauna Softbottom flora	- - -

5. HELCOM working structure in support of regionally coordinated monitoring

The regional cooperation on monitoring is supported by the HELCOM working structure. There are two permanent Working Groups focusing on regional coordination and monitoring of the Baltic Sea: GEAR and STATE* respectively.

GEAR (Group for the Implementation of the Ecosystem Approach) steers the implementation of the HELCOM BSAP from a managerial point of view and is the responsible body for the regional coordination of the implementation of the MSFD. GEAR also coordinates the implementation of the ecosystem approach across HELCOM's scientific-technical Working Groups.

STATE* (Group on the State of the Environment and Nature Conservation) oversees the technical development of monitoring programmes. The STATE group is responsible for developing, updating and maintaining the HELCOM monitoring in general. The group follows and co-operates with other international organisations dealing with relevant monitoring programmes.

In addition there are five long-lasting project expert groups under MONAS that address monitoring and sharing of information on seals, phytoplankton, zooplankton, coastal fish, radioactive substances:

- HELCOM ZEN-QAI: the group works on quality assurance and integration of zooplankton monitoring in the Baltic Sea and to assure data comparability and their effective usage.
- HELCOM PEG: the phytoplankton expert group aims to ensure and maintain high quality standard of the international Baltic regional phytoplankton monitoring.
- HELCOM SEAL: the group develops among other things coordinated monitoring programmes for seals.
- HELCOM FISH-PRO II: the group works on assessment and monitoring of coastal fish
- HELCOM MORS: the group coordinates monitoring of radioactive substances and produce periodic assessment on radioactivity in the Baltic Sea.

The regional coordination and cooperation on monitoring that GEAR, MONAS and its expert groups facilitate, are founded on the HELCOM Monitoring and Assessment Strategy.

6. Baltic Sea Action Plan and the MSFD

The implementation of the Baltic Sea Action Plan and the Marine Strategy Framework Directive is coordinated, including the monitoring and indicator based assessment systems.

BSAP Vision and Goals

The Baltic Sea Action Plan (BSAP) is a programme to restore the good ecological status of the Baltic marine environment by 2021. It was adopted by the coastal states of the Baltic Sea and the EU in 2007 at the HELCOM Ministerial Meeting in Krakow. It is supplemented by the Declarations of the Ministerial Meetings of 2010 in Moscow and 2013 in Copenhagen.

The BSAP provides a concrete basis for HELCOM work by incorporating the latest scientific knowledge and innovative management approaches into strategic policy implementation. It stimulates a goal-oriented multilateral cooperation around the Baltic Sea region.

The overarching vision of the BSAP is: a healthy Baltic Sea environment, with diverse biological components functioning in balance, resulting in a good ecological status and supporting a wide range of sustainable human economic and sustainable activities.

It is further based on a vision, four main goals, and a number of ecological objectives associated to the goals (Figure 2).

FIGURE 2 HELCOM Vision goals and objectives.

MSFD GES and Descriptors

For those HELCOM Contracting Parties being also EU Member States, the Marine Strategy Framework Directive (MSFD, 2008/56/EC) establishes a framework within which the EU Member States shall take the necessary measures to achieve or maintain good environmental status of the marine environment by the year 2020 at the latest (MSFD, Article 1).

The core definition of Good Environmental Status (GES) according to the MSFD is: an environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive within their intrinsic conditions, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations.

In Annex I of the MSFD there are eleven qualitative descriptors for determining good environmental status as summarized in Table 2.

TABLE 2. MSFD qualitative descriptors for determining good environmental status

MSFD Descriptors		
1	**Biological diversity**	Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions.
2	**Non-indigenous species**	Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems
3	**Populations of all commercially exploited fish and shellfish**	Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock
4	**Marine food webs**	All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity
5	**Eutrophication**	Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters
6	**Sea-floor integrity**	Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected
7	**Alteration of hydrographical conditions**	Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems
8	**Contaminants**	Concentrations of contaminants are at levels not giving rise to pollution effects.
9	**Contaminants in fish and other seafood for human consumption**	Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards
10	**Marine litter**	Properties and quantities of marine litter do not cause harm to the coastal and marine environment
11	**Energy**	Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment

Relationship between the BSAP Goals and the MSFD Descriptors

On an overarching level, the BSAP can be considered by EU-Member States as the HELCOM contribution to the regionally coherent implementation of the MSFD in the Baltic Sea. Its vision and the MSFD definition of GES are comparable in their objectives while BSAP goals can be linked to the MSFD descriptors (Table 3). The MSFD GES descriptors however cover a wider definition of good environmental status than the BSAP goals and thus not all MSFD descriptors can be directly assigned to the BSAP goals. These are: D3 - Population of commercial fish and shellfish at safe biological levels; D7 - Hydrographical conditions; D10 - Properties and quantities of marine litter and D11 - Introduction of energy, including noise. Furthermore, the BSAP segment on Maritime Activities partly covers several MSFD descriptors.

TABLE 3. Link between BSAP goals and MSFD Descriptors.

BSAP goal	MSFD Descriptor
Baltic Sea unaffected by eutrophication	D5 Eutrophication
Baltic Sea life undisturbed by hazardous substances	D8 Concentrations of contaminants D9 Contaminants in fish and shellfish
Favorable status of Baltic Sea biodiversity	D1 Biological diversity D2 Non-indigenous species D4 Marine food webs D6 Sea-floor integrity
Maritime activities in the Baltic Sea carried out in an environmentally friendly way	D2 Non-indigenous species D5 Eutrophication D8 Concentrations of contaminants D10 Marine litter D11 Noise

The BSAP ecological objectives lack a counterpart in the MSFD structure; sometimes they are most closely linked to descriptors while sometimes they are more similar to detailed criteria outlined in the Commission decision on criteria and methodological standards on good environmental status of marine waters (2010/477/EU) (Figure 3). However, there is a broad degree of coherence between the objectives of the two instruments.

Finally, HELCOM core indicators can be linked to the GES criteria and methodological standards as outlined the Com decision (2010/477/EU). The specific links are described in the sub-programmes of the Monitoring Manual.

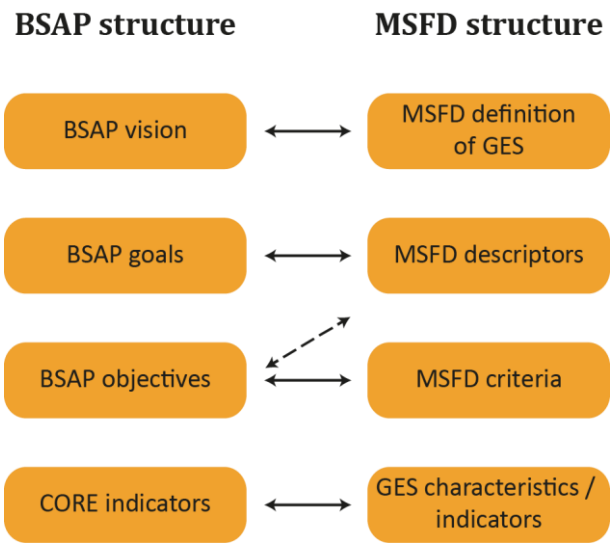

FIGURE 3 Relationships between BSAP and MSFD.

Regional definition of GES and environmental targets

In the BSAP, the Contracting Parties to the Helsinki Convention agreed to periodically evaluate whether the goals of the Plan have been met by using indicator-based assessments.

Core indicators form the critical set of indicators which are needed to regularly assess the status of the Baltic Sea marine environment against a definition of GES and progress towards a set of environmental targets.

For core indicators that reflect the status of the environment, a tentative/preliminary quantitative boundary is required to distinguish between a state within GES and a state not meeting GES.

For core indicators that reflect pressures on the environment, tentative/preliminary quantitative targets values are required to define the maximum level of pressure that is acceptable to achieve or maintain GES.

Quantitative GES-boundaries or targets are available for some but not for all core indicators. Their development is an ongoing process, depending on the maturity of the indicator concerned. In those cases, interim boundaries or proxies are used to provide a measurable expression of GES, based on the current best available knowledge.

7. HELCOM Monitoring programmes

Biodiversity - Birds

The aim of the programme is to provide data to assess the status of waterbirds in the Baltic, their abundance, distribution and population structure. Waterbird monitoring can also give information on the state of the sea and of the benthic habitats. The monitoring supports the HELCOM core indicators and corresponding MSFD GES criteria and methodological standards (indicators) for Descriptor 1 and 4.

There are two types of monitoring activities in the Baltic Sea region: monitoring of resting, migrating or moulting birds (wintering) and monitoring of breeding birds. For bird health monitoring is limited to the white-tailed eagle.

In 2014, there is no coordinated monitoring of seabirds in the region. Monitoring of breeding birds varies between countries in relation to the species monitored, the start of the time series, and the temporal resolution of monitoring which ranges from annual monitoring to every third year depending on the species. Some countries have state financed monitoring programmes in place, while in some countries monitoring is carried out by volunteers.

All Baltic Sea countries have been carrying out ground-count-based coastal surveys for wintering birds with some time series starting as early as the 1960s. Most countries run these coastal counts as volunteer programmes. Offshore surveys using both ship and plane are also carried out in most countries.

Although national monitoring of breeding and wintering birds is taking place in almost all Baltic Sea countries either by the state or by volunteers, coordinated monitoring is still missing. Regionally coordinated guidelines and a database would be needed for the Baltic to ensure that methods and the data collected are comparable and could support HELCOM assessments and core indicators.

Programme topic: Birds

Biodiversity - Fish

The monitoring of coastal fish is carried out by national programmes and collated through HELCOM, specifically under the HELCOM FISH-PRO II group. The monitoring provides data on the relative abundance/biomass and species composition of the coastal fish community and supports the HELCOM core indicators and corresponding MSFD GES criteria and methodological standards (indicators) for Descriptor 1. Some of these fish are of freshwater origin, thus the populations are more local and respond more locally to environmental conditions compared to typical offshore fish that generally migrate over larger distances with populations spanning larger spatial scales. The current coastal fish monitoring as coordinated by HELCOM represents a minimum requirement and there are substantial geographical gaps.

Regarding migratory fish, national programmes focus on sea trout, salmon, eel and sturgeon and they are coordinated by ICES (International Council for the Exploration of the Sea). Full scale monitoring in rivers is only carried out in Finland and Sweden whereas the spatial-temporal coverage of catch sampling from sea may need to be increased. The monitoring supports HELCOM core indicators and corresponding MSFD GES criteria and methodological standards (indicators) for Descriptor 1 and 4.

The monitoring of offshore fish includes stocks that are regulated by TACs (total allowable catch) and country wise quotas and are exploited by large commercial fisheries. The main commercial shellfish populations in the HELCOM region currently monitored are predominant in the western part of the region.

Programme topics Fish, shellfish and fisheries

Biodiversity - Mammals

The aim of the programme is to provide data to assess the status, abundance, trends, distribution and health of marine mammal species native to the Baltic Sea. The monitoring supports the HELCOM core indicators and corresponding MSFD GES criteria and methodological standards (indicators) for Descriptor 1 and 4.

The abundance and distribution of the three seal species native to the Baltic Sea - grey seal, harbour seal and ringed seal – are monitored by Finland, Denmark, Germany, Sweden and Estonia at their haul-out locations by aerial, ship-based and land-based methods.

The health status is currently monitored by investigations on stranded, by-caught and hunted animals.

A permanent or long-term programme for internationally coordinated monitoring of harbour porpoise abundance in the Baltic Sea currently does not exist. Ship-based line transect surveys for the management unit in the Belt Sea (in Danish, German and Swedish sea areas) are scheduled to be performed every six years under national Danish monitoring efforts.

Marine mammal monitoring is being coordinated by the HELCOM SEAL group especially regarding abundance and distribution of seals and health status of marine mammals. Common guidelines still need to be adopted to ensure common methods in monitoring. There is also no common database at present.

Programme topic: Mammals

Biodiversity - Water column habitats

The monitoring programme for pelagic habitats is regionally coordinated and measures:

- Concentrations of nutrients and oxygen (under the programme topic hydrochemistry), chlorophyll-a (under the programme topic phytoplankton) as well as Secchi depth (under the programme topic hydrography). This monitoring supports the HELCOM core indicators and corresponding MSFD GES criteria and methodological standards (indicators) for Descriptor 5 for the assessment of the eutrophication status and the effectiveness of measures (nutrient concentrations).
- Information on salinity, temperature, turbidity and ice (under the programme topic hydrography) as well as pH and CO2 (under the programme topic hydrochemistry) required in Annex III MSFD. This monitoring supports MSFD criteria of Descriptor 7.
- Abundance and biomass of phytoplankton and zooplankton species. This monitoring supports the HELCOM core indicators and corresponding MSFD criteria and methodological standards (indicators) of Descriptors 1, 2, 4 and 5.

For some parameters and basins monitoring frequencies need to be increased and methods need to be harmonised. Work is under way to improve the spatial and temporal coverage of the monitoring programme by using earth observation data and data from automated measuring devices (ferryboxes and/or ships of opportunity).

Programme topics: Hydrography, Hydrochemistry, Phytoplankton, Zooplankton

Biodiversity - Seabed habitats

Monitoring of phytobenthos and soft-bottom fauna exists in all Baltic Sea countries and is partly covered by HELCOM coordinated monitoring. Monitoring of phytobenthos focuses on depth distribution, composition and coverage of benthic plant species. The monitoring potentially supports MSFD criteria and methodological standards (indicators) for Descriptor 1 and 5. Monitoring of soft-bottom fauna measures species composition, abundance and biomass and supports HELCOM core indicators and MSFD criteria and methodological standards (indicators) for Descriptor 1 and 6.

Currently there is no monitoring in place which targets seabed habitat distribution and hard-bottom fauna is monitored only in a few countries in the Baltic Sea (e.g. Finland). The "drop-video" technique in combination with traditional methods used for characterising benthic communities (grab sampling, SCUBA diving) could be a promising, cost-effective solution at least for certain habitats. Joint and standardised methods in the Baltic Sea area need to be agreed in HELCOM.

Programme topics: Seabed habitat distribution and extent, Benthic community species distribution and abundance

Non-indigenous species

There is currently no coordinated monitoring specifically targeting non-indigenous species (NIS) in the Baltic Sea. Most of the data is obtained through the monitoring programmes relating to phytoplankton, zooplankton, macrozoobenthos, macrophytes. In addition there are national programmes covering hard bottom biota in some countries. These programmes cover biological parameters and concern mobile and sessile species, water column and seabed habitats.

NIS monitoring is to address all ecosystem components as NIS may belong to any trophic level and affect the functioning of the ecosystem. However, since most of the new introductions of NIS occur in port areas via shipping (e.g. ballast water and fouling) it is specifically important to monitor these areas.

There is a coordinated and widely agreed protocol developed for HELCOM and OSPAR regions for monitoring NIS in ports. Such a protocol is part of the "Joint HELCOM/OSPAR Guidelines on the granting of exemptions under the International Convention for the Control and Management of Ships' Ballast Water and Sediments, Regulation A-4" adopted by HELCOM and OSPAR Contracting Parties in 2013. The protocol has been tested in several ports around the Baltic Sea and is ready for routine use.

At present this monitoring lacks resources and, therefore, has not yet started. In order to obtain reliable data for NIS distribution and abundance and especially to spot the new arrivals, coordinated port monitoring would be needed.

Programme topic: Non-indigenous species

Eutrophication

The existing HELCOM and WFD procedures have been successfully applied to assess the eutrophication status for marine and coastal waters. Eutrophication is a main pressure acting on the marine environment throughout the Baltic Sea region. Monitoring and assessment apply Baltic-wide. The monitoring programme is regionally coordinated and measures:

- Concentrations of nutrients and direct and indirect effects of nutrient enrichment in the marine environment : concentrations of chlorophyll-a (under the programme topic phytoplankton) and oxygen (under the programme topic hydrochemistry), transparency (under the programme topic

hydrography) and biological metrics relating to phytoplankton (under the programme topic phytoplankton) , macrophytobenthos and macrozoobenthos (under the programme topic benthic community species distribution and abundance).
This monitoring supports the HELCOM core indicators and corresponding MSFD GES criteria methodological standards (indicators) for Descriptor 5 for the assessment of the eutrophication status, trends in pressures (nutrient concentrations) and impacts (indicators for direct and indirect effects) and the effectiveness of measures (nutrient concentrations). The measurements also provide information on physical and chemical characteristics of seawater (salinity, temperature, pH and distribution of nutrients and oxygen) and biological features (phytoplankton, angiosperms, macro-algae, invertebrate bottom fauna) required in Annex III MSFD.

- Inputs via rivers and direct discharges from land-based sources. It also collects model-based data on atmospheric inputs of nutrients to the sea. The monitoring supports the HELCOM BSAP nutrient reduction targets and corresponding national MSFD environmental targets, source-apportionments to help directing measures, and the assessment of the effectiveness of measures. The monitoring contributes information required under Annex III MSFD on pressures and impacts (inputs of fertilisers and other nitrogen and phosphorus-rich substances).

For some parameters and sea-basins monitoring frequencies need to be increased and methods need to be harmonised. Work is under way to improve the spatial and temporal coverage of the monitoring programme by using earth observation data and data from automated measuring devices (ferryboxes and/or ships of opportunity).

Programme topics: Inputs, Hydrography, Hydrochemistry, Phytoplankton

Hydrographic changes

The monitoring programme on hydrographic changes compiles the available monitoring data on the abiotic marine environment. In the marine environment both the seafloor and the water masses above are dynamic, constantly changing systems. The compiled monitoring information on hydrographic changes in the programme, forms a framework relevant for assessments of many other monitoring programmes tracking changes in biotic systems.

Programme topics: Hydrography, Seabed Habitat Distribution and Extent

Contaminants

The aim of the monitoring programme is to provide data to assess the state regarding contamination in the Baltic Sea as well as identify pressures and impacts leading to the contamination. This is done through a combination of measurement and modelling.

Concentrations of contaminants are monitored in water, sediment and biota. Monitoring covers heavy metals, organic substances and radionuclides and supports the HELCOM core indicators and corresponding MSFD GES criteria and methodological standards (indicators) for Descriptor 8 and 9.

Contaminants are measured in selected species of biota from different geographical regions of the Baltic Sea in order to detect possible contamination patterns, including areas of special concern. Contaminants are also measured in biota at specific locations over time in order to detect whether levels are changing, also in response to the changes in inputs of contaminants to the Baltic Sea.

The programme covers all core indicators for concentrations of contaminants, but not in all matrices and areas. Identified gaps include the lack of monitoring of certain contaminants in biota on the eastern coast (Estonia, Lithuania, Latvia). Furthermore the monitoring of contaminants in blue mussels and perch in the smaller sub-basins makes the assessment spatially limited.

Atmospheric inputs of metals and dioxins/furans to the Baltic Sea are modelled using estimated emission data. Contracting Parties take measurements of atmospheric deposition on land and this data is used to calibrate the models.

Waterborne inputs of (heavy) metals from land-based sources to the Baltic Sea are calculated using measured data from the monitored rivers and MWWTPs in Baltic Sea catchment (300 monitored rivers and 23 unmonitored areas).

Furthermore, as a measure of acute pollution, the number of oil discharges observed in the Baltic Sea is reported. In the future also discharges of other substances could be included.

The only biological effect so far included in the Monitoring Programme on hazardous substances is the monitoring of imposex in snails as a result of TBT-exposure in support of the HELCOM core indicator.

Programme topics: Inputs, Concentration of contaminants, Biological effects of contaminants

Contaminants in seafood

Currently there is no monitoring programme for contaminants in seafood. However, monitoring of contaminants in biota has been conducted in HELCOM monitoring programmes, which also include species that are used for food consumption. There are European regulations for sampling and analyzing contaminants in food. Sampling arrangements within countries may differ, e.g. size range for seafood sampling may differ from environmental monitoring. The analyzed matrix, analysis methods and quality standards used for food consumption analyses are not identical to environmental quality standards.

Programme topic: Contaminants in seafood

Litter

Currently, there are no HELCOM indicators, assessment procedures or coordinated monitoring in place in relation to the amount and composition of marine litter on beaches, on the seafloor, in the water column and regarding the impact of litter on marine organisms. Some countries carry out beach litter surveys, and use information from fishing for litter projects to gain information on the presence of litter in the marine environment. Development of HELCOM indicators on marine litter is taken forward through the CORESET II project.

In the MSFD CIS framework, the EU Task Group Marine Litter has developed recommendations for monitoring which will provide a basis for the development of coordinated monitoring in the Region. Various studies are under way in the Baltic Sea region to provide baseline information and test methods with a view to determining options for developing cost-efficient monitoring programmes.

Programme topic: Litter

Noise

Noise is a new topic for the HELCOM community and core indicators are currently under development to assess impulsive and ambient noise levels. The aim of the monitoring programme is to provide data and

assessments on the status of the marine environment. The monitoring programme is of relevance to both the biodiversity and maritime traffic segments of HELCOM work.

The current development work on noise monitoring in HELCOM builds on results from the Technical Sub Group Noise that was established in the MSFD-GES framework. Research projects on optimal monitoring methodologies are currently underway in the Baltic Sea area.

Programme topic: Underwater noise

Annexes

Annex 1 - Glossary of terms (interim)

Definitions and interpretations of the terms relating to the Marine Strategy Framework Directive are agreed in the EU MSFD Common Implementation Strategy (CIS) process. The common understanding of the terminology used in the MSFD context is under review and revision in 2014/2015. In addition the following references have been used:

[1] Common Understanding of (Initial) Assessment, Determination of Good Environmental Status (GES) & Establishment of Environmental Targets (Articles 8, 9 & 10 MSFD), Status: 22.11.2011

[2] Annex 3 of the Outcome of HELCOM MONAS 18-2013. "Rev" indicates that the definitions have been revised after MONAS-18.

[3] Reporting package for MSFD Article 11 on monitoring programmes. MSCG 12/2014/02rev1.

The glossary will be updated to reflect changes in these reference documents as needed.

Biotope
A habitat and its associated community.

Characteristics

a) Ecosystem components (physical and chemical features, habitat types, biological features and other features) relevant for analysing the environmental state as described in Annex III, Table 1 MSFD **[1]**.
b) Elements describing GES as set out in Art. 9(1) MSFD (characteristics of GES) **[1]**.
c) The “indicators” associated to the criteria outlined in Commission decision (2010/477/EU) **[3]**.

Core indicators
Core indicators are commonly agreed indicators among the HELCOM Contracting Parties. A core indicator measures the progress towards a BSAP objective and/or an MSFD criteria. A core indicator describes a scientifically sound phenomenon and is based on measurements, observations or validated models. Core indicators are Baltic wide whenever ecologically relevant, and the area of applicability is expressed through HELCOM assessment units.

Core indicators are either state- or pressure indicators. Pressure core indicators measure an anthropogenic pressure directly, and measure the progress towards an environmental target. State core indicators measure the progress towards a GES-boundary. The environmental target and/or the GES-boundary are

described in detail in an operational core indicator, as well as the assessment methods and rationale. State core indicators are indirectly linked to anthropogenic pressures, and the link is described either qualitatively or quantitatively as appropriate.

Operational core indicators are to be regularly updated by CP's through agreed long-term data handling arrangements and the updated result is published on the HELCOM web-page. The aim is that the parameters required for the core indicators are monitored by all Contracting Parties when ecologically relevant through HELCOM coordinated monitoring that will be described through the HELCOM Monitoring Manual. **[2 rev]**

GES criteria/criterion

According to the definitions in Art. 3(6) MSFD, "criteria" mean "distinctive technical features that are closely linked to qualitative descriptors". Specific criteria are listed for each GES Descriptor in Part B of Annex 2 in COM Decision 2010/477/EU. For this reason GES criteria refer to those aspects which are to be assessed, through the application of appropriate indicators, to determine whether GES is being achieved **[1]**.

Descriptor
Annex I MSFD provides a list of eleven qualitative 'Descriptors' which constitute the basis for the assessment of GES, and provide a further refinement of aspects of the definition of GES in Art. 3(5) MSFD. These descriptors are substantiated and further specified in the COM Decision 2010/477/EU through a set of 29 criteria and 56 proposed indicators (see also characteristics) **[1]**.

Ecosystem component
Ecosystem components comprise abiotic and biotic components of the marine environment, including those described in MSFD Annex III, Table 1. Abiotic components include non-living physical, hydrological and chemical factors. Biotic components include species, functional groups and habitat types **[1]**.

Environmental Target
In the HELCOM Monitoring Manual, the term environmental target reflects the level of sustainable pressure on (or use of resources from) the marine environment. The marine environment is assumed not to be negatively affected by the pressure when the pressure remains below the environmental target, indicating that good environmental status is reached. Article 10 of the MSFD requires that 'Environmental targets' and associated indicators are established to guide progress towards achieving good environmental status in the marine environment. The environmental targets should take into account the indicative lists of pressures and impacts set out in Table 2 of Annex III of the MSFD.

In HELCOM, environmental targets have been agreed for input of nutrients; Maximum Allowable nutrient Inputs (MAI) and Country Allocation of Reduction Targets (CART). For the most recent agreement see HELCOM 2013 Ministerial Meeting.

Functional groups of species
As a way of simplifying and categorising biodiversity, species can be assigned to functional groups. Such groups comprise species with similar structural and functional characteristics, such as how they acquire their nutrients, their state of mobility or their mode of feeding.

Each functional group represents a predominant ecological role (e.g. offshore surface-feeding birds, demersal fish) within the marine environment or within a habitat. For MSFD purposes, the term is particularly applied to birds, mammals, reptiles, fish and cephalopods to provide focus for the assessment of status of these often highly mobile or widely-dispersed species groups. The term is also useful in the

context of assessing communities' condition (in the water column or seabed) through assessment of the range of functional groups present. **[1]**

Good Environmental Status
For the purposes of the MSFD, good environmental status (GES) is defined in Art. 3(5) MSFD as "the environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive within their intrinsic conditions, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations." For GES a set of characteristics is to be determined on the basis of the qualitative descriptors listed in Annex I MSFD (Art. 9(1) MSFD). COM Decision 2010/477/EU provides the criteria and methodological standards to be used for determining GES (Art. 9(3) MSFD).

For the purposes of the HELCOM BSAP, good environmental status is defined as the vision of "a healthy Baltic Sea environment, with diverse biological components functioning in balance, resulting in a good ecological status and supporting a wide range of sustainable human economic and sustainable activities."

In HELCOM, GES is expressed in quantitative terms for each indicator, e.g. as a threshold value or a range of values that have been identified as representative of GES based on a scientific analysis of data that underpin the specific indicator. The determination is based on the Descriptors and criteria laid down in Annex I MSFD and in COM Decision 2010/477/EU and the visions, goals and ecological objectives of the Baltic Sea Action Plan (HELCOM 2007).

Habitat
The physical and environmental conditions (e.g. the seabed substratum and associated hydrological and chemical condition) that support a particular biological community or communities (Cochrane et al. 2010).

Hydrographical conditions
Hydrographical conditions refer to the depth, tidal, current and wave characteristics of marine waters, including the topography and morphology of the seabed **[1]**.

Hydrological processes
Hydrological processes refer to the movement, distribution and quality of water. Interference with hydrological processes can encompass changes in the thermal or salinity regime, in the tidal regime, in sediment and freshwater transport, in current or wave action and in turbidity.

Hydrographical conditions can be influenced by (changing) hydrological processes **[1]**.

Impact
An impact is the environmental effect of a pressure resulting from human activities. It is an alteration, whether permanent or temporary, in a physical, chemical or biological aspect of the environment that is considered undesirable **[1]**.

Indicators that reflect the state of the environment inevitably also reflect the impact of pressures and human activities.

Parameter
A parameter is a measureable single characteristic e.g. number of individuals, biomass in g/dry weight, sediment particle diameter size in mm, concentration of nutrients in µg/l etc. An indicator can be based on single or multiple parameters.

Pre-core indicator (HELCOM)
Pre-core indicators have been identified as necessary by the HELCOM Contracting Parties for BSAP and MSFD purposes. The indicator has not been adopted as a core indicator e.g. because some aspects of the

indicator may be under-developed and/or agreement on the indicator among the CP's may be intermediate. Contracting Parties should aim to monitor the parameters relevant for the pre-core indicator, with the understanding that the pre-core indicators can be based on compilations of data from sources other than coordinated HELCOM monitoring data **[2 rev]**.

Pressure
Pressures describe the causative anthropogenic factors behind environmental changes. Pressure indicators measure the magnitude of anthropogenic influence and the degree of resource use e.g. input of nutrients, introduction of non-indigenous species through shipping activities, or size of catches of fish in the fisheries.

Pressure core indicators are used to assess the progress towards reaching environmental targets.

State/status
The word 'state', as used in the context of the MSFD, refers to the quality/condition of specific aspects of the environment, such as ecosystem components. This can be determined through measurements in the environment of relevant parameters for such components; such measurements, by definition, will reflect any impacts (individual and cumulative) to which the component has been subjected.

The word 'status', as used in the context of Good Environmental Status or Environmental Quality Status, draws together the determination of the 'state' of individual ecosystem components, typically through use of particular criteria, threshold values and indicators, to assign a 'status' classification (e.g. at GES, below GES).

State core indicators are used to assess progress toward reaching GES. **[1 rev]**

Supplementary indicator (HELCOM)
Supplementary indicators are applied in a limited area, such as a sub-basin, and are commonly agreed among the countries in that area. A supplementary indicator measures the progress towards GES or an environmental target. An indicator can be defined as a supplementary indicator and not a core indicator, for reasons such as resource limitation and not due to ecological reasons. Calibration of GES boundaries between the countries should ensure the applicability of these supplementary indicators also in common HELCOM integrated assessments.

For reasons of competence and/or resources not all Contracting Parties will be required to carry out all measurements but all measurements will need to be covered on a work-sharing basis. **[2 rev]**

Supporting parameters (HELCOM)
Supporting parameters are commonly agreed complementing parameters to core indicator information, but do not measure the progress towards a BSAP objective and/or a MSFD descriptor. Supporting parameters are included in the coordinated monitoring programme and updated regularly. The structure of a supporting parameter is not as strictly defined as that of a core indicator and a supporting parameter does not measure progress towards GES or an environmental target. The commonly agreed *HELCOM Baltic Sea Environment Fact Sheets* are supporting parameters. **[2 rev]**.

Annex 2 Links between EU sub-programmes and HELCOM sub-programmes

EU Sub-programmes	HELCOM Sub-programmes
Mobile species - abundance and/or biomass	Marine breeding birds abundance and distribution Marine wintering birds abundance and distribution Seal abundance Harbor porpoise abundance Coastal fish Migratory fish Offshore fish Commercial shellfish
Mobile species – population characteristics	Coastal fish Migratory fish Offshore fish Commercial shellfish
Mobile species - health status	Marine bird health Mammals Health status
Mobile species – state of habitats	Ice Water column hydrological characteristics Water column chemical characteristics Nutrients
Mobile species mortality/injury rates from fisheries	Fisheries by-catch
Mobile species – mortality/injury rates from other human activities	No equivalent HELCOM sub-programme,
Seabed habitats – distribution and extent	Habitat-forming species and substrates
Seabed habitats – physical/chemical characteristics	Seabed habitat physical characteristics
Seabed habitats – community characteristics	Hardbottom Species Softbottom fauna Softbottom flora
Benthic species – abundance and/or biomass	Hardbottom Species Softbottom fauna Softbottom flora
Benthic species – health status	Imposex
Water column – physical characteristics	Water column –physical characteristics
Ice cover	Ice
Water column – hydrological characteristics	Water column – hydrological characteristics
Water column – chemical characteristics	Water column – chemical characteristics Nutrients
Pelagic habitats – community characteristics	Phytoplankton - Pigments Phytoplankton - Species composition, abundance and biomass Zooplankton - Species composition, abundance and biomass
Plankton blooms	Phytoplankton - Species composition, abundance and biomass Phytoplankton - Pigments
Non-indigenous species inputs – from specific sources	No equivalent HELCOM sub-programme
Nutrient inputs – land-based sources	Nutrient inputs from landbased sources
Nutrients input from atmosphere	Nutrient inputs from atmosphere

EU Sub-programmes	HELCOM Sub-programmes
Nutrients input from sea-based sources	Nutrient inputs from seabased sources
Contaminants inputs – land-based sources	Contaminant inputs land-based sources
Contaminants input from atmosphere	Contaminant inputs from atmosphere
Contaminants input from sea-based sources	No equivalent HELCOM sub-programme
Contaminants input from sea-based acute events incl. oil spills	Acute pollution
Litter inputs – land based (riverine) sources	No equivalent HELCOM sub-programme
Non-indigenous species – abundance and/or biomass	Non-indigenous species. At present referring to monitoring of phytoplankton, zooplankton, macrophytes, benthic fauna
Nutrients levels – in water column	Nutrients
Physical loss – distribution and extent (e.g. from infrastructure, coastal protection)	Physical damage and loss - under development
Physical disturbance – from bottom trawling	Physical damage and loss - under development
Physical disturbance – from dredging and disposal of dredge material	Physical damage and loss - under development
Physical disturbance from sand and gravel extraction	Physical damage and loss - under development
Contaminant levels – in water/sediment	Contaminants in water Contaminants in sediment
Contaminants levels – in species, including seafood	Contaminants in biota Contaminants in seafood - under development
Microbial pathogen levels – in water column (bathing water)	No equivalent HELCOM sub-programme
Microbial pathogen levels – in biota (seafood)	No equivalent HELCOM sub-programme
Litter – characteristic and abundance/volume	Macrolitter characteristics and abundance/volume
Litter microparticles – abundance/volume	Microlitter particle abundance and characteristics
Acute underwater noise – distribution, frequency and levels	HELCOM monitoring programme but not yet in place
Diffuse underwater noise – distribution, frequency and levels	HELCOM monitoring programme but not yet in place
Activities extracting living resources (fisheries, including recreational, mearl, seaweed)	No equivalent HELCOM sub-programme, Catch data available but not yet included in the manual
Activities extracting non-living resources (sand, gravel, dredging)	No equivalent HELCOM sub-programme, Data collection and reporting requirements exists in HELCOM but no yet included in the manual
Activities extracting non-living resources (desalination)	No equivalent HELCOM sub-programme
Activities producing food (aquaculture)	No equivalent HELCOM sub-programme
Activities with permanent infrastructures (e.g. renewable energy, oil & gas, ports) or structural changes (e.g. coastal defences)	No equivalent HELCOM sub-programme

EU Sub-programmes	HELCOM Sub-programmes
Sea-based mobile activities (shipping, boating)	No equivalent HELCOM sub-programme
Coastal human activities (e.g. tourism, recreational sports, ecotourism)	No equivalent HELCOM sub-programme
Land-based activities	No equivalent HELCOM sub-programme
Effectiveness of measures	No equivalent HELCOM sub-programme

Acknowledgments

The production of the HELCOM Monitoring Manual was made possible through the input from more than 100 experts from the HELCOM projects MORE, CORESET II, EUTRO-OPER, ZEN-QAI, PEG, FISH PRO-II, SEAL EG, LOAD EG, MORS EG, HELCOM marine litter experts network, the HELCOM coordinated EU-funded project BALSAM, and the Life+ project BIAS. Their contribution is greatly acknowledged.

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BIRDS

GENERAL INFORMATION

The monitoring of birds covers seabirds in the Baltic, including the abundance and distribution of breeding and wintering birds and marine bird health.

At present monitoring of birds is not coordinated in HELCOM and the information presented in the Monitoring Manual is based on national monitoring programmes. A seabird monitoring platform will be proposed through the ongoing BALSAM project.

Sub-programme: Marine breeding birds abundance and distribution

All Baltic countries except Russia have reported to survey breeding birds. Some of the reported monitoring efforts are species specific and often restricted to particular sites or protected areas.

Lithuania, Denmark, Germany, Sweden and Estonia have state financed monitoring programmes in place. In Finland monitoring of breeding birds is mainly carried out by volunteers and to some extent also in Germany. In Latvia the only coastal breeding bird surveys have been carried out on a project basis.

HELCOM core indicator linked to the sub-programme is 'Abundance of waterbirds in the breeding season'.

Sub-programme: Marine wintering birds abundance and distribution

All Baltic Sea countries are monitoring marine wintering birds. Counting methods, timing and type of financing varies greatly among the countries.

Ground-based counts in coastal areas exists in all countries. Most countries run coastal counts as volunteer programmes. Offshore surveys have been reported for all countries except Russia.

HELCOM core indicator linked to the sub-programme is 'Abundance of waterbirds in the wintering season'.

Sub-programme: Marine bird health

Marine bird health monitoring is only reported for the white-tailed eagle.

HELCOM core indicator linked to the sub-programme is 'White-tailed eagle productivity'.

SUB-PROGRAMMES

Marine breeding birds abundance and distribution

Marine wintering birds abundance and distribution

Marine bird health

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RESPONSIBLE HELCOM SUBSIDIARY BODIES

HELCOM STATE*

Contact information: HELCOM Secretariat

*Tentative name

Monitoring programme: Biodiversity - Birds
Programme topic: Birds

SUB-PROGRAMME: MARINE BREEDING BIRDS ABUNDANCE AND DISTRIBUTION

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **Not coordinated**.

Coordinated monitoring for the Baltic Sea region is under development by the EU co-funded BALSAM project, which is running until March 2015. The project will develop recommendations for a common platform for bird monitoring and a common metadatabase.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Biodiversity
	Ecological objectives	Natural distribution and occurence of plants and animals
Marine strategy framework directive (MSFD)	Descriptors	D1 Biodiversity D4 Food webs D6 Seabed habitats
	Criteria (Q5a)	1.1 Species distribution 1.2 Population size 1.3 Population condition 4.1 Productivity (production per unit biomass) of key species or trophic groups 4.3 Abundance/distribution of key trophic groups/species 6.2 Condition of benthic community
	Features (Q5c)	Biological features: A description of the population dynamics, natural and actual range and status of species of seabirds occurring in the marine region or subregion.
Other relevant legislation (Q8a)	Habitats Directive Birds Directive	

Assessment of: (Q4k)

State/Impacts	x	temporal trends
	x	spatial distribution
Pressures		
Human activities causing the pressures		
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)

HELCOM assessment unit levels

1 - Baltic Sea	
2 - Subbasins	
3 - Subbasins with coastal and offshore division	x
4 - Subbasins with coastal WFD division	

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
National	White-tailed eagle	Population size (abundance)	Population abundance and offspring	National	Yearly	Identified territories	White-tailed eagle productivity	1.2.1 Population abundance and/or biomass	Coastal Waters	1972	FI, SE, DE, PL, DK, RU, EE
National	Barnacle goose	Population size (abundance)	Population abundance and offspring	National	Yearly	Selected coastal areas	Abundance of waterbirds in the breeding season	1.2.1 Population abundance and/or biomass	Territorial Waters	1989	FI
National	Breeding population census	Population size (abundance)	Nest counts. of breeding birds	National	Every 3 years	Total of c. 2000 islands in the outer/central archipelago. 43 areas/ units of 3-233 islets (coastal bays, mainland shores not included).	Abundance of waterbirds in the breeding season	1.2.1 Population abundance and/or biomass	Territorial Waters	1984	FI
National	Caspian tern monitoring	Population size (abundance)	Nest counts. Visiting all known sites and finding new ones.	National	Yearly	100	Abundance of waterbirds in the breeding season	1.2.1 Population abundance and/or biomass	Territorial Waters	1984	FI
National	Cormorant breeding sites	Population size (abundance)	Ground-based	National	Yearly	All colonies (FI)	Abundance of waterbirds in the breeding season	1.2.1 Population abundance and/or biomass	Territorial Waters	DK: 1938 FI: 2005	DK, FI
National	Arctic Tern breeding sites	Population size (abundance)	Ground-based	National	Every 6 years		Abundance of waterbirds in the breeding season	1.2.1 Population abundance and/or biomass	Territorial Waters	2000	DK
National	Sandwich Tern breeding sites	Population size (abundance)	Ground-based	National	Every 3 years		Abundance of waterbirds in the breeding season	1.2.1 Population abundance and/or biomass	Territorial Waters	2000	DK
National	Blacktern breeding sites	Population size (abundance)	Ground-based	National	Yearly		Abundance of waterbirds in the breeding season	1.2.1 Population abundance and/or biomass	Territorial Waters	2000	DK
National	Common Eider	Population size (abundance)		National	Every 10 years		Abundance of waterbirds in the breeding season	1.2.1 Population abundance and/or biomass	Territorial Waters	2000	DK

National	Guillemot/ Razorbill	Population size (abundance)	.	National	Yearly	.	Abundance of waterbirds in the breeding season	1.2.1 Population abundance and/or biomass	Territorial Waters	From 60's but not always with public monitoring programme	DK
National	Great Cormorant	Population size (abundance)	Nests	National	Yearly	See page 47 of Estonian marine monitoring program (In Estonian)	Abundance of waterbirds in the breeding season	1.2.1 Population abundance and/or biomass	Territorial Waters	1983	EE
National	Breeding birds	Population size (abundance)	Pairs and nests	National	Yearly (or every 3, 5, 6 or 10 years)	Nature reserves, Moonsund islets in Matsalu Nature reserve, Islets in Vilsandi Nature reserve, Hiiumaa islets, Kolga islets. See page 46 of Estonian marine monitoring program (In Estonian)	Abundance of waterbirds in the breeding season	1.2.1 Population abundance and/or biomass	Territorial Waters	1957	EE
National	Breeding birds	Population size (abundance)	Pairs and nests	National	Yearly	Mecklenburg-Western Pomerania	Abundance of waterbirds in the breeding season	1.2.1 Population abundance and/or biomass	Territorial Waters	1970	DE
National	Breeding birds	Population size (abundance)	Pairs and nests	National	Every 6 years	Schleswig-Holstein SPA	Abundance of waterbirds in the breeding season	1.2.1 Population abundance and/or biomass	Territorial Waters	2000	DE
National	Breeding birds	Population size (abundance)	Pairs and nests	National	Yearly	Schleswig-Holstein Nature reserves	Abundance of waterbirds in the breeding season	1.2.1 Population abundance and/or biomass	.Territorial Waters	1984	DE
National	Breeding birds	Population size (abundance)	Pairs and nests	National		one-off, ca 2/3 of the coast	Abundanceof waterbirds in the breeding season	1.2.1 Population abundance and/or biomass	Territorial Waters	2011	LV
National	Breeding birds	Population size (abundance)		National	Every 2 years	coastline, Nemunas river delta, Curonian spit national park area	Abundance of waterbirds in the breeding season	1.2.1 Population abundance and/or biomass	Territorial Waters	2007	LT
National	Breeding birds	Population size (abundance)	Nests	National	Yearly	Almost whole coastline	Abundance of waterbirds in the breeding season	1.2.1 Population abundance and/or biomass	Territorial Waters	2010	PL
National	Breeding birds	Population size (abundance)	Nests	National	Yearly	Stora Karlsö, W Gotland Basin	Abundance of waterbirds in the breeding season	1.2.1 Population abundance and/or biomass	Territorial Waters	1997	SE
National	Breeding birds	Population size (abundance)	Nests, Pairs, Males, by boat	National	Other	Entire coast	Abundance of waterbirds in the breeding season	1.2.1 Population abundance and/or biomass	Territorial Waters	1975	SE
National	Sandwich tern	Population size (abundance)	Nests	National	Yearly	Blekinge	Abundance of waterbirds in the breeding season	1.2.1 Population abundance and/or biomass	Territorial Waters	1994	SE

National	Cormorant	Population size (abundance)	Nests	National	Yearly	Gotland	Abundance of waterbirds in the breeding season	1.2.1 Population abundance and/or biomass	Territorial Waters	1992	SE

Brief description of monitoring

Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added

Element / parameter	**Breeding birds/Population size** (abundance)
Method	Most countries use counts of nest and/or pairs as the counting method. Sweden is also monitoring by boat.
QA/QC	National
Frequency	The temporal resolution of the monitoring of breeding birds varies from annually to every third year by most countries depending on species.
Spatial Scope	Different spatial scope in different countries.
Spatial resolution	Spatial resolution depends on species distribution and varies from counting of all occurrences to selected breeding areas

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	Waterbirds are a special part of the Baltic ecosystem, spending most of their time above the surface and breeding on land. Nevertheless, their role in the marine trophic web as herbivores, benthivores, piscivores or scavengers is significant. Monitoring of marine breeding birds is needed to support the HELCOM core indicator 'Abundance of waterbirds in the breeding season'. The indicator consists of six species (Common Eider, Caspian Tern, Sandwich Tern, Razorbill, Common Guillemot and Great Cormorant), four of which have increased significantly during the past 20 years. The core indicator is based on two parameters: abundance and breeding success. The abundance parameter follows the OSPAR EcoQO1 procedure for the status of seabirds in the North Sea (ICES 2008, 2011), whereas the breeding success parameter will be developed separately for each bird species. Currently monitoring is done nationally in all Baltic countries besides Russia, but the number of breeding marine bird species (i.e. number of species to be monitored) differs between the countries. Countries with suitable cliffs for nesting colonies or many islets such as Finland, Sweden, Denmark and Estonia have far more breeding species than the countries having mostly sandy beaches like Latvia or Lithuania, Poland and Germany. Some monitoring efforts are species specific and often restricted to particular sites or protected areas. Lithuania, Denmark, Germany, Sweden and Estonia have state financed monitoring programmes in place, while monitoring is mainly carried out by volunteers in Finland and to some extent also in Germany. In Latvia the only coastal breeding bird surveys have been carried out on a project basis. To support the core indicator, the six species should be monitored by all Baltic countries (where ecologically relevant), and monitoring methods and temporal resolution should be harmonized.
Gaps	For breeding birds, only Denmark, Sweden, Poland and Lithuania have reported monitoring that covers the entire or almost entire coastal area for selected species. In Finland the monitoring of Great cormorant, Caspian tern and White-tailed eagle covers the whole marine area. For the rest of the countries monitoring efforts are concentrated to particular areas. It is important to ensure that monitoring is representative for the whole population of each marine bird species (especially the six species for the core indicator) breeding in the particular country. Since there are many species with very uneven distributions, often separate programmes are required as their distribution, habitat preferences and timing or methods used for counting are not compatible. Currently monitoring of breeding birds is lacking coordination, guidelines and a joint database.

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	Yes
Established methods for assessment?	Yes nationally, under development regionally
Adequate understanding of GES?	Partially

Adequate capacity to perform assessments?	Nationally

Assessment of natural variability (Q5e)

Not possible until longer series exist.

DATA PROVIDERS AND ACCESS

Data access point	BALSAM database and platform (in the future)
Data type (Q10c)	Processed Data sets
Data availability (Q10c)	Joint ICES database, national databases
Data access (Q10c)	Access by request
INSPIRE standard (Q10c)	Species distribution
When will data become available? (Q10c)	Maybe in 2015 but still unclear
Data update frequency (Q10c)	Every 6 years
Describe how the data and information from the programme will be made accessible to the EC/EEA	By request
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	Yes, e.g. BSEP116B Biodiversity in the Baltic Sea
Data is used in the following Baltic Sea Environment Fact Sheets (BSEF)	Population development of Great Cormorant Population development of Sandwich Tern Population development of Southern Dunlin

REFERENCES

Herrmann C., Rintala J., Lehikoinen A, Petersen I.K., Hario M., Kadin M. and Korpinen K. 2013. Abundance of waterbirds in the breeding season. HELCOM Core Indicator of Biodiversity. HELCOM, Helsinki, 21 pp.

Monitoring programme: Biodiversity - Birds
Programme topic: Birds

SUB-PROGRAMME: MARINE WINTERING BIRDS ABUNDANCE AND DISTRIBUTION

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **Not coordinated**

Coordinated monitoring is under development within the BALSAM project, which is running until March 2015. The project will develop recommendations on a common platform for bird monitoring in the Baltic and a common metadatabase.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Biodiversity
	Ecological objectives	Natural distribution and occurence of plants and animals Viable populations of species
Marine strategy framework directive (MSFD)	Descriptors	D1 Biodiversity D4 Food webs D6 Seabed habitats
	Criteria (Q5a)	1.1 Species distribution 1.2 Population size 4.3 Abundance/distribution of key trophic groups/species 6.2 Condition of benthic community
	Features (Q5c)	Biological features: A description of the population dynamics, natural and actual range and status of species of seabirds occurring in the marine region or subregion.
Other relevant legislation (Q8a)	Habitats Directive Birds Directive	

Assessment of: (Q4k)

State/Impacts	X	temporal trends, spatial distribution
Pressures		
Human activities causing the pressures		
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)

HELCOM assessment unit levels	
1 - Baltic Sea	
2 - Subbasins	
3 - Subbasins with coastal and offshore division	x
4 - Subbasins with coastal WFD division	

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
National	Coastal birds	Population size (abundance)	Transects (3), 20 days, Ground/Plane	National	Every 6 years	3000km	Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass	Territorial Waters	2000 (1968)	DK
National	Coastal birds	Population size (abundance)	Transects (3), 15 days, Ground/Plane	National	Every 3 years	8000km	Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass	Territorial Waters (EEZ)	2000 (1968)	DK
National	Whoopers Swan, Bewicks Swan	Population size (abundance)	Ground counts	National	Yearly, jan+feb		Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass	Territorial Waters/ Terrestrial	2000	DK
National	Geese	Population size (abundance)	Ground counts	National	Yearly		Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass	Territorial Waters/ Terrestrial	2000	DK
National	Winter census in Åland Islands	Population size (abundance)	Midwinter-waterfowl counting in ship-based strip transect.	National	Yearly	Three selected areas	Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass	Territorial Waters	1968	FI
National	Winter bird census.	Population size (abundance)	Coastal transects	National	Yearly	Whole Coast	Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass	Coastal Waters	Mid 1950's	FI
National	Key wintering areas of waterfowl	Population size (abundance)	Aerial surveys and expeditions by boats for identifying key wintering and staging areas	National	Yearly	Åland islands	Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass	EEZ	2000	FI
National	Coastal survey for all waterfowl species	Population size (abundance)	Ground-based	National	Yearly	Most of the ice-free coastline	Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass		1967	EE
National	Beached bird survey	Mortality rate	Ground	National	Yearly			8.2.2 Occurrence, origin, extent of significant acute pollution events and their impact on biota physically affected by this pollution		1992	EE
National	Offshore counts	Population size (abundance)	Plane and ship	National	One-off	Gulf of Riga, NW Estonia, Saaremaa Island, Hiiumaa island (plans to cover the whole coast), Irbe Strait, Gretagrund	Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass		2007	EE
National	Coastal	Population size (abundance)	Ground	National	Yearly	Mecklenburg-Western Pomerania, Schleswig-Holstein	Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass		1965	DE
National	3 strips (2200km): Gavia arctica, Gavia stellata, Melanitta nigra	Population size (abundance)	Plane	National	Every 3 years	Entire area	Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass		2009	DE

National	German EEZ	Population size (abundance)	Plane and ship	National	Every 3 years	All areas by plane every 3 years, Pomerania by ship every 2 years.	Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass	2008	DE
National	Schleswig Holstein: Somateria mollissima, Melanitta nigra, Clangula hyemalis	Population size (abundance)	Plane	National	Yearly	Coastline since 1980, offshore since 2004	Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass	1980	DE
National	All wintering waterbirds	Population size (abundance)	Ground and ship	National	Yearly	Latvian coast	Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass	1991	LV
National	All wintering waterbirds	Population size (abundance)	Ship	National	One-off	Gulf of Riga (LV)	Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass	1998	LV
National	All wintering waterbirds	Population size (abundance)	Plane	National	One-off	Irbe strait and banks NW from Ventspils	Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass	2011	LV
National	All wintering waterbirds	Population size (abundance)	Ship	National	One-off	Shallow parts of Riga Gulf and Orbe strait with banks NW from Ventspills	Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass	2011	LV
National	Wintering waterbirds	Population size (abundance)		National	Every 2 years	Lithuanian coast line, Nemunas river delta, Curonian's spit national park area	Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass	2007	LT
National	Wintering waterbirds	Population size (abundance)	Ship	National	One-off	Three areas offshore	Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass		LT
National	All waterfowl	Population size (abundance)	Ground	National	Yearly	Western part of the Gulf of Gdansk	Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass	1984	PL
National	All waterfowl	Population size (abundance)	Ship	National	Yearly, during the winter season	Whole Polish 12 miles zone. Two offshore areas: Slupsk Bank and Pomeranian Bay	Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass	2011	PL
National	Wintering waterbirds	Population size (abundance)	Ground	National	Yearly	Neva estuary within ST Petersburg	Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass		RU
National	Waterfowl (ducks, geese, swans, cormorants, divers etc.)	Population size (abundance)	Ground	National	Yearly	Swedish Baltic Sea Coast up to Kattegatt	Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass	1967	SE
National	Waterfowl	Population size (abundance)	Plane and ship	National	One-off	Skane to Stockholm	Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass	2007-2011	SE
National	Waterfowl	Population size (abundance)	Plane	National	One-off	Kattegat	Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass	2009	SE

National	Waterfowl	Population size (abundance)	Plane	National	One-off	SW Scania, Blekinge and Hanö bukten Gävlebukten, Stockholm archipelago	Abundance of waterbirds in the wintering season	1.2.1 Population abundance and/or biomass		SE

Brief description of monitoring

Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	**Wintering birds/Population size** (abundance)
Method	Ground count based coastal surveys by volunteers, offshore surveys by plane and ship.
QA/QC	National, , but guidelines from the Wetlands International are used.
Frequency	The temporal resolution of the monitoring of wintering birds varies greatly among the countries. Data is available from the year 1991. In Finland winter bird census has been organized by LUOMUS (Finnish Museum of Natural History); the first censuses were done as early as the mid-1950s.
Spatial Scope	Different spatial scope in different countries.
Spatial resolution	Spatial resolution varies between countries and specific parts within the country waters depending on site importance for wintering waterbirds

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	All Baltic Sea countries are currently monitoring wintering birds and collecting data on species numbers and distribution; however, counting methods, timeframe and type of financing varies greatly among the countries. Ground count based coastal surveys are carried out in all countries and mostly by volunteers. Offshore surveys by plane and ship are being carried out in all countries, except Russia. Further coordination will be needed between the countries to harmonize monitoring methods and timing. Monitoring of wintering birds will support the core indicator 'Abundance of waterbirds in the wintering season'.
Gaps	Offshore monitoring in the winter time lacks coordination and is geographically not representative. Because of the very uneven survey coverage across the Baltic region, assessments of some species, such as long-tailed duck or common scoter are not possible with the current monitoring. Experts have suggested improvements in offshore monitoring in the Baltic Sea during the winter time. In addition, there is an attempt to evaluate the usefulness of spring migration count data from bird observatories in Gulf of Finland as the estimate of annual abundance changes of the long-tailed duck winter population. There is also a need for revising the winter population monitoring system, as it is expectable that due to general climate warming, iceless winters in the Northern Baltic become more frequent in the future. Thus, in order to monitor total Baltic populations, there has to be readiness for spatially larger-scale censuses than nowadays. Coordination should be enhanced by building a platform for seabird monitoring in the Baltic and agreeing on common guidelines and a metadabase for seabird monitoring. Activities should be coordinated with neighboring countries as much as possible.

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	Adequate data exist already for coastal and inshore parts across the Baltic, e.g. Finland (the annual International Waterbird Census counts starting from 1960's), reliable datasets for the whole region starting with 1991. For offshore areas: NOT YET
Established methods for assessment?	Yes by Wetlands International
Adequate understanding of GES?	Under development

Adequate capacity to perform assessments?	Nationally

Assessment of natural variability (Q5e)

Natural variability is assessed from the long-term data series and scientific studies have assessed the effects of climate change on the seabird winter distribution and abundance

DATA PROVIDERS AND ACCESS

Data access point	BALSAM will agree on common monitoring platform which might develop a database in the future.
Data type (Q10c)	Processed Data sets
Data availability (Q10c)	National databases
Data access (Q10c)	Access by request
INSPIRE standard (Q10c)	Species distribution
When will data become available? (Q10c)	Data for coastal/inshore parts of the Baltic: available already Offshore: differences between countries
Data update frequency (Q10c)	Coastal/inshore: Annual
Describe how the data and information from the programmewill be made accessible to the EC/EEA	On request
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added.
Has the data been used in HELCOM assessments?	Yes, e.g. BSEP116B Biodiversity in the Baltic Sea.

REFERENCES

Aunins A., Nilsson L., Hario M., Garthe S., Dagys S., Petersen I.K., Skov H., Lehikoinen A., Mikkola-Roos M., Ranft S., Stipniece A., Luigujoe L., Kuresoo A., Meissner W., Korpinen S. 2013. Abundance of waterbirds in the wintering season. HELCOM Core Indicator of Biodiversity. HELCOM, Helsinki, 25 pp.

Monitoring programme: Biodiversity - Birds
Programme topic: Birds

SUB-PROGRAMME: MARINE BIRD HEALTH

TABLE OF CONTENTS

REGIONAL COORDINATION

The monitoring of this sub-programme is: **Not coordinated**.

Monitoring of the white-tailed eagle is carried out nationally. Some coordination in timing, methodology and results are done bilaterally. Regional coordination of reporting planned.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Biodiversity Hazardous substances
	Ecological objectives	Healthy wildlife Viable populations of species No illegal pollution
Marine strategy framework directive (MSFD)	Descriptors	D1 Biodiversity D4 Food webs D8 Contaminants
	Criteria (Q5a)	1.3 Population condition 4.1 Productivity (production per unit biomass) of key species or trophic groups 8.2 Effects of contaminants
	Features (Q5c)	Biological features: A description of the population dynamics, natural and actual range and status of species of seabirds occurring in the marine region or subregion.
Other relevant legislation (Q8a)	Birds Directive Water Frame Directive/Chemical quality CITES Bonn Convention Bern Convention	

Assessment of: (Q4k)

State/Impacts	X
Pressures	
Human activities causing the pressures	
Effectiveness of measures	

Scale of data aggregation for assessments: (Q10a)

HELCOM assessment unit levels

1 - Baltic Sea	
2 - Subbasins	
3 - Subbasins with coastal and offshore division	
4 - Subbasins with coastal WFD division	
Other: coastal zones	X

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
Semi-regional	White-tailed eagle	Breeding success, Nestling brood size, Productivity	National	National	Yearly	Selected coastal area	White-tailed eagle productivity	1.3.1 Population demographic characteristics 4.1.1 Performance of key predator species using their production per unit biomass (productivity) 8.2 Effects of contaminants	Coastal Waters	1965-1973	EE, DE, DK, FI, LV, LT, PL, RU, SE
Other	White-tailed eagle	Abundance, productivity	National, counting nests and reproductive parameters	National	Yearly	Location of known nests	White-tailed eagle productivity	1.2.1 Population abundance 4.1.1 Performance of key predator species using their production per unit biomass (productivity)	Coastal Waters	1994	EE

Brief description of monitoring

Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	White-tailed eagle reproduction/ breeding success, nestling brood size and productivity
Method	White-tailed eagles are resident and faithful to their territories throughout their lifetime. These features provide good opportunities for long-term monitoring of populations and breeding performance. Nest sites are checked annually for occupancy and the reproductive output is recorded for each occupied territory. Based on the frequency distribution in the population of occupied nests containing 0, 1, 2 or 3 nestlings, three reproductive parameters are assessed: the proportion of reproducing pairs in the population (Breeding success), the mean number of nestlings per successfully breeding pair (Nestling brood size) and the the mean number of nestlings per checked pair in the population (Productivity). Based on data from nests inspected by climbing the nest tree, and excluding nests checked only from the ground, nestling brood size is a precise standard. Nest trees are climbed for precise assessment of reproductive parameters. Some samples are taken from the ground. In connection with these nest visits, measurements and biological samples are taken. The following parameters are usually measured from the nestlings: wing chord (for estimation of age in days), tarsus width and depth (for estimation of sex, see Helander 1981, Helander et al.2007), weight (for nutritional status) and in some areas feather and blood samples (for chemical analyses and genetic studies). The nestlings are ringed using an international colour ringing programme for identification, according to Helander (2003b). Dead eggs and shell pieces are collected for measurements, investigation of contents and chemical analyses, for studies on relationships with reproduction. Feathers shed from adults are generally collected. All samples collected in Sweden are archived in the National Specimen Data Bank.
QA/QC	National. Regional coordination to be developed for reporting of national metadata.
Frequency	Monitoring is done in the HELCOM Contracting Parties on an annual basis.
Spatial Scope	Coastal waters / TW

Spatial resolution	Eagles are presently breeding along the coasts and mainland shores of the whole Baltic Sea, and are monitored in a network of national projects with harmonized methodology. Monitoring is made for the entire population. There are sub-regions with small subpopulations: the Gulf of Finland, and especially the Kattegat where the species was brought to extinction in the 1800s but where resettlement is now in progress.

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	White-tailed sea eagle reproductive ability is monitored annually by assessing the frequency distribution of occupied eagle nests containing 0, 1, 2 or 3 nestlings (3 being the maximum in this species). These data are used for the assessment of the three indicators of reproductive ability: breeding success. nestling brood size and productivity. Survey techniques and sampling methods are presented in (Helander 1994b, Helander et al. 2007, 2009). For assessment of nutritional condition of nestlings, weight and winglength (for age) is required. The core indicator 'Productivity of white-tailed eagle' describes not only biomagnification of contaminants, but also persecution, disturbance of nest sites, food availability and availability of suitable nesting sites. This indicator combines the breeding success and brood size into a single indicator and assesses the reproductive output of the population. It is a useful indicator in studies on relationships between reproduction and anthropogenic pressures and also a vital parameter in assessments of population status in management perspectives. Most Baltic Sea countries are monitoring white-tailed eagle and for assessment purposes monitoring should be done in all areas along the Baltic coast where the species occurs in adequate minumum abundance. In order to include white-tailed eagles that forage specifically in the coastal ecosystem zone and marine area, only breeding pairs in the coastal area should be considered (tentative boundary up to a maximum of 10 km inland from the coastal mean water line, in accordance with the guidelines of EC Nature 2-5, 1993) Other bird species are currently not being monitored for marine bird health.
Gaps	Besides for the white-tailed eagle, monitoring for marine bird health currently does not exist.

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	Yes
Established methods for assessment?	Under development in the HELCOM CORESET II project. A 5-year mean value against a pre-1950s target level for each reproductive parameter will be used.
Adequate understanding of GES?	Yes
Adequate capacity to perform assessments?	Nationally

Assessment of natural variability (Q5e)

Quantitative. Natural variability in reproductive output is very small in this species

DATA PROVIDERS AND ACCESS

Data access point	National databases
Data type (Q10c)	Processed datasets

Data availability (Q10c)	National data centres
Data access (Q10c)	Access by request
INSPIRE standard (Q10c)	Species distribution (metadata; no nest site coordinates for protective reasons)
When will data become available? (Q10c)	In 2015
Data update frequency (Q10c)	3-year or 5-year intervals suggested
Describe how the data and information from the programmewill be made accessible to the EC/EEA	By request
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added.
Has the data been used in HELCOM assessments?	Yes, e.g. BSEP116B Biodiversity in the Baltic Sea.
Data is used in the following Baltic Sea Environment Fact Sheets (BSEF)	Population development of White-tailed eagle

REFERENCES

Core indicator Productivity of white-tailed eagle

MAMMALS

GENERAL INFORMATION

The monitoring of marine mammals covers biological parameters (abundance, abundance trends, distribution and health) of marine mammal species native to the Baltic Sea.

Sub-programme: Seals abundance

The abundance and distribution of the three seal species native to the Baltic Sea (grey seal, harbour seal and ringed seal) are monitored at their haul-out locations by aerial, ship-based and land-based efforts and currently coordinated by the HELCOM Seal Expert Group.

HELCOM core indicator linked to the sub-programme is 'Population growth rate, abundance and distribution of marine mammals'.

Sub-programme: Harbour porpoise abundance

A permanent or long-term program for regionally coordinated monitoring of the harbour porpoise abundance does not exist currently but the aerial porpoise surveys (SCANS II) by Sweden, Denmark and Germany contribute to the design of the future monitoring programme. The SAMBAH project (Static acoustic monitoring of the Baltic harbour porpoise) will provide by end of 2014 information on the distribution and abundance of the species in the Baltic. The results will form a basis for recommendations on the design of future coordinated programs for harbour porpoise monitoring.

HELCOM core indicator linked to the sub-programme is 'Population growth rate, abundance and distribution of marine mammals'.

Sub-programme: Health status

Monitoring of mammal health is performed by necropsies of by-caught and stranded seals, and in Sweden and Finland also on hunted seals. The monitoring of health of mammals is carried out in some Contracting Parties and on different levels. Data is compiled and assessments are coordinated by the HELCOM Seal Expert Group.

HELCOM core indicators linked to the sub-programme are 'Nutritional status of seals' and 'Reproductive status of marine mammals'.

Note: HELCOM SEAL 7/2013 recommended that no hunting programs should be initiated to fulfil the data needs of core indicators. Further, due to the fact that today only the Baltic Sea grey seal population is above the Limit Reference Level, and according to the HELCOM Seal

SUB-PROGRAMMES

Seals abundance

Harbour porpoise abundance

Health status

Rec. (27-28) “no allowances for deliberate killing should be issued” for ringed seals and harbor seals, and for grey seals only, “if in the population a significant positive long-term growth rate can be observed, and if licenses for anthropogenic removals are issued, special care has to be taken so that the positive long-term growth rate is not jeopardized”.

RESPONSIBLE HELCOM SUBSIDIARY BODIES

HELCOM STATE*

HELCOM Seal Expert Group

Contact information: HELCOM Secretariat

*Tentative name

Monitoring programme: Biodiversity - Mammals
Programme topic: Mammals

SUB-PROGRAMME: SEAL ABUNDANCE

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **Partly coordinated** within HELCOM SEAL *ad hoc* expert group.

- Common monitoring guidelines: Coordinated guidelines for monitoring are being developed in the BALSAM project and by the HELCOM SEAL ad hoc expert group and are expected to be adopted by HELCOM by end of 2014.
- Common quality assurance programme: missing. National QA/QC exists
- Common database: missing.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Biodiversity
	Ecological objectives	Viable populations of species
Marine strategy framework directive (MSFD)	Descriptors	D1 Biodiversity D4 Food webs
	Criteria (Q5a)	1.1 Species distribution 1.2 Population size 1.3 Population condition 1.5 Habitat extent 4.3 Abundance/distribution of key trophic groups/species
	Features (Q5c)	Biological features: A description of the population dynamics, natural and actual range and status of species of marine mammals and reptiles occurring in the marine region or subregion.
Other relevant legislation (Q8a)	Habitats Directive	

Assessment of: (Q4k)

State/Impacts	X	Temporal trends Spatial distribution State classification
Pressures		
Human activities causing the pressures		
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)
HELCOM assessment unit levels

1 - Baltic Sea	**X** (for grey seal)
2 - Subbasins	**X** (for ringed seal and harbor seal)
3 - Subbasins with coastal and offshore division	
4 - Subbasins with coastal WFD division	

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
Through HELCOM SEAL Expert Group	Grey seal	Population size (abundance) Species distributional range/pattern	Aerial surveys	National/HELCOM SEAL	Yearly	All haul outs	Population growth rate, abundance and distribution of marine mammals	1.1.1 Distributional range 1.2.1 Population abundance	EEZ	2000	SE, FI, EE, RU, DK
Through HELCOM SEAL Expert Group	Ringed seal	Population size (abundance) Species distributional range/pattern	Aerial surveys	National/HELCOM SEAL	Yearly	Entire distribution	Population growth rate, abundance and distribution of marine mammals	1.1.1 Distributional range 1.2.1 Population abundance	EEZ	1988/1996	SE, FI, EE, RU
Through HELCOM SEAL Expert Group	Harbour seal/ Kalmarsund	Population size (abundance) Species distributional range/pattern	Aerial surveys	National/HELCOM SEAL	Yearly	Entire distribution	Population growth rate, abundance and distribution of marine mammals	1.1.1 Distributional range 1.2.1 Population abundance	EEZ	1972	SE
Through HELCOM SEAL Expert Group	Harbour seal S. Baltic	Population size (abundance) Species distributional range/pattern	Aerial surveys	National/HELCOM SEAL	Yearly	Entire distribution	Population growth rate, abundance and distribution of marine mammals	1.1.1 Distributional range 1.2.1 Population abundance	Territorial waters	1979	SE, DK
Through HELCOM SEAL Expert Group	Harbour seal/Kattegat	Population size (abundance) Species distributional range/pattern	Aerial surveys	National/HELCOM SEAL	Yearly	Entire population	Population growth rate, abundance and distribution of marine mammals	1.1.1 Distributional range 1.2.1 Population abundance	EEZ	1979	SE, DK
National	Grey seal cubs	Population size (abundance)	National	National/HELCOM SEAL	Yearly	Archipelago Sea	-	4.1 Productivity (production per unit biomass) of key species or thophic groups	Territorial Waters	2006	EE, FI

Brief description of monitoring

Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	**Grey seal/Abundance and distribution** **Ringed seal/Abundance and distribution** **Harbour seal/Abundance and distribution**
Method	All monitoring is conducted from aircrafts, except for a few locations where boat or land-based counting are better options. Seal haul-outs are monitored with cameras and the number of seals on the photographs are subsequently analysed by computers. Surveys are conducted annually during the moult and in some cases pupping seasons are surveyed. Deviations and detailed methodology is described in the document "Baltic Seal Monitoring Methods", which is being developed in the BALSAM project and HELCOM SEAL EG. Grey seal/abundance and distribution: Fixed wing and helicopter, photos taken of all haul-outs annually. Two internationally coordinated surveys annually during peak moulting season. Ringed seal/abundance and distribution: Fixed wing, line transect over ice, covering a minimum of 13% of the ice covered area. Annual flights during peak moulting season in Bothnian Bay, more scarce in southern subpopulations. Gulf of Finland and Gulf of Riga: Due to poor ice conditions complementary counts on hauled out seals in August are planned. Harbour seal/Abundance and distribution: Fixed wing, all haul-outs photographed during the peak moulting season. Three flights carried out annually.
QA/QC	HELCOM seal expert group coordinates and evaluates the data.
Frequency	Harbour seal/abundance and distribution: triple surveys carried out annually during moult in August covering the entire area of distribution. Grey seal/abundance and distribution: coordinated surveys in end of May-early June annually. Ringed seal/abundance and distribution: annual line transect surveys in the Bothnian Bay and Archipelago Sea, sporadic in the Gulf of Finland and the Gulf of Riga. Archipelago Sea, Gulf of Finland and Estonian coastal waters only monitored under ice conditions.
Spatial Scope	The programme covers the haul-out range of each seal species within the HELCOM area.
Spatial resolution	Kattegat, Great Belt, The Sound, Kiel Bay, Bay of Mecklenburg, Arkona Basin, Bornholm Basin, Eastern Gotland Basin, Western Gotland Basin, Gulf of Riga, Northern Baltic Proper, Gulf of Finland, Åland Sea, Bothnian Sea, The Quark, Bothnian Bay. For grey seals and harbour seals all significant seal haul-outs are covered. For ringed seals, at least 13% of the ice-covered sea area.

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	To assess seal abundance and trends over 5-year periods, annual surveys of each management unit are required to obtain the necessary power of detection. The survey efforts must be coordinated internationally to ensure that every management unit is surveyed by simultaneous surveys covering its range of distribution. The aerial surveys only contribute distribution data on land distribution. In order to obtain distribution at sea data for seals, other measures, such as periodical telemetry studies must be implemented.
Gaps	The grey seal range is expanding, and minor localities in Germany and Poland are not covered by the current programme. While currently insignificant in regard to the general abundance, they may grow to become significant in the future. In Denmark, the grey seals are only surveyed once during the moulting season, while each locality is surveyed twice in Sweden, Finland, Russia and Estonia. This makes the counts from Denmark less robust. Warmer winters in recent years have resulted in reduced ice cover, making estimates in such years unreliable. This compromises the power to detect trends and calls for design of alternative methods. With the current methodology, absolute abundances cannot be estimated for any of the species, as correction factors taking into account the proportion of the population that is hauled out during the surveys do not exist for any of the species in the Baltic. Studies to address this gap need to be performed. Data for ringed seal southern populations insufficient due to poor ice conditions. Alternative methods are being developed.

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	Yes for grey seal and harbor seal. Insufficient for ringed seals in the Gulf of Finland and Gulf of Riga.
Established methods for assessment?	Yes. Alternative methods are developed as needed.
Adequate understanding of GES?	Yes
Adequate capacity to perform assessments?	Yes

Assessment of natural variability (Q5e)

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

DATA PROVIDERS AND ACCESS

Data access point	HELCOM SEAL EG
Data type (Q10c)	Processed Data sets
Data availability (Q10c)	HELCOM
Data access (Q10c)	Open access
INSPIRE standard (Q10c)	Species distribution
When will data become available? (Q10c)	03/2015
Data update frequency (Q10c)	Yearly, or as soon as data have been analysed and quality assured
Describe how the data and information from the programme will be made accessible to the EC/EEA	
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	Yes, e.g. BSEP116B Biodiversity in the Baltic Sea.

REFERENCES

Teilmann, J., F. Riget, T. Harkonen. 2010. Optimising survey design in Scandinavian harbour seals: Population trend as an ecological quality element.

ICES Journal of Marine Science, 67: 952–958 Härkönen, T., O. Stenman, M. Jüssi, I. Jüssi, R. Sagitov, M. Verevkin. 1998. Population size and distribution of the Baltic ringed seal (Phoca hispida botnica). In: Ringed Seals (Phoca hispida) in the North Atlantic. Edited by C.Lydersen and M.P. Heide-Jørgensen.

NAMMCO Scientific Publications, Vol. 1, 167-180. Härkönen, T and S. G. Lunneryd 1992. Estimating abundance of ringed seals in the Bothnian Bay. Ambio 21:497-510.

Monitoring programme: Biodiversity - Mammals
Programme topic: Mammals

SUB-PROGRAMME: HARBOUR PORPOISE ABUNDANCE

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **Partly coordinated** for the Belt Sea population. **Not coordinated** for the Baltic Proper population.

Recommendation on coordinated monitoring for the Baltic Proper population is under development by the SAMBAH project. The monitoring of the Belt Sea population is planned and coordinated by Aarhus University, Denmark under the Danish national monitoring programme, NOVANA. Other Contracting Partners are involved on an *ad hoc* basis.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Biodiversity
	Ecological objectives	Viable populations of species
Marine strategy framework directive (MSFD)	Descriptors	D1 Biodiversity D4 Food webs
	Criteria (Q5a)	1.1 Species distribution 1.2 Population size 4.3 Abundance/distribution of key trophic groups/species
	Features (Q5c)	Biological features: A description of the population dynamics, natural and actual range and status of species of marine mammals and reptiles occurring in the marine region or subregion.
Other relevant legislation (Q8a)	Habitats Directive	

Assessment of: (Q4k)

State/Impacts	X	Temporal trends Spatial distribution State classification
Pressures		
Human activities causing the pressures		
Effectiveness of measures		

Scale of data aggregation for assessments:(Q10a)

HELCOM assessment unit levels

1 - Baltic Sea	
2 - Subbasins	
3 - Subbasins with coastal and offshore division	
4 - Subbasins with coastal WFD division	X

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
Through HELCOM SEAL Expert Group	Harbour porpoise, Belt Sea	Population size (abundance)	SCANS II, Hammond et al. 2013	SCANS II, Hammond et al. 2013	5-7 years	Entire population	Population growth rate, abundance and distribution of marine mammals	1.1.1 Distributional range, 1.2.1 Population abundance	EEZ	1994	SE, DK, DE
HELCOM SEAL Expert Group	Harbour porpoise, Baltic Proper	Population size (abundance)	SAMBAH.org NB that this is a project: not a regular monitoring programme	SAMBAH.org	To be decided	Entire population	Population growth rate, abundance and distribution of marine mammals	1.1.1 Distributional range, 1.2.1 Population abundance	EEZ	2011	SE (not a regular monitoring programme) , DK, DE, EE, FI, LT, LV, PL

Brief description of monitoring

Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	**Harbour porpoise/Population size** (abundance)**, Belt Sea**
Method	The current Danish national monitoring program, NOVANA, includes line transect surveys of the Belt Sea population with a frequency of approx. 6 years, starting 2011 and building on the previous SCANS surveys. Line transect double platform visual surveys during summer (distance methods, random transects)
QA/QC	Surveys are planned under the Danish national NOVANA monitoring program.
Frequency	Every 5-7 years.
Spatial Scope	Entire distribution of population
Spatial resolution	Circa 1000 km of line transect survey effort randomly distributed over the population area.

Element / parameter	**Harbour porpoise/Population size** (abundance)**, Baltic Proper**
Method	Methods are being developed within SAMBAH, but a monitoring programme has not been implemented.
QA/QC	-
Frequency	No scheduled efforts yet. Project based monitoring.
Spatial Scope	-
Spatial resolution	Baltic Proper: Pending monitoring design

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	Line transect aerial and ship-based monitoring of the harbour porpoise in the Baltic proper is complicated by the very low density of the species in this area, resulting in very uncertain estimates of abundance. The SAMBAH project has aimed to address this by employing static acoustic recorders. Assessment of monitoring methods and the necessary scope of the monitoring in order to assess GES in the Baltic Proper should wait for results and assessment of the static acoustic approach in the report of the SAMBAH-project, due in 2014. Another harbour porpoise population unit occurs in the Danish, German and Swedish Belt Sea area, where density is sufficient for ship-based surveys. This area is covered by the SCANS surveys conducted in 1994 and 2005, and population abundance estimates on the basis of these surveys are possible. Another survey with methods comparable to the SCANS surveys was performed in 2012. With the interval between the 1994 and 2005 (11 years) surveys, a power analysis revealed that four surveys with this interval would be required to detect an annual change in abundance of 8% with a power of 0.8. Thus, to be able to monitor the population over shorter periods than 33 years, much more frequent surveys are needed. Thus, current monitoring is not adequate for data on porpoise abundance to be used for e.g., the CORESET indicator on 'Population growth rate, abundance and distribution of marine mammals', or the MSFD-descriptor on biodiversity for harbour porpoise. If such a level of precision is needed, a higher frequency of surveys with greater accuracy of estimates should be considered. The current Danish national monitoring program, NOVANA, includes line transect surveys of the Belt Sea population with a frequency of approx. 6 years, starting 2011 and building on the previous SCANS surveys.
Gaps	Better individual biomass assessment would increase the indicator reliability, since using length or other individual size measurements would provide more realistic biomass values compared to the fixed individual weight values. This is related to seasonal and geographic variability in body size. Also, regular intercalibrations of sample analysis (Ring-tests) would facilitate the interlaboratory comparisons. Harmonization of sampling frequency and spatial resolution among the national monitoring programmes is needed to improve indicator-based assessment across the Baltic Sea and to increase coherency of GES targets.

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	Yes (Belt Sea population)
Established methods for assessment?	Yes (Belt Sea population)
Adequate understanding of GES?	Yes (Belt Sea population)
Adequate capacity to perform assessments?	Yes (Belt Sea population)

Assessment of natural variability (Q5e)

Quantitative. Line-transect surveys using Distance statistics of the management unit of the Belt Sea are carried out with an interval of circa 5 years. There is currently no planned monitoring of the management unit in the inner Baltic.

DATA PROVIDERS AND ACCESS

Data access point	Danish NOVANA database (Belt Sea)
Data type (Q10c)	Processed Data sets (Belt Sea) Unprocessed/raw Data
Data availability (Q10c)	Data in national data centre (Belt Sea)
Data access (Q10c)	
INSPIRE standard (Q10c)	
When will data become available? (Q10c)	
Data update frequency (Q10c)	Every 6 years (Belt Sea)
Describe how the data and information from the programme will be made accessible to the EC/EEA	Under development
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added

Has the data been used in HELCOM assessments?	No

REFERENCES

Hammond PS, Macleod K, Berggren P, Borchers DL, Burt L, Cañadas A, Desportes G, Donovan GP, Gilles A, Gillespie D, Gordon J, Hiby L, Kuklik I. Leaper R, Lehnert K, Leopold M, Lovell P, Øienm N, Paxton CGM, Ridoux V, Rogan E, Samarra F, Scheidat M, Sequeira M, Siebert U, Skov H, Swift R, Tasker ML, Teilmann J, Van Canneyt O, Vázquez JA. 2013. Cetacean abundance and distribution in European Atlantic shelf waters to inform conservation and management. Biological Conservation 164: 107–122.

Monitoring programme: Biodiversity - Mammals
Programme topic: Mammals

SUB-PROGRAMME: SEAL HEALTH STATUS

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **Partly coordinated** within HELCOM SEAL *ad hoc* expert group.

- Common monitoring guidelines: Regional guidelines for sampling and assessment have been developed under HELCOM for the core indicators.
- Common quality assurance programme: missing. National QA/QC exists.
- Common database: missing.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Biodiversity
	Ecological objectives	Healthy wildlife Viable populations of species
Marine strategy framework directive (MSFD)	Descriptors	D1 Biodiversity D4 Food webs
	Criteria (Q5a)	1.3 Population condition 8.2 Effects of contaminants
	Features (Q5c)	Biological features: A description of the population dynamics, natural and actual range and status of species of marine mammals and reptiles occurring in the marine region or subregion
Other relevant legislation (Q8a)	Habitats Directive	

Assessment of: (Q4k)

State/Impacts	X	Temporal trends State classification
Pressures		
Human activities causing the pressures		
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)

HELCOM assessment unit levels

1 - Baltic Sea	X (for grey seal)
2 - Subbasins	X (for ringed seal)
3 - Subbasins with coastal and offshore division	
4 - Subbasins with coastal WFD division	

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
Through HELCOM SEAL Expert Group	Grey seal	Reproduction rate	Necropcies investigations of female reproductive organs and age determination (in Swedish)	National	Year round	Other	Reproductive status of marine mammals	1.3 Population condition	EEZ	1977	FI, PL, SE
Through HELCOM SEAL Expert Group	Grey seal	Marine mammal blubber	Necropcies measuring blubber thickness on the sternum in 1-3 years old. (in Swedish)	National	Year round	Other	Nutritional status of seals	1.3 Population condition	EEZ	1977	FI, SE
Through HELCOM SEAL Expert Group	Ringed seal	Reproduction rate	Necropcies investigations of female reproductive organs and age determination. (in Swedish)	National	Year round	Other	Reproductive status of marine mammals	1.3 Population condition	EEZ	SE 1977 FI 1999	FI, SE
Through HELCOM SEAL Expert Group	Ringed seal	Marine mammal blubber	Necropcies measuring blubber thickness on the sternum in 1-3 years old. (in Swedish)	National	Year round	Other	Nutritional status of seals	1.3 Population condition	EEZ	SE 1977 FI 1999	FI, SE
Through HELCOM SEAL Expert Group	Harbour seal	Reproduction rate	Necropcies investigations of female reproductive organs and age determination. (in Swedish)	National	Year round	Other	Reproductive status of marine mammals	1.3 Population condition	EEZ	SE 1988	DE, DK, SE
Through HELCOM SEAL Expert Group	Harbour seal	Marine mammal blubber	Necropcies measuring blubber thickness on the sternum in 1-3 years old. (in Swedish)	National	Year round	Other	Nutritional status of seals	1.3 Population condition	EEZ	SE 1988	DE (stranded and by-caught specimen only), DK, SE

Brief description of monitoring

Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	Female reproductive status measured as pregnancy rate: - proportion of females with presence of a fetus in the pregnancy period and birth rate - proportion of females showing post partum signs as ovarian corpus albicans and uterine scars between time for birth and implantation - proportion of mature females 2-5 years old measured as presence of an ovarian corpus luteum between time for birth and implantation. Stranded seals can be used for the additional parameter 'uterine obstructions and leiomyoma'. Nutritional status measured as blubber thickness (mm) at sternum in 1-3 years old.
Method	Reproductive status: Data for the core indicators are received during seal necropsies. For reproductive status the uterus is examined for fetus or postpartum signs and ovaries are examined for corpora luteum and 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	HELCOM SEAL *ad hoc* expert group health team coordinates and evaluates. During the three decades of monitoring two persons in Sweden (veterinarian and patho-biologist) have conducted the necropsies (Bergman, 1999). During these three decades several persons in Finland (veterinarians, seal biologists) have performed necropsies. In Germany and Poland necropsies are performed by veterinarians. National consultations and synchronisations are made continuously between persons in different countries. Age determinations of the grey seals are performed by counting growth layer groups (GLGs) in the cementum of teeth according to a well-established method. Readings of tooth sections are made independently by two persons. More information in this paper (in Swedish).
Frequency	All by-caught and stranded seals species are sampled all year around and the seals from hunting from middle of April. The number of seals is dependent on people collecting and sending them.
Spatial Scope	The female reproductive status of all three seal species is assessed on available material in Level 2 assessment units. Most of the grey seals and ringed seals data on reproduction is from the Gulf of Bothnia. Currently material from the southern Baltic Sea is insufficient for assessment of reproductive status of grey seals. For harbor seals the assessment are is Kattegat. Currently experts are working in the HELCOM CORESET II project to identify the assessment units for which valid assessments can be made based on the available data. The Swedish data including by-caught grey seals is insufficient, N=26 during 2002-2012 from the Baltic Proper. The nutritional status is assessed for all three seal species based on available data originationg from by-catch and hunting. The nutritional status is assessed for the whole Baltic Sea.
Spatial resolution	Baltic Sea

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

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 communities. 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: • Pregnancy rate measured as per cent ± CI females having a fetus after delayed implantation time • Birth rate measured as per cent ± CI females with postpartum signs between the time of birth and implantation. • Per cent ± CI mature young females (2-5 years old) measured as presence of corpus luteum in ovaries between the time of birth and implantation. • Per cent females showing uterine pathological changes year round. Female reproduction is measured in hunted and by-caught seals and for some parameters also in stranded seals. At present time the assessment of female reproduction depends on hunted seals for sufficiency of data. The nutritional status is measured as geometric mean ± CI of blubber thickness in 1-3 years old females and males during the fattest time of the year, the pregnancy period. Experts are currently investigating if data from all months could be included in the HELCOM CORESET II project. The monitoring of nutritional status should be confined to by-caught and hunted seals and these two categories should be assessed separately since by-caught seals usually are leaner. In areas without hunt the monitoring can be carried out on by-caught seals only. Data compilation: By-caught, stranded and shot seals are received and necropsied all year around in Sweden and mostly in the springtime in Finland. Sweden and Finland have most data from Baltic grey seals and ringed seals. Sweden also has harbour seal data. Denmark and Germany (by-caught and stranded animals only) may also have harbour seal data. Data from Poland, Estonia, Lithuania, Latvia and Russia is very welcomed. For grey seals it will be evaluted if the data held by Finland and Sweden is sufficent to make a Baltic wide assessment of the health of the species. Data is assessed and also presented as trends. Reproductive data is presented in five years interval and blubber thickness in 3 years intervals for grey seals. The intervals (GES) for ringed seals (nutritional status) and harbor seals (reproductive status and nutritional status) are not decided yet.
Gaps	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. 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, recent findings indicate that the overall health problems due to environmental toxins have decreased during the past decades (Nyman et al. 2002, Routti 2009). 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 in harbor seals from the Swedish west coast are only monitored in hunted animals. Data on harbour porpoises is insufficient to determine overall health status at this time. For female reproducive status sufficient data is available for seals from the Gulf of Bothnia (grey seal and ringed seal) and the Swedish west coast (harbour seal, Kattegat) while there is limited data from Baltic Proper and Gulf of Riga. Data on harbor porpoise is insufficient at this time.

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	Yes*
Established methods for assessment?	Yes
Adequate understanding of GES?	Yes
Adequate capacity to perform assessments?	Yes

*NOTE: The MSFD classifies the selective extraction of species and the associate biological disturbance as pressures and impacts to the marine environment which must not jeopardize the achievement of the good environmental status according to MSFD or the ecological objectives according to the HELCOM BSAP. Hunting is therefore not a Baltic Sea wide option for data collection.

Assessment of natural variability (Q5e)

Pregnancy rate is measured as presence or absence of a foetus in the pregnancy period in 6–24 years-old grey seals and from the proportion of females 7-25 years old with CA in spring. GES is proposed to be assessed every third year (pooling the data for each 3-year period) for 6–24 years old, and every sixth year pooling the data for each 6-year period, separately for young (4–5 years-old) and adult (≥ 6-year-old) females. For ringed seals, a period of 10 years to get enough data may be needed. Today's figures suggest that in 4–20 years old grey seal GES could be set at the lower limit of the 95% confidence interval i.e. at about 80%, referring to the period 2008–2009 which is proposed to be defined as representative of a healthy population. However, recently calculated values for 6-24 year old grey seals show higher pregnancy rate values and need to be furhter considered. The same GES boundary is proposed for the ringed seal. Data should also be presented as trends.

Blubber thickness is measured at the sternum between the muscle layer and the skin during the season of pregnancy (August-February for grey and ringed seals). New methods that allow the use of data from all months are currently being considered. Suggested reference levels for GES are the lower limit of the 95 % confidence interval for the geometric mean. These have been calculated for 1–3 years old, 5–20 years old males, and 5–20 years old females in the Norwegian and Swedish grey seals from hunt in 1999–2004. The reason for basing the proposed GES boundary to data from before 2005 is that since this year the available data indicates a trend of decreasing blubber thickness. In support for this approach, the lower limit of 95 % confidence intervals for the 1–3-year-old grey seal is 26.8 mm also in Finland. Suggestion GES boundaries for grey seals during the season of pregnancy from stranded, by-caught or hunted animals.

Age class	Sex	Geometric mean - Confidenc interval = GES boundary
1–3 years	females and males	≥26
5–20 years	males	≥36
5–20 years	females	≥37

In order to get enough data, assessment could be renewed every third year (i.e. pooling the data for each 3-year period) for grey seals.
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 are suggested to be presented separately since their proportions will influence the GES determination. It has been discussed in the HELCOM SEAL health team that the lower 95 % CI could be used as the GES boundary for ringed seal as well. The lower limit of 95 % confidence intervals was 35.6 mm for young and sub-adult individuals and 51.4 mm for adults in 2001–2011. The sample includes both by-caught and hunted seals from August-February.

GES limits for blubber thickness in ringed seals and harbour seals are still investigated as part of the CORESET II project and expected to be ready by end of the project by June 2015. Data for harbour porpoises is insufficent at this time.

DATA PROVIDERS AND ACCESS

Data access point	HELCOM - not yet available
Data type (Q10c)	Processed Data sets
Data availability (Q10c)	National data centres
Data access (Q10c)	
INSPIRE standard (Q10c)	
When will data become available? (Q10c)	
Data update frequency (Q10c)	Every 6/3 years
Describe how the data and information from the programme will be made accessible to the EC/EEA	
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	Yes

REFERENCES

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.

Home / Action areas / Monitoring and assessment / Monitoring manual / Fish, fisheries and shellfish

FISH, FISHERIES AND SHELLFISH

GENERAL INFORMATION

The monitoring of fish and shellfish cover the abundance, distribution, growth, population dynamics and exploitation of fish in the HELCOM area. Much of the programme is carried out under the auspices of ICES.

Fish are mobile components of the ecosystem and many are commercially exploited. For many of the sub-programmes there are monitoring surveys, monitoring of commercial catches and direct assessments of population (stock) dynamics.

Sub-programme: Coastal fish

These are fish in the coastal habitats of the Baltic Sea and many of the coastal fish are of freshwater origin. Monitoring is carried out by national monitoring programmes and collated through HELCOM.

The HELCOM core indicators 'Abundance of key fish species' and 'Abundance of fish key functional groups' are linked to the monitoring undertaken in the sub-programme.

Sub-programme: Fish - Migratory fish

The monitoring covers anadromous and catadromous fish. They migrate from more saline habitats to freshwater (or vice versa) to spawn. The more wide ranging species (salmon, seatrout and eel) are monitored and assessed through ICES, whereas rarer species (e.g. sturgeon) and local species (e.g. whitefish) are monitored through local programmes or research projects. These fish have specific habitat requirements for certain stages of the life cycle, but are widely distributed across the HELCOM region.

The HELCOM core indicators 'Abundance of sea trout spawners and parr' and 'Abundance of salmon spawners and smolt' are linked to the sub-programme.

Sub-programme: Fish - Offshore fish

The monitoring of offshore fish includes stocks that are regulated by TACs (Total Allowable Catch) and countrywise quotas and are exploited by large commercial fisheries. They tend to prefer more saline and/or offshore habitats. The grouping includes herring, cod, sprat and flatfish. These species are characterised by large biomasses of fish with changing distributions and growth dynamics.

The HELCOM core indicator 'Proportion of large fish in the community' is linked to the sub-programme.

SUB-PROGRAMMES

Coastal fish

Fish - Migratory fish

Fish - Offshore fish

Commercial shellfish

Fisheries bycatch

Sub-programme: Commercial shellfish

The main shellfish populations in the HELCOM region that are currently monitored are predominantly in the west of the region. These include Nephrops in the Kattegat, a few local shrimp populations and blue mussels. In contrast to fish, these shellfish are considered less mobile and many are characterised as more sessile or associated with specific benthic habitat.

Currently there are no HELCOM core indicators linked to the sub-programme.

Sub-programme: Fisheries by-catch

Fisheries by-catch is considered to be the catching of non-target species by commercial or recreational fisheries. This can include seabirds, marine mammals, non-commercial fish species and benthos.

The HELCOM core indicator 'Number of drowned mammals and waterbirds in fishing gears' is linked to the sub-programme.

RESPONSIBLE HELCOM SUBSIDIARY BODIES

HELCOM STATE*

HELCOM FISH-PRO II

Contact information: HELCOM Secretariat

*Tentative name

Monitoring programme: Biodiversity - Fish
Programme topic: Fish, shellfish and fisheries

SUB-PROGRAMME: COASTAL FISH

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **Partly coordinated.** The sub-programme is coordinated within HELCOM FISH PRO II to facilitate comparability of data across areas and harmonized assessments.

- Common monitoring guidelines: HELCOM COMBINE manual.
- Common quality assurance programme: missing but national assurances are common practice
- Common database: missing. common database for data from coastal fish monitoring in the Baltic. Currently all data is stored in national databases from which extracts of data for assessments are made.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Biodiversity
	Ecological objectives	Thriving and balanced communities of plants and animals Viable populations of species
Marine strategy framework directive (MSFD)	Descriptors	D1 Biodiversity D3 Commercial fish and shellfish D4 Food webs
	Criteria (Q5a)	1.2 Population size 1.6 Habitat condition 3.1 Level of pressure of the fishing activity 3.2 Reproductive capacity of the stock 3.3 Populatin age and size distribution 4.3 Abundance/distribution of key trophic groups/species
	Features (Q5c)	Biological features: Information on the structure of fish populations, including the abundance, distribution and age/size structure of the populations.
Other relevant legislation (Q8a)	Common Fisheries Policy (DCF) Habitats Directive Water Framework Directive	

Assessment of: (Q4k)		
State/Impacts	X	temporal trends, spatial distribution, status classification
Pressures		
Human activities causing the pressures		
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)	
HELCOM assessment unit Level 1: Baltic Sea	
HELCOM assessment unit Level 2: Subbasin	
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	X (see also Assessment requirements)
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	

MONITORING CONCEPTS

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
Regional (COMBINE)	Coastal fish	Population size (abundance) Population size (biomass)	HELCOM COMBINE Manual Part C Annex C-10. For FI and DK, see HELCOM core indicators report	National	Yearly	Variable	Abundance of key fish species Abundance of fish key functional groups	1.2.1 Population abundance and/or biomass, 1.6.1 Condition of the typical species and communities 4.3.1 Abundance trends of functionally important selected groups/species	Territorial waters	Differ across countries from the 1970s, to be started in 2014. In all countries except PL, DE and DK, some data are available from 1995. See also http HELCOM fact sheet on coastal fish and HELCOM core indicator report	DE, DK, EE, FI, LT, LV, PL, SE

Brief description of monitoring

Full description in HELCOM COMBINE manual. Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	**Coastal fish/Population size** (abundance) **Coastal fish/Population size** (biomass) **Abundance/biomass of important functional groups**
Method	Gill-net and/or fyke net monitoring, see HELCOM 2008. Guidelines for coastal fish monitoring sampling methods of HELCOM in HELCOM COMBINE manual Part C Annex C-10. The abundance and size of each fish and species that is caught in gill net catches is beign monitored, in some areas also the weight. When weight is not measured, it is usually derived from length-weight relationships. The abundance of functional groups, species composition as well as size structures and biomass can be calculated from different species and/or functional groups. The coastal fish guidelines will be updated in 2014 and include also trawl surveys and trammel nets. In some countries (FI) data from the small-scale commercial coastal fishery is used for status assessments of coastal fish. In DK, assessments will be based on a recreational fishermen survey.
QA/QC	National. No Baltic wide quality assurance is currently undertaken, but data is checked nationally in Contracting Parties.
Frequency	Annually, except Lithuania (every third year) and Latvia (not undertaken at all).
Spatial Scope	See map for details.

Spatial resolution	Monitoring of coastal fish communities is in some form currently undertaken in all CPs. The spatial coverage is, however, highly variable, and there are gaps. See HELCOM fact sheet on coastal fish and gap analysis below. Not all the data are reported to HELCOM.

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	The two HELCOM core indicators for coastal fish, 'Abundance of key fish species' and 'Abundance of fish key functional groups', capture important features of coastal fish communities. To give a more representative view of the status of coastal fish communities, however, indicators reflecting the size-structure and trophic state of the community should be included and assessed. Coastal fish communities are rather local in their appearance and response to external driving variables (Saulamo & Neuman 2002; Laikre et al 2005; Olsson et al 2011; 2012a). As such, no Baltic wide GES border and reference state could be defined for coastal fish communities. These parameters should instead be based and defined on the basis of the conditions in the specific coastal region or transitional water type, and status assessments are hence generally not transferable across coastal regions or water types. Ideally, coastal fish communities should be assessed within the coastal water type, but with reference to the HELCOM Assessment unit hierarchical system, coastal fish could be assessed at a slightly larger spatial scale: level 3 “Open sub-basins and coastal waters (< 1 NM from baseline)”. To capture the local features of coastal fish communities and the heterogeneity of coastal areas within a sub-basin, a few monitoring areas per coastal sub-basin (level 3) should be monitored and assessed. Assessments within coastal regions could potentially be aggregated up to the subbasin level, but there is no proposed method for this to date. The “one-out-all-out” procedure is likely not fully applicable for aggregations within and across assessment units since the indicators proposed for example are interrelated with each other. The suggested approach for assessing coastal fish community status relies on a time-series approach of the data within the suggested assessment unit. As there has been considerable turn-over in the species composition of coastal fish communities during recent decades (Olsson et al 2012b), and given that an indicator based status assessment needs to consider effects of strong and weak year classes of certain species as a natural feature, the monitoring serving as the basis for status assessments, needs to cover more than 10 years. Including a five-years assessment period, this requires at least 15 years of monitoring data. For data with shorter coverage in time, trend-based assessments could be executed. The time-interval should hence be annual monitoring. For more information on the assessment procedure as suggested in Abundance of key fish species core indicator. This will be updated in the upcoming revision of CORE indicator fact sheets. The MSFD descriptors and associated criteria relevant to the monitoring programme are given in question on MSFD GES Criteria above.
Gaps	Long time-series enough to meet the proposed time-series approach for assessing the status of coastal fish communities are currently available in Sweden, Finland, Estonia, Latvia and Lithuania covering the Gulf of Bothnia and the northern and eastern parts of the Baltic Proper. In Sweden, Finland and Estonia the coasts are extensive and rather heterogeneous, and sampling programmes only covers a part of the total stretch of the coast. Particularly in the northern parts of Finland (Gulf of Bothnia) and the southern parts of the Baltic Proper (Sweden), very little data from gill-net monitoring is available. In Sweden and Finland, the spatial coverage is increasing when considering the monitoring programmes using Nordic coastal multi-mesh nets HELCOM (2012). These monitoring programmes were initiated in the early – mid 2000s and are too short to assess the status using a baseline approach. Instead, a trend-based approach is desirable. In Germany and Denmark there are data that will be used for coastal fish assessments, but the time-perspective is short covering the last 5-10 years. As such a trend-based approach for status assessments is applicable. In Poland a coastal fish monitoring programme has been established in 2013, but the data does not allow for any assessments within the coming years. In Finland data on catch per unit effort from the small-scaled coastal fishery can be used as a complement for status assessments. This source of data might also be used in additional countries to fill the spatial gaps in monitoring, but the use and quality of the data needs to be addressed. To summarize, the current coastal fish monitoring as coordinated by HELCOM represents a minimum. Whereas the geographical coverage is rather good in the northern parts, there are substantial gaps in many areas. Additional monitoring programmes should hence be established and/or alternative data sources used in order to fully capture the current status of coastal fish communities along all parts of the Baltic coast. An additional aspect that should be considered is that there iscurrently a lack of funding in some countries for monitoring and assessments of coastal fish. In Estonia there is lack of funding for experts to make assessments of the monitoring data, in Latvia there is no funding for monitoring and assessments, in Lithuania monitoring is currently carried out only every third year which is not in line with the suggested principles of HELCOM, and in Denmark and Germany monitoring and assessments is project based, without any long-term monitoring plan. Especially in Germany, there is no coastal fish monitoring programme, but data can be extracted from other sources of data.

Adequacy for assessment of GES (Q5d)

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 reporting under Article 9 and 11.

Adequate data?	Yes. But note gaps in monitoring in some coastal areas (see Monitoring requirements and gaps)
Established methods for assessment?	Under development in HELCOM CORESET II
Adequate understanding of GES?	Under development in HELCOM CORESET II
Adequate capacity to perform assessments?	An assessment will be carried out for the upcoming HELCOM CORE Indicator fact sheets in 2014. Funding for assessments is however lacking in some Contracting Parties.

Assessment of natural variability (Q5e)

The reference period is defined as a period of time that covers more than two times the generation time of typical species (in this case 10 years) and is without any significant change in the parameter, As such natural variability is considered. Also, the GES boundaries are defined taking into consideration rare events and unusual values of the indicator value. Since assessments are performed with respect to reference levels within the coastal area of the monitoring station, natural variability across areas is considered. This approach is under development.

DATA PROVIDERS AND ACCESS

Data access point	National databases
Data type (Q10c)	Unprocessed/raw Data
Data availability (Q10c)	By request
Data access (Q10c)	Open access to data (covered by ICES data policy)
INSPIRE standard (Q10c)	Species distribution
When will data become available? (Q10c)	Unprocessed/raw Data
Data update frequency (Q10c)	Yearly
Describe how the data and information from the programme will be made accessible to the EC/EEA	Not applicable yet on a Baltic wide scale
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Data is used in the following Baltic Sea Environment Fact Sheets (BSEF)	Temporal development of Baltic coastal fish communities and key species
Has the data been used in HELCOM assessments?	Yes, e.g. BSEP131 Indicator-based assessment of coastal fish community status in the Baltic Sea 2005-2009 (2012).

REFERENCES

HELCOM 2012 (BSEP 131)

Laikre, L., Palm, S., and Ryman, N. 2005. Genetic population structure of fishes: implications for coastal zone management. Ambio, 34: 111–119.

Olsson, J., Mo, K., Florin, A-B., Aho, T., and Ryman, N. 2011. Genetic population structure of perch, Perca fluviatilis L, along the Swedish coast of the Baltic Sea. Journal of Fish Biology, 79: 122–137.

Olsson, J., Mo, K., Florin, A-B., Aho, T., and Ryman, N. 2012a. Genetic structure of whitefish (Coregonus maraena) in the Baltic Sea. Estuarine, Coastal and Shelf Science, 97: 104–113.

Olsson, J., Bergström, L., and Gårdmark, A. 2012b. Abiotic drivers of coastal fish community change during four decades in the Baltic Sea – ICES Journal of Marine Science, 69: 961–970.

Saulamo & Neuman 2002; Laikre et al 2005; Olsson et al 2011; 2012a Olsson et al 2012b

Saulamo, K., and Neuman, E. 2002. Local management of Baltic fish stocks—significance of migrations. Finfo 2002: 9

Monitoring programme: Biodiversity - Fish
Programme topic: Fish, shellfish and fisheries

SUB-PROGRAMME: MIGRATORY FISH

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **Partly coordinated.** The sub-programme is partly coordinated within ICES WGBAST. Missing: sea trout parr densities and most of eel monitoring.

- Common monitoring guidelines: Monitoring is coordinated under ICES groups: Assessment Working Group on Baltic Salmon and Trout and Joint EIFAAC/ICES Working Group on Eels
- Common quality assurance programme: ICES
- Common database: There are no centralised databases in ICES that cover for baltic salmon and trout, other than the ground fish trawl surveys. A common, coordinated analysis of database is made under ICES by the Finnish Game and Fisheries Research Institute.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Biodiversity
	Ecological objectives	Viable populations of species
Marine strategy framework directive (MSFD)	Descriptors	D1 Biodiveristy D3 Commercial fish and shellfish D4 Food webs
	Criteria (Q5a)	1.1 Species distribution 1.2 Population size 1.6 Habitat condition 3.1 Level of pressure of the fishing activity 3.2 Reproductive capacity of the stock 3.3 Population age and size distribution 4.1 Productivity (production per unit biomass) of key species or trophic groups 4.3 Abundance/distribution of key trophic species
	Features (Q5c)	Habitat types: Identification and mapping of special habitat types, especially those recognised or identified under Community legislation (the Habitats Directive and the Birds Directive) or international conventions as being of special scientific or biodiversity interest. Biological features: Information on the structure of fish populations, including the abundance, distribution and age/size structure of the populations
	Activities (Q7a, 7b)	Extraction of living resources: Fisheries
Other relevant legislation (Q8a)	Common Fisheries Policy (CFP) and Data Collection Framework (DCF) Habitats Directive Water Framework Directive	

Assessment of: (Q4k)		
State/Impacts	X	temporal trends, spatial distribution, status classification
Pressures		
Human activities causing the pressures	X	
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)	
HELCOM assessment unit Level 1: Baltic Sea	
HELCOM assessment unit Level 2: Subbasin	
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	
Other: Salmon assessment units/river specific	X

MONITORING CONCEPTS

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
ICES	Fish abundance	Life history stage (e.g. egg, juvenile, adult)	Sea trout parr density surveys-rivers	Other	Yearly	Targeting river basins	Abundance of sea trout spawners and parr	1.1.1 Distributional range, 1.2.1 Population abundance and/or biomass, 1.3.1 Population demographic characteristics, 1.3.2 Population genetic structure	MS land/FW	Varies by river – earliest 1976	SE, FI, RU, EE, LT, PL, DK, DE
ICES	Fish abundance	Life history stage (e.g. egg, juvenile, adult)	Sea trout parr density surveys - areas	Other	Yearly	Targeting areas	Abundance of sea trout spawners and parr	1.3.1 Population demographic characteristics, 3.3.1 Proportion of fish larger than the mean size of first sexual maturation), 3.3.4 Size at first sexual maturation	Territorial waters	Varies by area – earliest 1980	FI, RU, EE, LV, LT, PL
ICES	Sampling from sea trout catch	Composition of catch	Biological sampling	Other	Yearly	Main fisheries	-	1.3.1 Population demographic characteristics, 3.3.1 Proportion of fish larger than the mean size of first sexual maturation, 3.3.4 Size at first sexual maturation	Territorial waters	Early 2000s	All HELCOM Contracting Parties

ICES	Population dynamics salmon	Population size (abundance)	Stock assessment	Other	Yearly	Stock wide assessment Gulf of Finland	-	3.2.1 Spawning Stock Biomass (SSB), 3.2.2 Biomass indices, 1.3.1 Population demographic characteristics, 1.2.1 Population abundance and/or biomass, 3.1.1 Fishing mortality, 3.3.1 Proportion of fish larger than the mean size of first sexual maturation, 4.3.1 Abundance trends of functionally important selected groups/species	EEZ	1993	All HELCOM Contracting Parties
ICES	Population dynamics salmon	Population size (abundance)	Stock assessment	Other	Yearly	Stock wide assessment Main Baltic Basin and GoB and on river basis	-	3.2.1 Spawning Stock Biomass (SSB), 3.2.2 Biomass indices, 1.3.1 Population demographic characteristics, 1.2.1 Population abundance and/or biomass, 3.1.1 Fishing mortality, 3.3.1 Proportion of fish larger than the mean size of first sexual maturation, 4.3.1 Abundance trends of functionally important selected groups/species	EEZ	1993	All HELCOM Contracting Parties
ICES	Catch statistics of salmon	Composition and number of retained/landed catch	Time series of catches of salmon	Other	3-monthly	Offshore, coastal, river, commercial and angling	-	3.1.1 Fishing mortality	MS land/FW	1972	All HELCOM Contracting Parties
ICES	Salmon parr densities	Life history stage (e.g. egg, juvenile, adult)	Electrofishing	Other	Yearly	River areas, rolling programme	Abundance of salmon spawners and smolt	1.1.1 Distributional range, 1.2.1 Population abundance and/or biomass), 1.3.2 Population genetic structure	MS land/FW	1980	All HELCOM Contracting Parties
ICES	Salmon spawning runs	Reproduction rate	Monitoring at fish ladders with traps or DIDSON	Other	Yearly	At the few index rivers	Abundance of salmon spawners and smolt	3.2.1 Spawning Stock Biomass (SSB)	MS land/FW	Traps since 1990s, DIDSON since 2008	All HELCOM Contracting Parties

ICES	Salmon smolt production	Life history stage (e.g. egg, juvenile, adult)	Traps and mark recapture	Other	Yearly	At the few salmon index rivers and other rivers	Abundance of salmon spawners and smolt	1.2.1 Population abundance and/or biomass, 1.3.2 Population genetic structure	MS land/FW	1990	All HELCOM Contracting Parties
ICES	Sampling from salmon catch	Composition of catch	Biological sampling	Other	Yearly	All main fisheries	-	1.3.1 Population demographic characteristics, 1.3.2 Population genetic structure, 3.3.1 Proportion of fish larger than the mean size of first sexual maturation, 3.3.4 Size at first sexual maturation	MS land/FW	2003	All HELCOM Contracting Parties
ICES under WGEEL Group	Yellow eel recruitment	Life history stage (e.g. egg, juvenile, adult)	traps	Other	Yearly	At 5 Baltic rivers	-	1.3.1 Population demographic characteristics, 3.2.1 Spawning Stock Biomass (SSB), 3.3.1 Proportion of fish larger than the mean size of first sexual maturation, 3.3.4 Size at first sexual maturation	MS land/FW	1950	SE and DK
ICES	Silver eel escapement	Life history stage (e.g. egg, juvenile, adult)	Catch per unit effort of silver eel	Other	Yearly	4 locations in Sweden	-	1.3.1 Population demographic characteristics, 3.2.1 Spawning Stock Biomass (SSB), 3.3.1 Proportion of fish larger than the mean size of first sexual maturation, 3.3.4 Size at first sexual maturation	Territorial waters	1950	SE
ICES	Eel commercial catch	Composition and number of retained/landed catch	Monitoring of catches	Other	Yearly	Across the Baltic	-	3.1.1 Fishing mortality	Territorial waters	1945	All HELCOM Contracting Parties

Brief description of monitoring

Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	**Salmon, sea trout, eel/Catches**
Method	All catches are monitored.
Spatial resolution	The catch monitoring occurs across the Baltic. Catch monitoring collates national catch records (but method varies by country across sea trout, salmon and eel).

Element / parameter	**Salmon population/Stock assessment**

Method	Smolt and parr surveys (traps, DIDSON and electrofishing) at index rivers, and other locations. Stock assessments exist for the main salmon population in the Baltic and the overall trends for Gulf of Finland salmon determined using various methods f interpolating monitoring trends. Stock assessments integrate time series trends and biological information.
QA/QC	Either by ICES protocol, benchmark or workshop. Some though use national approaches.
Frequency	The frequency varies, with some series stopping and then starting again. Varieties of rivers can be monitored each year. The salmon index rivers should be monitored annually. Sea trout and salmon don't occur parallel in all rivers, selection of index rivers need to be considered separately for salmon and sea trout.
Spatial Scope	Monitoring for salmon is carried out by assessment unit.
Spatial resolution	Stock assessments are region specific. The surveys of recruitment, escapement, smolts or parrs are river specific (see ICES SGBALANST REPORT 2007 page 10 for a summary of sea trout monitoring in the Baltic ; ICES WGBAST REPORT 2013 page 18 for a table of biological sampling of salmon in the Baltic in 2012 and page 270 for assessment units)

Element / parameter	**Sea trout population/Stock assessment**
Method	Smolt and parr surveys (traps, DIDSON and electrofishing) at index rivers, and other locations. Stock assessments exist for overall trends for sea trout, determined using various methods of interpolating monitoring trends. Stock assessments integrate time series trends and biological information.
QA/QC	Either by ICES protocol, benchmark or workshop. Some though use national approaches.
Frequency	The frequency varies, with some series stopping and then starting again. Varieties of rivers can be monitored each year. The salmon index rivers should be monitored annually. Sea trout and salmon don't occur parallel in all rivers, selection of index rivers need to be considered separately for salmon and sea trout.
Spatial Scope	Region specific / River specific. Assessment is river specific, results can be summed up by coastal area or sub basin.
Spatial resolution	Stock assessments are region specific. The surveys of recruitment, escapement, smolts or parrs are river specific (see ICES SGBALANST REPORT 2007 page 10 for a summary of sea trout monitoring in the Baltic ; ICES WGBAST REPORT 2013 page 18 for a table of biological sampling of salmon in the Baltic in 2012 and page 270 for assessment units)

Element / parameter	**Eel population/Stock assessment**
Method	The abundance trends of various life stages (smolt, parr, yellow eel and silver eel) are monitored. Yellow eel monitoring by traps in specific locations. Silver eel by catch per unit of fishing effort estimates. The Baltic is a component of the Europe wide stock assessment. Overall trends for eel are determined using various methods of interpolating monitoring trends. Stock assessments integrate time series trends and biological information.
QA/QC	Either by ICES protocol, benchmark or workshop. Some though use national approaches.
Frequency	The frequency varies, with some series stopping and then starting again. Varieties of rivers can be monitored each year. The salmon index rivers should be monitored annually.
Spatial Scope	Most monitoring for eel is carried out in Sweden.
Spatial resolution	Stock assessments are region specific.

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	The current management regime requires an evaluation of the status of individual salmon stocks. This implies that stock-specific information need to be collected from all salmon rivers; currently there are about 40 spawning rivers of salmon in the Baltic Sea (and 16 rivers in Kattegat). It has a high priority to establish at least one index river in each Assessment Unit (AU) of Baltic salmon. Data from an index river consists of monitoring of salmon spawning runs and their composition, smolt runs, river catches and parr densities. Monitoring in all non-index salmon rivers should be arranged so that each juvenile cohort is sampled at least once before smoltification. Electrofishing surveys in non-index salmon rivers are of high priority but it is not necessary to have annual surveys in every river. Periodic smolt trapping in non-index rivers and monitoring of the M74 mortality in a subset of rivers supplement assessment by improving the accuracy of stock estimates. Updating any information relevant to the migration and/or reproduction possibilities of salmon in rivers (e.g., changes in migration obstacles, restoration of river habitat, measures affecting water quality and/or flow regimes) is also needed. Assessment requirements concerning monitoring at sea covers: fishing effort and catches (incl. discarding and estimates of unreporting), catch sampling from which the stock composition and the origin (wild/hatchery-reared) is analysed. These data are needed on fleet basis (offshore/coastal fishing by gear type). Also catch data on recreational fisheries at sea and in rivers is necessary and used in the salmon assessment. Monitoring requirements concerning sea trout are very similar to those of salmon. However, the current trout assessment does not require as broad range of data sets as is required for salmon assessment. The data sets of highest priority are: parr densities and inventories of river habitat. Establishment of index rivers similar to salmon index rivers is highly recommended. This would enable supplementing of parr density information with counts of trout smolts and ascending spawners in a part of rivers. Catches, tag recaptures from fisheries, and information about fishing pressure and fishing pattern (gear and mesh sizes used) are also required for in-depth assessment of sea trout stocks. There is no such thing as Baltic eel. Eel is pan-European, so the monitoring programmes must be European wide
Gaps	Currently, few salmon index rivers in the Baltic Sea provide a full set of information (monitoring of salmon spawning runs, smolt runs and river catches, and parr densities) required from index rivers. Full scale monitoring takes place only in Finland and Sweden and covers Assessment Units 1, 2 and 4. More index rivers with full set of information are especially needed from Assessment Units 5 and 6. Complete and more accurate estimates about recreational salmon catches are needed both from the sea and the rivers. The spatio-temporal coverage of catch sampling from sea may need to be increased for assessment efforts serving stock specific management and restoration of weak stocks. For sea trout, establishment of index rivers similar to salmon index rivers is highly recommended.

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	Yes
Established methods for assessment?	Yes. Expert evaluations are available and a substitutive model to estimate reference densities in a certain areas is available, but a generally working model for all areas is still missing. In addition a criteria for selection of monitoring sites need to be developed.
Adequate understanding of GES?	Yes i.e. 50% of the max. reference density.
Adequate capacity to perform assessments?	Yes. ICES WGBAST have a capacity to perform the expert evaluation on the status of stock and to run potential models.

Assessment of natural variability (Q5e)

Quantitative and by expert opinion. Natural variation is quantified by analytical assessment tools (life cycle models for salmon and other statistical analyses methods for sea trout) and the results are complemented by expert opinions, trend analyses etc.

DATA PROVIDERS AND ACCESS

Data access point	National databases

Data type (Q10c)	Processed Data sets Data Products Modelled data
Data availability (Q10c)	Provide location of data in national data centre: Modelled data available in the Finnish Game and Fisheries Research Institute. Provide location of data in international data centre (e.g. RSC, ICES, EEA, EMODnet): Catch sampling data of salmon available in the ICES Regional database.
Data access (Q10c)	Restricted by specific licence Data will not be available
INSPIRE standard (Q10c)	Species distribution
When will data become available? (Q10c)	Unclear
Data update frequency (Q10c)	Yearly
Describe how the data and information from the programme will be made accessible to the EC/EEA	Unclear
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	Yes

REFERENCES

Stock assessment of Gulf of Finland Salmon

Stock assessment of salmon in Baltic main basin and Gulf of Bothnia

Monitoring of smolts and migrating adults: Annex of the WGBAST report

Study group on data requirements and assessment needs for Baltic Sea trout (SGBALANST)

SALAR project

Report of the Joint EIFAAC/ICES Working Group on Eels (WGEEL)

Electrofishing method manual: Bohlin T, S Hamrin, T G Heggberget, G Rasmussen & S Jakob Saltveit (1989) Electrofishing — Theory and practice with special emphasis on salmonids. Hydrobiologia 173: 9-43.

Monitoring programme: Biodiversity - Fish
Programme topic: Fish, shellfish and fisheries

SUB-PROGRAMME: OFFSHORE FISH

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **Fully coordinated**

- Common monitoring guidelines: Monitoring is coordinated under ICES following the Manual for the Baltic International Trawl Surveys (BITS) and Manual for International Baltic Acoustics Surveys (BIAS).
- Common quality assurance programme: QA/QC and assessments are performed annually by ICES Baltic International Fish Survey Working Group (WGBIFS).
- Common database: hosted by ICES for sprat, herring and cod

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Biodiversity
	Ecological objectives	Thriving and balanced communities of plants and animals Viable populations of species
Marine strategy framework directive (MSFD)	Descriptors	D1 Biodiversity D3 Commercial fish and shellfish D4 Food webs
	Criteria (Q5a)	1.1 Species distribution 1.2 Population size 1.3 Population condition 3.1 Level of pressure of the fishing activity 3.2 Reproductive capacity of the stock 3.3 Population age and size distribution 4.1 Productivity (production per unit biomass) of key species or trophic groups 4.2 Proportion of selected species at the top of food webs 4.3 Abundance/distribution of key trophic groups/species
	Features (Q5c)	Biological features: Information on the structure of fish populations, including the abundance, distribution and age/size structure of the populations.
	Activities (Q7a, 7b)	Extraction of living resources: Fisheries
Other relevant legislation (Q8a)	Common Fisheries Policy (CFP - DCF)	

Assessment of: (Q4k)		
State/Impacts	X	temporal trends, spatial distribution, status classification
Pressures		
Human activities causing the pressures	X	
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)	
HELCOM assessment unit Level 1: Baltic Sea	X
HELCOM assessment unit Level 2: Subbasin	
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	
Other	

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
Regional (ICES)	Fish abundance & biology	Population size (abundance) Size of individuals (length or weight) Species distributional range/pattern Diet	Baltic International trawl survey - Q1 (see WGBIFS and WGBFAS) and HELCOM COMBINE manual	Other	Yearly	Stratified fixed station grid	Proportion of large fish in the community (includes population size and individual size parameters)	1.1.1, 1.1.2, 1.2.1, 1.3.1, 3.2.1, 3.3.1, 3.3.2, 4.1.1, 4.2.1, 4.3.1.	EEZ	1992	All HELCOM Contracting Parties
Regional (ICES)	Fish abundance & biology	Population size (abundance) Size of individuals (length or weight) Species distributional range/pattern Diet	Baltic International trawl survey – Q4 (see WGBIFS and WGBFAS) and HELCOM COMBINE manual	Other	Yearly	Stratified fixed station grid	Proportion of large fish in the community (includes population size and individual size parameters)	1.1.1, 1.1.2, 1.2.1, 1.3.1, 3.2.1, 3.3.1, 3.3.2, 4.1.1, 4.2.1, 4.3.1.	EEZ	1992	All HELCOM Contracting Parties
Regional (ICES)	Fish abundance & biology in water column	Population size (abundance) Size of individuals (length or weight) Species distributional range/pattern Migration patterns	Baltic International Acoustic Survey	Other	Yearly	Stratified acoustic transects	Proportion of large fish in the community (includes population size and individual size parameters)	1.1.1, 1.1.2, 1.2.1, 1.3.1, 3.2.1, 3.3.1, 3.3.2, 4.1.1, 4.2.1, 4.3.1.	EEZ	1991	All HELCOM Contracting Parties
Regional (ICES)	Fish abundance & biology in water column	Population size (abundance) Size of individuals (length or weight) Species distributional range/pattern Migration patterns	Baltic International Spring Acoustic Survey	Other	Yearly	Stratified acoustic transects	Proportion of large fish in the community (includes population size and individual size parameters)	1.1.1, 1.1.2, 1.2.1, 1.3.1, 3.2.1, 3.3.1, 3.3.2, 4.1.1, 4.2.1, 4.3.1.	EEZ	2001	All HELCOM Contracting Parties
Regional (ICES)	Fish abundance & biology in water column	Population size (abundance) Size of individuals (length or weight) Species distributional range/pattern Migration patterns	ICES coordinated acoustic survey for herring	Other	Yearly	Stratified acoustic transects	Proportion of large fish in the community (includes population size and individual size parameters)	1.1.1, 1.1.2, 1.2.1, 1.3.1, 3.2.1, 3.3.1, 3.3.2, 4.1.1, 4.2.1, 4.3.1.	EEZ	1991	All HELCOM Contracting Parties

Regional (ICES)	Fish abundance & biology	Population size (abundance) Size of individuals (length or weight) Species distributional range/pattern Diet	International Bottom Trawl Survey – Q1	Other	Yearly	Stratified fixed station grid	Proportion of large fish in the community (includes population size and individual size parameters)	1.1.1, 1.1.2, 1.2.1, 1.3.1, 3.2.1, 3.3.1, 3.3.2, 4.1.1, 4.2.1, 4.3.1.	EEZ	1983	All HELCOM Contracting Parties
Regional (ICES)	Fish abundance & biology	Population size (abundance) Size of individuals (length or weight) Species distributional range/pattern Diet	International Bottom Trawl Survey (see WGBIFS and WGBFAS) – Q3	Other	Yearly	Stratified fixed station grid	Proportion of large fish in the community (includes population size and individual size parameters)	1.1.1, 1.1.2, 1.2.1, 1.3.1, 3.2.1, 3.3.1, 3.3.2, 4.1.1, 4.2.1, 4.3.1.	EEZ	1991	All HELCOM Contracting Parties
Regional (ICES)	Herring larvae abundance	Life history stage (e.g. egg, juvenile, adult) Size of individuals (length or weight) Population size (abundance) Reproduction rate	N20 larval survey, Greifswalder Botten	Other	Yearly	Stratified fixed station grid		1.1.1, 1.1.2, 1.2.1, 1.3.1, 3.2.1, 3.3.1, 3.3.2, 4.1.1, 4.2.1, 4.3.1.	EEZ	1977	DE
Regional (ICES)	Fish abundance & biology	Population size (abundance) Size of individuals (length or weight) Species distributional range/pattern Diet	Havfisken – Q1	Other	Yearly	Stratified fixed station grid	Proportion of large fish in the community (includes population size and individual size parameters)	1.1.1, 1.1.2, 1.2.1, 1.3.1, 3.2.1, 3.3.1, 3.3.2, 4.1.1, 4.2.1, 4.3.1.	Territorial waters	1996	DK
Regional (ICES)	Fish abundance & biology	Population size (abundance) Size of individuals (length or weight) Species distributional range/pattern Diet	Havfisken – Q4	Other	Yearly	Stratified fixed station grid	Proportion of large fish in the community (includes population size and individual size parameters)	1.1.1, 1.1.2, 1.2.1, 1.3.1, 3.2.1, 3.3.1, 3.3.2, 4.1.1, 4.2.1, 4.3.1.	Territorial waters	1994	DK
Regional (ICES)	Fish abundance & biology	Population size (abundance) Size of individuals (length or weight) Species distributional range/pattern Die	Solea – Q4	Other	Yearly	Stratified fixed station grid	Proportion of large fish in the community (includes population size and individual size parameters)	1.1.1, 1.1.2, 1.2.1, 1.3.1, 3.2.1, 3.3.1, 3.3.2, 4.1.1, 4.2.1, 4.3.1.	Territorial waters	1992	DE
Regional (ICES)	Commercial monitoring of catch	Composition and number of retained/landed catch Composition and number of discards Age at maturity Size of individuals (length or weight)	RDB- BALTIC	Other	Monthly or quarterly	Sampling metiers of the fishing fleet		1.1.1, 1.1.2, 1.2.1, 1.3.1, 3.2.1, 3.3.1, 3.3.2, 4.1.1, 4.2.1, 4.3.1.	EEZ	1970s	All HELCOM Contracting Parties

Regional (ICES)	VMS of fishing fleet	Disturbance rates by human activities Mortality/damage rates to species from a pressure	ICES/HELCOM data call	Other	Monthly	Sampling metiers of the fishing fleet	Cumulative impact on benthic biotopes (pre-core)	3.1.1 Level of pressure of the fishing activity - Fishing mortality (F)	EEZ	2009	All HELCOM Contracting Parties
Regional (ICES)	Population dynamics cod, herring, sprat	Population size (biomass) Mortality rate Size of individuals (length or weight) Reproduction rate	Stock assessment	Other	Yearly	Fish stock time series	Proportion of large fish in the community (includes population size and individual size parameters)	1.1.1, 1.1.2, 1.2.1, 1.3.1, 3.2.1, 3.3.1, 3.3.2, 4.1.1, 4.2.1, 4.3.1.	EEZ	Varies by stock - approx. 1970	All HELCOM Contracting Parties
Regional (ICES)	Population dynamics plaice, flounder, dab, brill, turbot	Population size (biomass) Mortality rate Size of individuals (length or weight) Reproduction rate	Stock assessment (data limited)	Other	Yearly	Fish stock time series	Proportion of large fish in the community (includes population size and individual size parameters)	1.1.1, 1.1.2, 1.2.1, 1.3.1, 3.2.1, 3.3.1, 3.3.2, 4.1.1, 4.2.1, 4.3.1.	EEZ	Varies by stock – approx. 2001	All HELCOM Contracting Parties

Brief description of monitoring

Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	**Demersal fish communities/Abundance, distribution, size, age, maturity, sex ratios**
Method	The trawl surveys monitor the demersal fish community and some of the benthos. It is used to estimate the distribution and abundance of fish, the size and age of fish, the maturity and sex ratios. The sampling effort is standardised to provide input to stock assessments. The surveys are carried out by research vessels with fixed station or transect design. The monitoring of catches usually takes place at ports or in laboratories. Samples of the catch are sampled using a range of protocols which have all been documented by ICES PGCCDBS. The stock assessment methods are documented in stock annexes for each stock and the approach is determined by an internationally peer reviewed benchmark process Bottom trawl surveys are not carried out north of Gotland-Hiiumaa line
QA/QC	ICES ensures the quality assurance for the sampling methods through the use of protocols, technical blind exchanges, workshops, international peer review and stakeholder engagement in some of the processes.
Frequency	Almost all information collected gives input into the annual fisheries quota considerations. To ensure standardisation, the surveys occur at the same time of year and is dependent on the life cycle of the fish and the fish migrations.
Spatial Scope	The spatial scope varies and is dependent of the targeted fish stocks. Many surveys overlap and some, such as the herring larvae survey, are very specific to a particular site and season.
Spatial resolution	Surveys and monitoring of the catches offer the finest resolution, but these data integrate more observation noise into the time series. The stock assessments are considered more robust in terms of observation noise, but provide they the coarsest time series in terms of spatial resolution.

Element / parameter	**Pelagic fish communities/Abundance, distribution, size, age, maturity, sex ratios**
Method	The acoustic surveys monitor the community in the water column. It is used to estimate the distribution and abundance of fish, the size and age of fish, the maturity and sex ratios. The sampling effort is standardised to provide input to stock assessments. The surveys are carried out by research vessels with fixed station or transect design. Methods should follow ICES survey protocols. The monitoring of catches usually takes place at ports or in laboratories. Samples of the catch are sampled using a range of protocols that have all been documented by ICES PGCCDBS. The stock assessment methods are documented in stock annexes for each stock and the approach is determined by an internationally peer reviewed benchmark process.

QA/QC	ICES ensures the quality assurance for the sampling methods through the use of protocols, technical blind exchanges, workshops, international peer review and stakeholder engagement in some of the processes.
Frequency	Almost all information collected provides input to the annual fisheries quota considerations. To ensure standardisation, the surveys occur at the same time of year and are dependent on the life cycle of the fish and the fish migrations.
Spatial Scope	The spatial scope varies and is dependent of the targeted fish stocks. Many surveys overlap, some such as the herring larvae survey are very specific to a particular site and season.
Spatial resolution	Surveys and monitoring of the catches offer the finest resolution, but integrate more observation noise into the time series. The stock assessments are considered more robust in terms of observation noise, but provide the coarsest time series in terms of spatial resolution.

Element / parameter	**Fish Larvae**
Method	The surveys of larvae specifically monitor the abundance and size of the larvae.
QA/QC	ICES ensures the quality assurance for the sampling methods through the use of protocols, technical blind exchanges, workshops, international peer review and stakeholder engagement in some of the processes.
Frequency	Almost all information collected gives input into the annual fisheries quota considerations. To ensure standardisation, the surveys occur at the same time of year dependent on the life cycle of the fish and the fish migrations.
Spatial Scope	Pelagic is done through ICES, national do the demersal The spatial scope varies dependent of the targeted fish stocks. Many surveys overlap, some such as the herring larvae survey are very specific to a particular site and season.
Spatial resolution	Surveys and monitoring of the catches offer the finest resolution, but these data integrate more observation noise into the time series. The stock assessments are considered more robust in terms of observation noise, but provide the coarsest time series in terms of spatial resolution.

Activity	**Commercial catch monitoring**
Method	The commercial catch monitoring takes place across the whole Baltic Sea and monitors the size, age and maturity status of caught fish. Sampling is distributed representatively across fleet metiers (segments). The monitoring of catches usually takes place at ports or in laboratories. Samples of the catch are sampled using a range of protocols which have all been documented by ICES PGCCDBS. The stock assessment methods are documented in stock annexes for each stock and the approach is determined by an internationally peer reviewed benchmark process.
QA/QC	ICES ensures the quality assurance for the sampling methods through the use of protocols, technical blind exchanges, workshops, international peer review and stakeholder engagement in some of the processes.
Frequency	Almost all information collected gives input into the annual fisheries quota considerations. To ensure standardisation, the surveys occur at the same time of year dependent on the life cycle of the fish and the fish migrations. The monitoring of landings is monthly and usually raised to quarters to provide an overview of annual age/length composition.
Spatial Scope	The spatial scope varies dependent of the targeted fish stocks. Many surveys overlap, some such as the herring larvae survey are very specific to a particular site and season.
Spatial resolution	Surveys and monitoring of the catches offer the finest resolution, but integrate more observation noise into the time series. The stock assessments are considered more robust in terms of observation noise, but provide the coarsest time series in terms of spatial resolution.

Activity	**VMS-data**
Method	The VMS time series provides information on fishing fleet activity and distribution.
QA/QC	ICES ensures the quality assurance for the sampling methods through the use of protocols, technical blind exchanges, workshops, international peer review and stakeholder engagement in some of the processes.
Frequency	Continually (the data are collected every two hours by actual location)

Spatial Scope	Sampling metiers of the fishing fleet
Spatial resolution	0.05 x 0.05 aggregated grid within the EEZ

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	There are annual Baltic wide (EEZ) ICES coordinated surveys taking place for offshore fish that support data collection for CFP (DCF). For territorial waters Member States carry out national surveys. The trawl surveys (Baltic International trawl survey/ International bottom trawl survey) monitor the demersal fish community and some of the benthos. It is used to estimate the distribution and abundance of fish, the size and age of fish, the maturity and sex ratios. The sampling effort is standardised to provide input into stock assessments. The acoustic surveys monitor the community in the water column. It is used to estimate the distribution and abundance of fish, the size and age of fish, the maturity and sex ratios. The sampling effort is standardised to provide input to stock assessments. The surveys of larvae specifically monitor the abundance and size of the larvae. The commercial catch monitoring takes place across the Baltic and monitors the size, age and maturity status of caught fish. Sampling is distributed representatively across fleet metiers (segments). The VMS time series provides information on fishing fleet activity and distribution. The stock assessments should be seen as a synthesis of monitoring information to inform on the trends in population size and productivity and the exploitation impact. These assessments are used to inform decision makers for setting TACs and quotas. WGBFAS meets annually to assess the state of Baltic stocks. For stocks with sufficient data this leads to a forecast of catch options in the next year, while with data limited stocks, other approaches will be used, such as an analysis of trends in abundance estimates or catches. The 14 fish stocks presently covered by the working group are: • 3 cod stocks (Kattegat, western, and eastern Baltic) • 3 herring stocks (SD25-32, SD30, and SD31) • 2 plaice stocks (SD21-23 and SD24-32) • Sprat stock (SD22-32) • Sole stock in 21-32 • 4 flounders stocks (SD22-23, SD 24-25, SD26 and 28, and SD 27nad 29-32) • brill stock (SD22-32) • dab stock (SD22-32) • turbot stock (SD22-32
Gaps	The Large fish indicator (LFI) for the Baltic Sea has been developed for both the pelagic and the demersal community, but as with all LFIs it is developed using trawl survey information only. The trawl survey of the Baltic Sea covers the area inhabited by cod (the southern and western Baltic) as the survey is used to create indices for commercial demersal fish and all fish species are measured. The acoustic survey of the Baltic covers a greater area. However, there are no methods for combining trawl surveys and acoustic surveys to determine an LFI index for the entire fish community or Maximum Mean Length (MML). Also, the spatial distribution of commercial catches needs to be better quantified. At present there is no central database for acoustic surveys (both for trawl information and acoustic signals). ICES is developing a database to hold this information.

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	Yes for D3. No for D1 and D4.
Established methods for assessment?	Yes for D3. No for D1 and D4.
Adequate understanding of GES?	Yes for D3. No for D1 and D4.
Adequate capacity to perform assessments?	Yes for D3. No for D1 and D4.

Assessment of natural variability (Q5e)

Quantitative and Expert opinion. The programme (ICES advices EU through a Memorandum of Understanding) uses internationally accepted methods for monitoring and assessing fish stocks. These focus on the population dynamics of individual fish stocks and the pressure of fishing. The weakness in this approach is that the methods are not so well developed for considering D1, D3 and D4.

DATA PROVIDERS AND ACCESS

Data access point	ICES databases (DATRAS, ichthyoplankton, BALTIC RDB, secure VMS database, ICES standard graphs).
Data type (Q10c)	Unprocessed/raw Data Processed Data sets Data Products Modelled data
Data availability (Q10c)	DATRAS ICES Datasets ICES Data Portal: HELCOM
Data access (Q10c)	Open access for survey and stock assessment time series (covered by ICES data policy) Restricted by specific licence licence for monitoring of commercial catches and the VMS data (excluded from ICES data policy and covered by DCF). Data only available for agreed specific tasks and agreement of national data collection bodies is required to access and use the data.
INSPIRE standard (Q10c)	Species distribution
When will data become available? (Q10c)	Data are available annually at different times for different surveys
Data update frequency (Q10c)	Yearly
Describe how the data and information from the programme will be made accessible to the EC/EEA	The data are available through the ICES data centre with the data access limitations as described above
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added.
Has the data been used in HELCOM assessments?	Yes

REFERENCES

Baltic International Fish Survey Working Group (WGBIFS)

Baltic Fisheries Assessment Working Group (WGBFAS)

Herring assessment working group (HAWG)

International Bottom Trawl Survey Working Group (IBTSWG)

Planning Group on Commercial Catches, Discards and Bio-logical Sampling (PGCCDBS)

Report of the Regional Co-ordination Meeting for the Baltic (RCM Baltic) 2013

Stock assessment output data

Working Group of International Pelagic Surveys (WGIPS)

Monitoring programme: Biodiversity - Fish
Programme topic: Fish, shellfish and fisheries

SUB-PROGRAMME: COMMERCIAL SHELLFISH

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **Partly coordinated**. Monitoring of bivalve populations is not coordinated Baltic wide. Nephrops are monitored through ICES under the ICES Study Group on Nephrops Surveys (SGNEPS) and the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK)

- Common monitoring guidelines: ICES
- Common quality assurance programme: ICES
- Common database: missing. National databases

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Biodiversity
	Ecological objectives	Viable populations of species
Marine strategy framework directive (MSFD)	Descriptors	D1 Biodiversity D3 Commercial fish and shellfish D4 Food webs
	Criteria (Q5a)	1.1 Species distribution 1.2 Population size 1.3 Population condition 3.1 Level of pressure of the fishing activity 3.2 Reproductive capacity of the stock 3.3 Population age and size distribution
	Features (Q5c)	Biological features: Information on angiosperms, macro-algae and invertebrate bottom fauna, including species composition, biomass and annual/seasonal variability.
	Activities (Q7a, 7b)	Extraction of living resources: Fisheries
Other legislation (Q8a)	Common Fisheries Policy (DCF)	

Assessment of: (Q4k)		
State/Impacts	X	temporal trends, spatial distribution, status classification
Pressures		
Human activities causing the pressures	X	
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)
HELCOM assessment unit Level 1: Baltic Sea
HELCOM assessment unit Level 2: Subbasin
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division
HELCOM assessment unit Level 4: Subbasins with coastal WFD division
Other

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
ICES	Nephrops burrow density	Population size (abundance)	ICES coordinated Nephrops underwater TV surveys	ICES groups: WGNSSK and SGNEPS	Yearly	Stratified station survey design		1.1.1, 1.1.2, 1.1.3, 1.2.1, 1.3.1,3.1.1, 3.2.1	EEZ	2008 (2010 full series)	DK, SE
National	Shellfish assessment	Population size (biomass)	Danish Blue mussel and oyster survey	Other	Yearly	Limfjord stratified fixed sampling		1.1.1, 1.1.2, 1.1.3, 1.2.1, 1.3.1,3.1.1, 3.2.1	Territorial waters	1993	DK
National	Shellfish assessment	Population size (biomass)	Danish Blue mussel survey	National	Yearly	Little Belt stratified fixed sampling		1.1.1, 1.1.2, 1.1.3, 1.2.1, 1.3.1,3.1.1, 3.2.1	Territorial waters	2008	DK
ICES	Population dynamics Nephrops	Population size (abundance)	ICES stock assessment	Other	Yearly	ICES FU3 and FU4 (joint assessment Skagerrak and Kattegat)		1.1.1, 1.1.2, 1.1.3, 1.2.1, 1.3.1,3.1.1, 3.2.1	EEZ	1990	SE, DK
ICES	Commercial landings of Nephrops catch	Composition and number of retained/landed catch	ICES PGCCDBS approach to commercial sampling	Other	Monthly	Sampling metiers of the fishing fleet		3.1.1 Fishing mortality, 3.2.1 Spawning Stock Biomass (SSB)	EEZ	1991	SE, DK

Brief description of monitoring

Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	Nephrops/Population abundance, biomass and distribution
Method	Nephrops are monitored through underwater TV surveys, measuring the landings and discards and this is synthesised together using a stock assessment. Nephrops in the Kattegat is assessed and surveyed jointly with Nephrops in the Skagerrak (what ICES denote as functional units 3 and 4 (FU)). The Danish surveys for blue mussels and oysters occur in Limfjord and the Little Belt. These annual surveys measure abundance, distribution and density of shellfish. Research vessels are used to carry out the underwater TV surveys for Nephrops. The TV camera is attached to a sledge and the density of the burrows in enumerated. The sampling design is stratified relative to know population variability.
QA/QC	The Nephrops surveys are carried out using described ICES protocols (under ICES groups: WGNSSK and SGNEPS) which have been peer reviewed.
Frequency	All surveys, assessment and monitoring are annual.
Spatial Scope	Function Units (FU 3 and 4) in the Kattegat and Skagerrak.
Spatial resolution	Nephrops- Kattegat (mostly eastern side)

Element / parameter	Blue mussels and oysters/Population abundance, biomass and distribution
Method	The Danish surveys for blue mussels and oysters occur in Limfjord and the Little Belt. These annual surveys measure abundance, distribution and density of shellfish. The mussel and oyster surveys are carried out using international norms for bivalve sampling.
QA/QC	National
Frequency	All surveys, assessment and monitoring are annual.
Spatial Scope	For mussels and oysters the scope are the entire Limfjord and Lesser Belt area.
Spatial resolution	Mussels – Great Belt (20% as Little Belt only surveyed).

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	Monitoring of population state and fishing pressure on bivalves are carried out through local national projects. These are not coordinated Baltic Sea wide. The Nephrops populations and fishery are monitored through an ICES coordinated programme.
Gaps	There is no central database for shellfish populations in the Baltic Sea. There is no central coordination of monitoring of bivalve populations. Outside Denmark and Sweden, there are no other surveys of shellfish. There is a need for databases and coordination under D3.

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	No
Established methods for assessment?	No
Adequate understanding of GES?	No
Adequate capacity to perform assessments?	No

Assessment of natural variability (Q5e)

If shellfish need to be considered within the Baltic Sea area, there is little coordinated monitoring on any species other than Nephrops.

DATA PROVIDERS AND ACCESS

Data access point	National databases held at institutes

Data type (Q10c)	Unprocessed/raw Data Processed Data sets Modelled data
Data availability (Q10c)	By request
Data access (Q10c)	Open access – Nephrops stock assessment outputs Restricted by specific licence – sampling data on surveys covered by CFP- DCF
INSPIRE standard (Q10c)	Species distribution
When will data become available? (Q10c)	No agreement on data access
Data update frequency (Q10c)	Yearly
Describe how the data and information from the programme will be made accessible to the EC/EEA	Unclear
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added.
Has the data been used in HELCOM assessments?	No

REFERENCES

ICES Study Group on Nephrops Surveys (SGNEPS)

Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK)

Monitoring programme: Biodiversity - Fish
Programme topic: Fish, shellfish and fisheries

SUB-PROGRAMME: FISHERIES BY-CATCH

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **Not coordinated.**

Coordinated monitoring of fisheries by-catch is under development in HELCOM CORESET II project. A recommendation on coordinated monitoring will not be available before 2015.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Biodiversity
	Ecological objectives	Natural landscapes and seascapes Thriving and balanced communities of plants and animals Viable populations of species
Marine strategy framework directive (MSFD)	Descriptors	D1 Biodiversity D4 Food webs
	Criteria (Q5a)	1.1 Species distribution 1.2 Population size 1.3 Population condition 1.6 Habitat condition 1.7 Ecosystem structure 4.3. Abundance/distribution of key trophic groups/species
	Features (Q5c)	Biological features: A description of the population dynamics, natural and actual range and status of species of marine mammals and reptiles occurring in the marine region or subregion. A description of the population dynamics, natural and actual range and status of species of seabirds occurring in the marine region or subregion.
	Pressures and impacts, MSFD Annex III Table 2 (Q5c)	Selective extraction of species, including incidental non-target catches (e.g. by commercial and recreational fishing).
	Activities (Q7a, 7b)	Extraction of living resources: Fisheries
Other relevant legislation (Q8a)	Birds and Habitats Directives Common Fisheries Policy (DCF) EU regulation 812/2004	

Assessment of: (Q4K)		
State/Impacts	X	temporal trends, spatial distribution, status classification
Pressures	X	
Human activities causing the pressures	X	
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)	
HELCOM assessment unit Level 1: Baltic Sea	
HELCOM assessment unit Level 2: Subbasin	
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	
Other: National waters	X

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
None. Irregular research projects	By-catch of sea mammals	Composition and number of incidental/by-catch	Interviews with fishermen, observer programmes, TV surveillance (only as irregular research projects)		Yearly	Partial fleet metier coverage	Number of drowned mammals and water birds in fishing gear	4.3.1 Abundance trends of functionally important selected groups/species	EEZ	2004	DK, EE, DE, FI, LV, LT, PL
None. Irregular research projects	By-catch of seabirds	Composition and number of incidental/by-catch	Interviews with fishermen, observer programmes, TV surveillance (only as irregular research projects)		Yearly	Partial fleet metier coverage	Number of drowned mammals and water birds in fishing gear	4.3.1	EEZ	2008	DK, EE, DE, FI, LV, LT, PL, SE

Brief description of monitoring

Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	**Harbour porpoise / number of specimens by-caught** **Seals / number of specimens by-caught** **Wintering seabirds / number of by-caught birds**
Method	Currently methods are still in development and not standardised across the region. The main methods are onboard observer coverage, interviews with fishermen (both commercial and recreational) and TV monitoring of catches onboard (only in research projects/ case studies so far). Beached bird surveys can be conducted in appropriate sub-regions and are known from Lithuania. Examples of current monitoring: Harbour porpoise: number of specimens by-caught and reported by fishermen: In countries with a low on-board observer coverage - observer programmes conducted by the Baltic countries under Regulation 812/2004 in 2006 covered 0.1% to 9% of the national fleets concerned, gillnet coverage was at the lower end (Korpinen & Bräger 2013, ICES 2013, 2014). Seals: number of specimens by-caught and reported by fishermen Wintering seabirds: number of by-caught birds only in research projects (stranded birds, observers, cameras)
QA/QC	Ring tests (see HELCOM ZEN QAI reports for 2011 and 2012), Inter-and intra-laboratory calibrations, Accreditation procedures facilitating QA. An unresolved area with respect to QA is data quality control when submitting to a database host.

Frequency	Some data are currently collated on a regular basis from across the range of methods (e.g. monitoring obligations with regard to EU habitats directive, DCF, 812/2004). However, not all member states fulfil monitoring or reporting obligations. Observer coverage is much lower than required by 812/2004. This is the main reason why data gaps are so big. Other data is only collected sporadically.
Spatial Scope	The monitoring is not consistent across Contracting Parties and the metiers of fishing activity are not consistently covered either.
Spatial resolution	Wintering seabirds: Currently, some limited data are collected for protected taxa under DCF, but it is not possible to give an estimate concerning effort or coverage. A regionally and fishing method differentialised metier approach that considers fishing activity per spatial unit rather than spatial coverage alone is recommended for the future. Marine mammals: Currently, the coverage with respect to 812/2004 obligations is 0.1 to 9 % of national fleets concerned (Korpinen & Bräger 2014). Besides national differences there are large differences between coverage in fishing metiers. For the future, a regionally and fishing method differentialised metier approach is recommended (but it has not been agreed), that mainly considers fishing activity. However, in the case of the harbour porpoise which has two sub-populations within the Baltic Sea, it must be possible to differentiate between areas which are inhabited by the Baltic Proper subpopulation and the Inner Danish Waters (Western Baltic) subpopulation, respectively.

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	The current monitoring under DCF and 812/2004 seems more or less "opportunistic" as not all fisheries are adequately covered. Observer coverage focuses on larger vessels although the majority in Baltic gillnet fisheries are small vessels. Also fishing metiers under DCF have been selected with respect to fishery data needs rather than bird and mammal bycatch data needs. A monitoring of by-caught marine mammals and seabirds rather needs an approach allowing to estimate annual (seasonal) mortality from all kinds of specific fisheries to be compared to the population dynamics of the respective species. Due to the high mobility of the species involved, monitoring should be implemented for the whole Baltic Sea region, considering that fishing methods causing drowning of mammals and birds differ between sub-regions or even on a local level. Also different species may be affected in various sub-regions. Therefore, a mix of monitoring methods with subsequent aggregation of results is more promising than relying on only one method (on-board observers as under DCF and 812/2004). The general results (e.g. the number of drowned animals compared to model approaches such as potential biological removal PBR, catch limit algorithm CLA, or (in case of harbour porpoises) 1 % or 1.7 % as proposed by ASCOBANS) will allow to assess the state of the populations compared to GES, to identify the pressure in more detail and to propose relevant management measures. Besides the unsatisfactory data collection of the DCF and 812/2004 there are currently only case studies regarding the number of drowned mammals and birds available. Also effort data is needed in a meaningful metric (e. g., net length * hours soaked instead of kW * days at sea) on a fine spatial scale in order to relate by-catch to fishing effort. Hitherto existing results enable to address the problem of by-catch in general, but do not allow to quantify impacts in order to propose management measures such as (temporary) closures of specific fisheries. Thus, the core indicator 'Number of drowned mammals and waterbirds in fishing gear' has to be developed further to define GES, define reference points and to give guidelines for a monitoring programme covering the whole region and suitable for the variety of fisheries involved. This would also help to fulfill the overdue obligation of EU Council regulation 812/2004 (concerning incidental catches of cetaceans) which states that “monitoring schemes shall be designed on an annual basis and established to monitor cetacean by-catch, in a representative manner…”. As a general rule 812/2004 defines a variation coefficient of less than 0.3 to be reached by the sampling strategy. This would mean a high observer coverage which is impossible in fisheries in which mostly small vessels are involved. Innovative monitoring approaches such as onboard cameras may be needed to get data sufficient to answer the open questions in a cost-effective manner. Similar considerations apply to bird bycatch.
Gaps	There is currently no coordinated monitoring of by-catch. In Germany, only 0.01 % of effort of static gillnet vessels <15 m were monitored in 2013 (ICES 2014), whereas only 7 out of 1200 vessels in the Baltic Sea ,which fish with passive gears are longer than 15 m and thus covered by regular monitoring using on-board observers regarding obligations of 812/2004. Minor gillnet effort was monitored in Latvia and Poland (ICES 2014). No gillnet monitoring is operated under 812/2004 in Estonia, Finland, Lithuania and Sweden (ICES 2014). As alternatives to onboard observers, interviews with fishermen and onboard cameras(e.g. Germany, Denmark) have been used in research projects only. Under DCF, bird by-catch was monitored in Denmark, Germany, Poland and Sweden. Under DCF cetacean by-catch was monitored in Denmark, Germany, Latvia, Lithuania, Poland and Sweden (ICES 2013). It will be part of CORESET II work to find and compile details on national monitoring schemes and to recommend coordinated monitoring practises for the Baltic.

Adequacy for assessment of GES (Q5d)

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 Article 9 and 11.

Adequate data?	No
Established methods for assessment?	No
Adequate understanding of GES?	No
Adequate capacity to perform assessments?	No

Assessment of natural variability (Q5e)

Question not applicable. Most variability in bycatch is not natural. It strongly depends on specific properties of the fishing gear used and on fishing effort. Since in the existing monitoring programme not even the effort is monitored in a meaningful way (cf. ICES 2014), there is no way to account for additional natural (individual behaviour specific) variability. Further, the current monitoring effort in the gillnet fisheries in the Baltic Sea is much too low to detect any variability.

Adequacy for assessment of Targets

Monitoring should provide adequate data and information to enable the periodic assessment of environmental status, and distance from and progress towards Targets as required by the MSFD Article 10.

Description of Targets (Q6d)

By comparing the impact of pressures (here: mortality from drowning in fishing gear) to GES limits, it appears possible to adjust targets in the future if suitable monitoring programmes are developed. The DCF specifies the collective data that are required for the EU as a whole, as well as setting out targets for the precision of data within these different areas. These targets mainly focus on fisheries aspects such as size and species selectivity with respect to fish, but are not specific for cetaceans and birds. Such data is aquired more or less as a by-product.

Suitable and sufficient data? (Q6b)	No
Established methods for assessment?(Q6b)	No
Adequate capacity to perform assessments?(Q6b)	No
Will the data and information collected enable the regular updating of targets? (Q6c)	No
When will the programme be considered fully adequate? (Q6e)	In time for the updating of monitoring programmes due in 2020.

Plans for targets (Q6f)

In order to get the programme fully adequate for (re)defining targets there is the overriding need to implement a monitoring programme dealing with fisheries bycatch, allowing to assess this pressure quantitatively. This is the aim of CORESET II.

DATA PROVIDERS AND ACCESS

Data access point	Data collated by ICES and database is currently being constructed.
Data type (Q10c)	Unprocessed/raw Data Processed Data sets
Data availability (Q10c)	Restricted (on request and by CFP only)
Data access (Q10c)	Restricted by specific licence – currently these data are associated with the DCF so access is unclear.
INSPIRE standard (Q10c)	Species distribution
When will data become available? (Q10c)	This is uncertain
Data update frequency (Q10c)	Yearly
Describe how the data and information from the programme will be made accessible to the EC/EEA	These data will be provided to DGMARE every year
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added

Has the data been used in HELCOM assessments?	No

REFERENCES

ICES 2013, ICES 2014 Working Group on Bycatch of Protected Species (WGBYC)

ICES 2013b Workshop to Review and Advise on Seabird Bycatch (WKBYCS)

Korpinen & Bräger 2013 – Core indicator "number of drowned mammals and waterbirds in fishing gear"

Methods and protocols are being developed by Workshop on Bycatch of Cetaceans and other Protected Species (WKBYC)

Right sidebar

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Content

Add a Web Part

HYDROGRAPHY

GENERAL INFORMATION

The monitoring of hydrography covers the physical oceanographic parameters temperature, salinity, turbidity and water transparency. The topic also includes monitoring of waves, currents and sea ice extent and thickness.

Sub-programme: Water column hydrological characteristics

Temperature and Salinity are two supporting parameters in HELCOM monitoring.

Water transparency is related to increase in suspended algae and relevant for the assessment of eutrophication. Transparency and turbidity are used in monitoring (at least occassionally) but only Secchi depth is used as core indicator.

Turbidity describes an inherent optical quality, described often for example through attenuation of light. Secchi depth is a measure of apparent optical quality, but it is often used as a proxy of turbidity.

HELCOM core indicator linked to the sub-programme is:
'Secchi depth (summer)'

Sub-programme: Water column physical characteristics

Monitoring of waves, currents and sea level is required to assess permanent changes in hydrographic conditions as well as to describe natural variability of physical characteristics (wave exposure, upwelling, mixing conditions, and residence time) in relation to environmental assessments.

There is no HELCOM core indicator related to waves or currents.

Add a Web Part

SUB-PROGRAMMES

Water column hydrological characteristics

Water column physical characteristics

Ice

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Sub-programme: Ice

Ice conditions in the Baltic Sea are monitored using earth observation data from satellites (SAR) to monitor sea ice extent. Monitoring is carried out from the beginning until the end of annual ice season, typically from November to May.

In situ measurements are used for measurement of sea ice thickness, which is carried out in coastal waters and open sea areas.

There is no HELCOM core indicator related to ice.

RESPONSIBLE HELCOM SUBSIDIARY BODIES

HELCOM STATE*

Contact information: HELCOM Secretariat

*Tentative name

Monitoring programme: Biodiversity - Water column habitats, Eutrophication, Hydrographical changes
Programme topic: Hydrography

SUB-PROGRAMME: WATER COLUMN HYDROLOGICAL CHARACTERISTICS

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **Fully coordinated.**

- Common monitoring guidelines: HELCOM COMBINE manual.
- Common quality assurance programme: HELCOM COMBINE manual, national and ICES Data Type
- Common database: ICES

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Eutrophication Maritime activities
	Ecological objectives	Clear water
Marine strategy framework directive (MSFD)	Descriptors	D5 Eutrophication D7 Hydrographical changes
	Criteria (Q5a)	5.2 Direct effects of nutrient enrichment
	Features (Q5c)	Physical and chemical features: Annual and seasonal temperature regime and ice cover, current velocity, upwelling, wave exposure, mixing characteristics, turbidity, residence time. Spatial and temporal distribution of salinity. Habitat types: The predominant (seabed and) water column habitat type(s) with a description of the characteristic physical and chemical features, such as depth, water temperature regime, currents and other water movements, salinity, (structure and substrata composition of the seabed). Other features: A description of any other features or characteristics typical of or specific to the marine region or subregion.
Other relevant legislation (Q8a)	Habitats Directive	

Assessment of: (Q4k)		
State/Impacts	X	temporal trends, spatial distribution, status classification
Pressures		
Human activities causing the pressures		
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)	
HELCOM assessment unit Level 1: Baltic Sea	
HELCOM assessment unit Level 2: Subbasin	
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	X
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	

MONITORING CONCEPTS

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
Regional COMBINE	Physical oceanography: Temperature	Temperature	in situ (HELCOM COMBINE manual, Annex C-2 Chapter 4)	National, ICESDataType Guide, HELCOM COMBINE manual, Part B Annex B8, Appendix 1 and MyOcean NRT methods.	See map for details	COMBINE Stations, see map for details	-	-	EEZ	Data available since 1877, coordinated monitoring started in 1979	All HELCOM Contracting Parties
Regional COMBINE	Physical oceanography: Salinity	Salinity	in situ (HELCOM COMBINE manual, Annex C-2 Chapter 4)	National, ICESDataType Guide, HELCOM COMBINE manual, Part B Annex B8, Appendix 1 and MyOcean NRT methods.	see map for details	COMBINE Stations, see map for details	-	-	EEZ	Data available since 1877, coordinated monitoring started in 1979	All HELCOM Contracting Parties
Regional COMBINE	Physical oceanography - water transparency, using Secchi depth as proxy	Transparency of water column	in situ (HELCOM COMBINE manual, Annex C-2 Chapter 4)	National, ICESDataType Guide. HELCOM COMBINE manual, Part B Annex B2	see map for details	COMBINE stations (see map for details) and WFD stations, where not identical	Secchi depth (summer)	5.2.2 Water transparency related to increase in suspended algae	EEZ	Coordinated monitoring started 1979.	All HELCOM Contracting Parties
Regional COMBINE	Physical oceanography: Turbidity	Transparency of water column	in situ (HELCOM COMBINE manual, Annex C-2 Chapter 4)	National, ICESDataType Guide, HELCOM COMBINE manual, Part B Annex B2 and Annex B3	Variable	Coastal stations		5.2.2 Water transparency related to increase in suspended algae		DE: 2006 DK: 2010 SE: 2010 FI: 1985	DE, DK, FI, SE
National	Physical oceanography: Temperature (satellites)	Temperature (Satellites)	-	National	Daily	Whole Baltic Sea	-	-	EEZ	1999	FI
Coordination via Alg@line	Physical oceanography: Temperature and salinity (Alg@line)	Temperature ad salinity (Alg@line)	-	National and MyOcean NRT methods.	Continous	Ship routes	-	-	EEZ	2002	FI, EE
National	Physical oceanography: Secchi (satellites)	Secchi (Satellites)	-	National	Daily	Whole Baltic Sea	-	-	EEZ	2014	FI
National	Physical oceanography: Turbidity (satellites)	Turbidity (Satellites)	-	National	Daily	Whole Baltic Sea	-	-	EEZ	2020	FI

Brief description of monitoring

Full description in HELCOM COMBINE manual. Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Parameter	Temperature
Method	Measured in situ in the water column from boat. Mode of sampling: CTD, reverse thermometers or other, fixed station (stations listed in Annex C-1 in the HELCOM COMBINE manual). In Finland, temperature measurements are supported by satellite measurements and Alg@line measurements.
QA/QC	The quality system is formalized in the COMBINE manual (Part B Annex B2 in the HELCOM COMBINE manual). Guidance on the interpretation of ISO/IEC/EN 17025 'General Requirements for the Competence of Testing and Calibration of Laboratories' (formerly EN 45001 and ISO Guide 25) was given by a joint international EURACHEM/WELAC Working Group (EURACHEM/WELAC, 1992). Specific guidance to Analytical Quality Control for Water Analysis was elaborated by European - CEN/TC 230 (EN 14996) - as well as by international - ISO/TC 147 SC 7 (ISO/TR 13530) - standardisation authorities. The analytical requirements are specified, including definition of the type and nature of the sample and its environment, concentration range of interest and permissible tolerances in analytical error (Part B Annex B3 in the HELCOM COMBINE manual).
Frequency	Temperature should be measured always as a supporting parameter. Satellite measurements are made daily and Alg@line measurements are continuous during the 10-30 ship trip per year.
Spatial Scope	Covers whole Baltic from coast to EEZ relation to MDFD Descriptor 5, Eutrophication.
Spatial resolution	In situ samples are taken on COMBINE stations (listed in Annex C-1 of the HELCOM COMBINE manual). See map for details

Parameter	Salinity
Method	Measured in situ or in collected samples in the water column from boat. Mode of sampling: CTD, discrete water samples from rosette sampler, reversing bottles or other, fixed station (stations listed in Annex C-1 in the HELCOM COMBINE manual). In Finland, salinity measurements are supported by Alg@line measurements.
QA/QC	The quality system is formalized in the COMBINE manual (Part B Annex B2 in the HELCOM COMBINE manual). Guidance on the interpretation of ISO/IEC/EN 17025 'General Requirements for the Competence of Testing and Calibration of Laboratories' (formerly EN 45001 and ISO Guide 25) was given by a joint international EURACHEM/WELAC Working Group (EURACHEM/WELAC, 1992). Specific guidance to Analytical Quality Control for Water Analysis was elaborated by European - CEN/TC 230 (EN 14996) - as well as by international - ISO/TC 147 SC 7 (ISO/TR 13530) - standardisation authorities. The analytical requirements are specified, including definition of the type and nature of the sample and its environment, concentration range of interest and permissible tolerances in analytical error (Part B Annex B3 in the HELCOM COMBINE manual).
Frequency	Salinity should be measured always as a supporting parameter. Alg@line measurements are continuous during the 10-30 ship trip per year.
Spatial Scope	Covers whole Baltic from coast to EEZ relation to MDFD Descriptor 5, Eutrophication.
Spatial resolution	In situ samples are taken on COMBINE stations (listed in Annex C-1 of the HELCOM COMBINE manual). See map for details.

Parameter	Secchi-depth/Transparency of the water column
Method	Measured in situ in the water column from boat. Mode of sampling: CTD or other, fixed station (stations listed in Annex C-1 in the HELCOM COMBINE manual). In Finland, Secchi measurements are supported by satellite measurements.
QA/QC	The quality system is formalized in the COMBINE manual (Part B Annex B2 in the HELCOM COMBINE manual). Guidance on the interpretation of ISO/IEC/EN 17025 'General Requirements for the Competence of Testing and Calibration of Laboratories' (formerly EN 45001 and ISO Guide 25) was given by a joint international EURACHEM/WELAC Working Group (EURACHEM/WELAC, 1992). Specific guidance to Analytical Quality Control for Water Analysis was elaborated by European - CEN/TC 230 (EN 14996) - as well as by international - ISO/TC 147 SC 7 (ISO/TR 13530) - standardisation authorities.
Frequency	For assessment purposes, measurement should be made at least during the summer period (June – September). Secchi depth should be measured at all stations whenever possible, i.e. in day light and when the sea is relatively calm. Light attenuation shall always be measured if primary production measurements are performed (HELCOM COMBINE manual). Satellite measurements are made daily
Spatial Scope	Covers whole Baltic from coast to EEZ relation to MDFD Descriptor 5, Eutrophication.
Spatial resolution	In situ samples are taken on COMBINE stations (listed in Annex C-1 of the HELCOM COMBINE manual). See Figures 3-4 for station network and data mapped to Station dictionary. See map for details.

Parameter	Turbidity/Transparency of the water column

Method	Measured in situ or in collected samples in the water column from boat. Mode of sampling: CTD, discrete water samples from rosette, reversing samplers, turbidimeter or other, fixed station (stations listed in Annex C-1 in the HELCOM COMBINE manual).
QA/QC	The quality system is formalized in the COMBINE manual (Part B Annex B2 in the HELCOM COMBINE manual). Guidance on the interpretation of ISO/IEC/EN 17025 'General Requirements for the Competence of Testing and Calibration of Laboratories' (formerly EN 45001 and ISO Guide 25) was given by a joint international EURACHEM/WELAC Working Group (EURACHEM/WELAC, 1992). Specific guidance to Analytical Quality Control for Water Analysis was elaborated by European - CEN/TC 230 (EN 14996) - as well as by international - ISO/TC 147 SC 7 (ISO/TR 13530) - standardisation authorities. The analytical requirements are specified, including definition of the type and nature of the sample and its environment, concentration range of interest and permissible tolerances in analytical error (Part B Annex B3 in the HELCOM COMBINE manual).
Frequency	In coastal waters turbidity sampling depends on the station, but satellite measurements are made daily
Spatial Scope	Covers coastal waters.
Spatial resolution	Turbidity is analyzed in situ only in coastal stations in Finland, but satellite measurements are made for the entire sea area.

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	Open sea: For assessment purposes, at least 15 observations for a high confidence assessment (see BSEP 143) during the period June-September made yearly in each assessment unit. The compilation of observations is expected to be distributed spatially within the assessment unit in a non-biased way. Coastal areas (between shore and baseline + 1 nm): For an assessment of the coastal water bodies (= WFD water bodies), less than 15 observations per year may be available for the period May(June)-September due to a limited number of stations per assessment unit (=water body). In Germany, measurements of temperature, salinity and transparency (secchi depth) are carried out at each station 5-10 times p.a. depending on station and area (less frequently in the open sea – 5 to max. 10 times p.a., more often in the coastal areas where a monthly frequency (12 times p.a.) is attempted, but 10 times is realistic due to bad weather conditions etc.). In national assessments of transparency, we have used the summer months (May-September) up to now.
Gaps	Secchi-depth: Existing coordinated monitoring programme (HELCOM COMBINE manual) does not provide sufficient temporal coverage to achieve high confidence in the core indicator status estimate (BSEP 143).

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	Yes
Established methods for assessment?	Yes
Adequate understanding of GES?	Yes
Adequate capacity to perform assessments?	Yes

Assessment of natural variability (Q5e)

Quantitative.

DATA PROVIDERS AND ACCESS

Data access point	HELCOM, ICES Database
Data type (Q10c)	Processed Data sets
Data availability (Q10c)	ICES Database

Data access (Q10c)	Open access for environmental data (covered by ICES data policy)
INSPIRE standard (Q10c)	
When will data become available? (Q10c)	The data currently available is from 2011/2012 and before, the 2013 data will be reported in May 2014 and become available by November 2014.
Data update frequency (Q10c)	Yearly
Describe how the data and information from the programme will be made accessible to the EC/EEA	The data is open access and available to the EEA though HELCOM and ICES Web access points
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	Yes
Data is used in the following Baltic Sea Environment Fact Sheets (BSEF)	Developmentof Sea Surface Temperature in the Baltic Sea Hydrography and Oxygen in deep basins Water Exchange between the Baltic Sea and the NorthSea, and conditions in the Deep Basins

REFERENCES

Grasshoff, K. 1976. Methods of seawater analysis. Verlag Chemie, Weinheim, New York.

Grasshoff, K., Ehrhardt, M., and Kremling, K. (Eds.) 1983. Methods of sea water analysis. Verlag Chemie, Weinheim.

HELCOM COMBINE manual

HELCOM, 1988. HELCOM BSEP 27D. Guidelines for the Baltic Monitoring Programme for the Third Stage. Part D. Biological Determinands.

ISO/IEC/EN 17025 Requirements for the Competence of Testing and Calibration of Laboratories

CEN/TC 230 European Committee of Standarization. Water analysis

Monitoring programme: Biodiversity - Water column habitats, Eutrophication, Hydrographical changes
Programme topic: Hydrography

SUB-PROGRAMME: WATER COLUMN PHYSICAL CHARACTERISTICS

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **Partly coordinated** between the national operational oceanographic institutes (within BOOS/ Copernicus marine service).

- Common monitoring guidelines: national operational oceanographic institutes.
- Common quality assurance programme: national operational oceanographic institutes.
- Common database: missing

Fully coordinated program will be developed and implemented in 2015 by Copernicus marine service and its in-situ component

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Eutrophiction Biodiversity Maritime activities
	Ecological objectives	Natural distribution and occurrence of plants and animals Natural oxygen levels Natural landscapes and seascapes Safe maritime traffic without accidental pollution
Marine strategy framework directive (MSFD)	Descriptors	D1 Biodiversity D5 Eutrophication D7 Hydrographical changes D11 Energy, including underwater noise
	Criteria (Q5a)	1.4 Habitat distribution 1.5 Habitat exten 1.6 Habitat condition 6.1. Physical damage, having regard to substrate characteristics 7.1. Spatial characterisation of permanent alterations 7.2. Impact of permanent hydrographical changes
	Features (Q5c)	Physical and chemical features: Annual and seasonal temperature regime and ice cover, current velocity, upwelling, wave exposure, mixing characteristics, turbidity, residence time Habitat types : The predominant seabed and water column habitat type(s) with a description of the characteristic physical and chemical features, such as depth, water temperature regime, currents and other water movements, salinity, structure and substrata composition of the seabed .
	Pressures and impacts (Q5c)	Physical loss: Sealing (e.g. by permanent constructions).

	Activities (Q7a, Q7b)	Man-made structures: land claim Man-made structures: Port Man-made structures: Offshore structures
Other relevant legislation (Q8a)	Habitats Directive WFD	

Assessment of: (Q4K)

State/Impacts	X	Temporal trends Spatial distribution State classification
Pressures	X	
Human activities causing the pressures	x	
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)

HELCOM assessment unit Level 1: Baltic Sea	x
HELCOM assessment unit Level 2: Subbasin	x
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	**X**
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	x

MONITORING CONCEPTS

Coordination	**Elements** Q9a (Q5c)	**Parameter** Q9a (Q5c)	**Method** Q9c, Q9d	**QA/QC** Q9e, 9f	**Frequency** Q9h, 9i	**Spatial resolution** Q9g, 9i	**Link to HELCOM core indicators**	**Link to MSFD GES characteristics** Q5b	**Spatial scope** Q4i	**Monitoring started** Q4h	**CPs monitoring**
Other	Waves	Wave action	Wave buoys, numerical modelling (WAM, SWAN)	Other	Continually	1-2 stations per sub-basin	-	-	EEZ	2001	DE, EE, FI, SE
Other	Currents	Current velocity	Current meters, numerical modelling (HIROMB, HBM, NEMO)	Other	Continually	1-2 stations in connectinmg straits	-	-	EEZ	2001	DE, DK, SE
Other	Seal level	Other parameter	Tide gauges, numerical modelling (HIROMB, HBM, NEMO)	Other	Continually	5-6 stations per sub-basin	-	-	WFD CW	2001	All HELCOM Contracting Parties
National	Physical oceanography	Sea level	Tide gauge, observe	National	Depends on a station type and sensor type (10 min. …. 1 per day)	Hydrological stations	-	-	Coastal Waters		PL
National	Physical oceanography	Sea level	Automatic measurements	National	Continous	12 devices	-	-	Coastal Waters	1887	FI
National	Physical oceanography	Wave height	Automatic measurements	National	Continous	4 buoys	-	-	EEZ	1973	FI

Brief description of monitoring

Full description in HELCOM COMBINE manual. Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	**Physical oceanography / Sea level**
Method	Measured by mareographs on the shore
QA/QC	The first check is automatic and the second step is manual. Service to the device is made regularly.
Frequency	Continuous measurements.
Spatial Scope	Along the coastline.
Spatial resolution	12 mareograph devices along the Finnish coastline.

Element / parameter	Physical oceanography / Waves
Method	Measured by buoys in open sea areas. In Finland one buoy per sub-basin.
QA/QC	The first check is automatic and the second step is manual. Service to buoys is made regularly.
Frequency	Continuous measurements.
Spatial Scope	Gulf of Finland, Northern Baltic Proper, Bothnian Sea, Bothnian Bay.
Spatial resolution	4 buoys

Element / parameter	Waves/ Significant wave height, period and direction
Method	Wave measurements using wave buoys. Modelling of wave characteristics using numerival models (WAM; SWAN).
QA/QC	Routines of institutes
Frequency	Period and direction – continuous (statistical parameters with a time step 1 hour)
Spatial Scope	Period and direction – whole Baltic Sea, can be used also for sub-basins.
Spatial resolution	Period and direction; numerical modelling – 3 nm. For observation see Waves Baltic Sea Environmental Fact Sheet.

Element / parameter	Currents/ Current speed and direction
Method	Current measurements using moored current meters. Circulation modelling using 3D numerical models (HIROMB, HBM, NEMO)
QA/QC	Described in MyOcean publication: Quality information document for near real time in situ products.
Frequency	Continuous, time step 1 hour
Spatial Scope	Whole Baltic Sea, can be used also for sub-basins.
Spatial resolution	Period and direction; numerical modelling – 1 nm. For observation see EMODNET map service.

Element / parameter	Sea level/ Height
Method	Automatic measurements of sea level by tide gauges (mainly based on pressure measurements). Circulation modelling using 3D numerical models (HIROMB, HBM, NEMO)
QA/QC	Described in MyOcean publication: Quality information document for near real time in situ products.
Frequency	Time step 15 minutes (1 hour)
Spatial Scope	Whole Baltic Sea, can be used also for sub-basins.
Spatial resolution	Numerical modelling 1 nm. For observation BOOS seal level stations.

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	Monitoring of waves, currents and sea level has to be conducted in relevant spatial and temporal resolution, e.g. coastal sealevel stations (tide gauges) are placed at an appropriate distance from each other in all Baltic sub-basins, wave buoys – at least 1-2 buoys in each Baltic sub-basin, current measurements, at least in the sea areas connecting the Baltic Sea and North Sea as well as different Baltic Sea sub-basins. Numerical models are used for all listed parameters to be able to assess the spatial distribution and temporal trends at the Baltic Sea and its sub-basin scales. Monitoring (and modelling) is conducted in the frames of BOOS and Copernicus marine service provision (at the moment via MyOcean project; starting from April 2015 as a permanent service).
Gaps	Waves monitoring gives a reliable overview of the parameters but it does not cover all sub-basins (Gulf of Riga) or parts of them (Baltic Proper); currents monitoring is done mostly in the southwestern Baltic Sea. Good temporal and spatial coverage in Poland coastal waters. There was proposed to set up 1 (one) new station.

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	Yes
Established methods for assessment?	Yes
Adequate understanding of GES?	Irrelevant
Adequate capacity to perform assessments?	Yes

Assessment of natural variability (Q5e)

Quantitative. Numerical modelling is used, e.g. reanalysis for long enough periods (40 years, see MyOcean products).

DATA PROVIDERS AND ACCESS

Data access point	BOOS, Copernicus marine service (MyOcean) Finnish data is open and accessible (In Finnish). For Polish data: Institute of Meteorology and Water Management (IMGW)
Data type (Q10c)	Processed Modelled data
Data availability (Q10c)	EMODnet Finnish data is open and accessible (In Finnish). For Poland: IMGW database
Data access (Q10c)	Open access. Free and open in Finland. In Poland it is restricted, it depends on purpose and users.
INSPIRE standard (Q10c)	Hydrography
When will data become available? (Q10c)	Already available in Finland and Poland
Data update frequency (Q10c)	Depends on measurement method / device
Describe how the data and information from the programmewill be made accessible to the EC/EEA	In-situ data is available via EMODnet Physics portal; modelled data is available via MyOcean portal (Copernicus marine service in the future)
Contact points in the Contracting Parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	Yes
Data is used in the following Baltic Sea Environment Fact Sheets (BSEF)	Wave climate in the Baltic Sea

REFERENCES

Monitoring programme: Biodiversity - Water column habitats, Eutrophication, Hydrographical changes
Programme topic: Hydrography

SUB-PROGRAMME: ICE

TABLE OF CONTENTS

REGIONAL COORDINATION

The monitoring of this sub-programme is: **Partly coordinated.** See International Ice Chart Working Group (IICWG), UN Expert Team on Sea Ice (ETSI) and Baltic Sea Ice Service.

- Common monitoring guidelines: monitoring of the whole Baltic Sea using satellite observations.
- Common quality assurance programme: missing. Every country has its own and quality assurance tools.
- Common database: missing. Every country has its own databases.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Maritime activities
	Ecological objectives	Safe maritime traffic without accidental pollution
Marine strategy framework directive (MSFD)	Descriptors	D1 Biodiversity D7 Hydrographical changes
	Criteria (Q5a)	1.4 Habitat distribution 1.5 Habitat extent
	Features (Q5c)	Physical and chemical features: Annual and seasonal temperature regime and ice cover, current velocity, upwelling, wave exposure, mixing characteristics, turbidity, residence time Biological features: The predominant seabed and water column habitat type(s) with a description of the characteristic physical and chemical features, such as depth, water temperature regime, currents and other water movements, salinity, structure and substrata composition of the seabed. Other features: A description of any other features or characteristics typical of or specific to the marine region or subregion

Assessment of: (Q4k)

State/Impacts	X	temporal trends, spatial distribution
Pressures		
Human activities causing the pressures		
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)

HELCOM assessment unit Level 1: Baltic Sea	X
HELCOM assessment unit Level 2: Subbasin	
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	

MONITORING CONCEPTS

Coordination	Elements Q9a (Q5c)	Parameter Q9b	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q 9g, 9i	Link to HELCOM core indicators	Link to GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
Other	Extent of ice cover	Other parameter	See below	National	Daily	Synthetic-aperture radar (SAR) data - resolution 100 m, other satellite 250 m – 1 km	-	-	EEZ	Systematic observations: late 1800's First near-realtime ice charts: 1915	All Contracting Parties monitoring but only FI and SE the whole sea
Other	Ice thickness	Other parameter	See below	National	Daily	Synthetic-aperture radar (SAR) data - resolution 100 m, other satellite 250 m – 1 km	-	-	EEZ	1915	All Contracting Parties monitoring but only FI and SE the whole sea

Brief description of monitoring

Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	Extent of ice cover
Method	Extent of ice cover is measured using satellite observations. The whole Baltic is monitored by Finland (FMI) and Sweden (SMHI). The rest of Contracting Parties monitor national waters. Synthetic-aperture radar (SAR) satellite image is used. The algorithm, which combines SAR data and ground truth, provides ice thickness information in 500 m resolution. The products are provided operationally and are available for users shortly after the SAR data is available.
QA/QC	It follows nationally accredited methods and results are compared internationally.
Frequency	Extent of ice cover maps operationally produced every time a SAR image has been received.
Spatial Scope	Whole Baltic Sea.
Spatial resolution	The algorithm, which combines SAR data and ground truth, provides ice coverage information in 500 m resolution.

Element / parameter	Ice thickness
Method	Ice thickness is measured using satellite observations and in-situ measurements. The whole Baltic is monitored by Finland (FMI) and Sweden (SMHI). The rest of Contracting Parties monitor national waters. Synthetic-aperture radar (SAR) satellite image is used. The algorithm, which combines SAR data and ground truth, provides ice thickness information in 500 m resolution. The products are provided operationally and are available for users shortly after the SAR data is available.
QA/QC	It follows nationally accredited methods and results are compared internationally.
Frequency	Ice Thickness Charts are operationally produced every time a SAR image has been received, using the latest available ice chart as an input.
Spatial Scope	Whole Baltic Sea.
Spatial resolution	The algorithm, which combines SAR data and ground truth, provides ice thickness information in 500 m resolution.

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	To produce a comprehensive overview for the HELCOM Environment fact sheet Ice Season: Maximum extent of sea ice in the Baltic should be monitored with Baltic wide comprehensive earth observations (Synthetic-aperture radar (SAR)) during winter season. Temporal frequency of observations should be at least once a week. Spatial coverage should be the whole Baltic Sea and resolution 1 km. Sea ice thickness in the Baltic Sea should be monitored with earth observation data combined with in-situ measurements of ice thickness.
Gaps	There are no gaps, the monitoring covers the whole Baltic Sea with sufficient spatial and temporal resolution.

Adequacy for assessment of GES (Q5d)

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

Adequate data?	Yes
Established methods for assessment?	Yes
Adequate understanding of GES?	Yes
Adequate capacity to perform assessments?	Yes

Assessment of natural variability (Q5e)

Expert opinion.

DATA PROVIDERS AND ACCESS

Data access point	National databases
Data type (Q10c)	Data products Modelled data
Data availability (Q10c)	Data: SAR-Based Ice Thickness Charts from Finnish Meteorological Institute and Ice Conditions from Finnish Meteorological Institute. Aggregated data products: annual HELCOM environment fact sheet and MyOcean catalogue.
Data access (Q10c)	Open access
INSPIRE standard (Q10c)	
When will data become available? (Q10c)	
Data update frequency (Q10c)	Weekly, Yearly
Describe how the data and information from the programme will be made accessible to the EC/EEA	Weekly update cycle of operational data, annual HELCOM environment fact sheet assessment.
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Data is used in the following Baltic Sea Environment Fact Sheets (BSEF)	Ice season

REFERENCES

FMI Polar View Products

SMHI Polar View Products

MyOcean catalogue.

HYDROCHEMISTRY

GENERAL INFORMATION

The monitoring of hydrochemistry covers concentrations of nutrients as well as dissolved oxygen, pH and H_2S. The programme covers parts of the HELCOM core indicators for eutrophication. The relevant ecosystem component is spatial and temporal distribution of nutrients.

Sub-programme: Nutrients

The HELCOM monitoring data on nutrients covers DIN (Dissolved Inorganic Nitrogen, ammonium (NH_4-N), nitrate (NO_3-N), nitrite (NO_2-N)), total nitrogen (N), DIP (Dissolved inorganic phosphorus, phosphate (PO_4-P)) and total phosphorus (P). The geographical scope is the whole Baltic Sea.

HELCOM core indicators linked to the sub-programme are 'Concentrations of dissolved inorganic nitrogen (winter)' and 'Concentrations of dissolved inorganic phosphorus (winter)'.

Sub-programme: Water column chemical characteristics

The HELCOM monitoring data covers dissolved oxygen, pH and H_2S. The relevant HELCOM core indicator is 'Deep bottom oxygen debt'.

RESPONSIBLE HELCOM SUBSIDIARY BODIES

HELCOM STATE*

Contact information: HELCOM Secretariat

*Tentative name

SUB-PROGRAMMES

Monitoring programme: Eutrophication, Biodiversity - Water column habitats
Programme topic: Hydrochemistry

SUB-PROGRAMME: NUTRIENTS

TABLE OF CONTENTS

REGIONAL COORDINATION

The monitoring of this sub-programme is: **Fully coordinated**

- Common monitoring guideline: HELCOM COMBINE manual.
- Common quality assurance programme: HELCOM COMBINE manual.
- Common database: ICES.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Eutrophication
	Ecological objectives	Concentrations of nutrients close to natural levels
Marine strategy framework directive (MSFD)	Descriptors	D5 Eutrophication
	Criteria (Q5a)	5.1 Nutrients levels
	Features (Q5c)	Physical and chemical features: Spatial and temporal distribution of nutrients (DIN, TN, DIP, TP, TOC) and oxygen.
Other relevant legislation (Q8a)	Nitrates Directive Water Framework Directive	

Assessment of: (Q4k)

State/Impacts	X	temporal trends, status classification
Pressures		
Human activities causing the pressures		
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)

HELCOM assessment unit Level 1: Baltic Sea	
HELCOM assessment unit Level 2: Subbasin	
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	X

MONITORING CONCEPTS

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
Regional (COMBINE)	DIN: NH_4 in situ	Concentration of chemical/nutrient/pollutant in water column	Fixed station in situ (HELCOM COMBINE manual, annex C-2, Chapter 4.5)	ICESData TypeGuide	See map for details	See map for details	Concentrations of dissolved inorganic nitrogen (winter)	5.1.1 Nutrient concentrations in the water column 5.1.2 Nutrient rations	EEZ	Data available from 1957, Coordinated COMBINE monitoring started 1965	All HELCOM Contracting Parties
Regional (COMBINE)	Tot-N in situ	Concentration of chemical/nutrient/pollutant in water column	Fixed station in situ (HELCOM COMBINE manual, annex C-2, Chapter 4.5)	ICESData TypeGuide	See map for details	See map for details	None at the time but considered in EUTRO-OPER	5.1.1 Nutrient concentrations in the water column 5.1.2 Nutrient ratios	EEZ	Data available from 1966, Coordinated COMBINE monitoring started 19XX	All HELCOM Contracting Parties
Regional (COMBINE)	DIN: NO_3-N in situ	Concentration of chemical/nutrient/pollutant in water column	Fixed station in situ (HELCOM COMBINE manual, annex C-2, Chapter 4.5)	ICESData TypeGuide	See map for details (NOTE: NO_3-NO_2 map)	See map for details (NOTE: NO_3-NO2 map)	Concentrations of dissolved inorganic nitrogen (winter)	5.1.1 Nutrient concentrations in the water column 5.1.2 Nutrient ratios	EEZ	Data available from 1955, Coordinated COMBINE monitoring started 1979	All HELCOM Contracting Parties
Regional (COMBINE)	DIN: NO_2-N in situ	Concentration of chemical/nutrient/pollutant in water column	Fixed station in situ (HELCOM COMBINE manual, annex C-2, Chapter 4.5)	ICESData TypeGuide	See map for details	See map for details	Concentrations of dissolved inorganic nitrogen (winter)	5.1.1 Nutrient concentrations in the water column 5.1.2 Nutrient ratios	EEZ	Data available from 1928, Coordinated COMBINE monitoring started 1979	All HELCOM Contracting Parties
Regional (COMBINE)	Tot-P in situ	Concentration of chemical/nutrient/pollutant in water column	Fixed station in situ (HELCOM COMBINE manual, annex C-2, Chapter 4.5)	ICESData TypeGuide	See map for details	See map for details	None at the moment. Considered by EUTRO-OPER.	5.1.1 Nutrient concentrations in the water column 5.1.2 Nutrient ratios	EEZ	Data available from 1966, Coordinated COMBINE monitoring started 1979	All HELCOM Contracting Parties
Other	DIN: NO_2+NO_3-N - SoO in situ	Concentration of chemical/nutrient/pollutant in water column	Ship-of-opportunity in situ. HELCOM COMBINE manual	HELCOM COMBINE manual and other QA/QC systems	Monthly / weekly		Concentrations of dissolved inorganic nitrogen (winter)	5.1.1 Nutrient concentrations in the water column 5.1.2 Nutrient ratios	EEZ	1999	FI, SE, EE
Other	DIP: PO_4-P - SoO in situ	Concentration of chemical/nutrient/pollutant in water column	Ship-of-opportunity in situ. HELCOM COMBINE manual	HELCOM COMBINE manual and other QA/QC systems	Monthly / weekly		Concentrations of dissolved inorganic phosphorus (winter)	5.1.1 Nutrient concentrations in the water column 5.1.2 Nutrient ratios	EEZ	1999	FI, SE, EE

Brief description of monitoring

Full description in HELCOM COMBINE manual. Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	Nutrients in situ/ Concentration of nutrient in water column

Method	Platform: boat Mode of sampling: fixed station (stations listed in Annex C-1 in the HELCOM COMBINE manual). Sampling details, depth: The depths at which sampling should take place are as follows (in metres): 1, 5, 10, 15, 20, 25 (obligatory in the Kattegat and the Belt Sea), 30, 40, 50, 60, 70, 80, 100, 125, 150, 175, 200, 225, 250, 300, and 400 metres, and as close to the bottom as possible (preferably less than 1 metre from the sediment surface to get near bottom oxygen concentration). For unstratified water less than 10m depth, samples will be taken from 1m or an integrated sample is taken. The regional conditions and circumstances have to be considered, when choosing the sampling depth. In EE 1, 5, 10 m and in the near bottom layer Sampling details, replicas: At least two samples should be collected. Method sampling: Samples are collected using a CTD system which is attached to a rosette sampler or a cast of reversing water samplers (e.g., Niskin or Nansen bottles) equipped with reversing thermometers. Method of sample analysis: The determination of nutrients is based on colorimetric methods (c.f. Grasshoff et al., 1983, Kirkwood, 1996).
QA/QC	The quality system is formalized in the quality manual (Part B Annex B2 in the HELCOM COMBINE manual). Guidance on the interpretation of ISO/IEC/EN 17025 'General Requirements for the Competence of Testing and Calibration of Laboratories' (formerly EN 45001 and ISO Guide 25) was given by a joint international EURACHEM/WELAC Working Group (EURACHEM/WELAC, 1992). Specific guidance to Analytical Quality Control for Water Analysis was elaborated by European - CEN/TC 230 (EN 14996) - as well as by international - ISO/TC 147 SC 7 (ISO/TR 13530) - standardisation authorities. The analytical requirements are specified, including definition of the type and nature of the sample and its environment, concentration range of interest and permissible tolerances in analytical error (Part B Annex B3 in the HELCOM COMBINE manual). It has been established, by laboratory studies, that the performance characteristics (selectivity, sensitivity, range, limit of detection and accuracy) of the method meet the specifications related to the intended use of the analytical results (Part B Annex B4 in the HELCOM COMBINE manual). According to international standard, e.g. ISO 17025, a defined analytical quality has been achieved, maintained, and proven by documentation. The establishment of a system of control charts is a basic principle applied in this context. For further information for control charts refer to ISO/TR 13530 (1997). (Part B Annex B5 in the HELCOM COMBINE manual) The comparability of the data has been ensured through an external quality assessment, such as participation in external quality schemes, ring text and/ or use of external experts (Part B Annex B6 in the HELCOM COMBINE manual).
Frequency	For assessment purposes, measurements should be made at least during the winter period (December-February) Mapping the winter pool of nutrients should be done a few times per year at set stations. High frequency cruise station sampling should be done >12 times per year (basically monthly sampling but weekly in the vegetative period) for d N and P. Ship-of-opportunity sampling frequency should be about every 200 m, and nutrients about every 10 km and every 1 - 3 weeks. For ships-of-opportunity and helicopter sampling a single sample from the mixed surface layer can be taken.
Spatial Scope	Relation to D5 (eutrophication). Nutrients are measured in all HELCOM subbasins in the Baltic.
Spatial resolution	See map for details

Element / parameter	**Nutrients Ship of opportunity / Concentration of nutrient in water column**
Method	See HELCOM COMBINE manual. Platform: boat (Ship-of-opportunity) Mode of sampling: Sampling is done en route, at fixed longitudes. Sampling details, depth: Sampling is done at appr. 5 m depth, and represents the mixed surface layer. Sampling details, replicas: At least two samples should be taken. Method sampling: Water is continuously pumped through a system, taking water samples according to programming (Ferrybox sampling programme). The samples are stored in a dark refrigerator for max. 2 days. Method of sample analysis: The determination of nutrients is based on colorimetric methods (c.f. Grasshoff et al., 1983, Kirkwood, 1996).

QA/QC	The quality system is formalized in the quality manual (Part B Annex B2 in the HELCOM COMBINE manual). Guidance on the interpretation of ISO/IEC/EN 17025 'General Requirements for the Competence of Testing and Calibration of Laboratories' (formerly EN 45001 and ISO Guide 25) was given by a joint international EURACHEM/WELAC Working Group (EURACHEM/WELAC, 1992). Specific guidance to Analytical Quality Control for Water Analysis was elaborated by European - CEN/TC 230 (EN 14996) - as well as by international - ISO/TC 147 SC 7 (ISO/TR 13530) - standardisation authorities. The analytical requirements are specified, including definition of the type and nature of the sample and its environment, concentration range of interest and permissible tolerances in analytical error (Part B Annex B3 in the HELCOM COMBINE manual). It has been established, by laboratory studies, that the performance characteristics (selectivity, sensitivity, range, limit of detection and accuracy) of the method meet the specifications related to the intended use of the analytical results (Part B Annex B4 in the HELCOM COMBINE manual). According to international standard, e.g. ISO 17025, a defined analytical quality has been achieved, maintained, and proven by documentation. The establishment of a system of control charts is a basic principle applied in this context. For further information for control charts refer to ISO/TR 13530 (1997). (Part B Annex B5 in the HELCOM COMBINE manual) The comparability of the data has been ensured through an external quality assessment, such as participation in external quality schemes, ring text and/ or use of external experts (Part B Annex B6 in the HELCOM COMBINE manual).
Frequency	Sampling is done between March – December, during the ice-free season. Samples are taken biweekly / monthly.
Spatial Scope	All sub-basins.
Spatial resolution	Some tens of samples along the ship routes.

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	For assessment purposes, at least 15 observations should be conducted during the period December-February made every winter in each assessment unit. The compilation of observations is expected to be distributed spatially within the assessment unit in a non-biased way.
Gaps	Existing coordinated monitoring programme (HELCOM COMBINE manual) does not provide sufficient temporal coverage to achieve high confidence in the core indicator status estimate (BSEP143) during the assessment season.

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	Yes
Established methods for assessment?	Yes
Adequate understanding of GES?	Yes
Adequate capacity to perform assessments?	Yes

Assessment of natural variability (Q5e)

Quantitative.

DATA PROVIDERS AND ACCESS

Data access point	HELCOM, ICES database, Algabase
Data type (Q10c)	Processed Data sets
Data availability (Q10c)	ICES database. To be specified for Ferrybox-data
Data access (Q10c)	Open access to data covered by ICES data policy
INSPIRE standard (Q10c)	
When will data become available? (Q10c)	The data currently available is from 2011/2012 and before, the 2013 data is reported in May 2014 and will become available by November 2014.
Data update frequency (Q10c)	Yearly
Describe how the data and information from the programme will be made accessible to the EC/EEA	Through HELCOM web portal/via ICES
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Data is used in the following Baltic Sea Environment Fact Sheets (BSEF)	
Has the data been used in HELCOM assessments?	Yes, e.g. BSEP143 Eutrophication status of the Baltic Sea 2007-2011 - A concise thematic assessment.

REFERENCES

Edler, L., 1979. Recommendations for marine biological studies in the Baltic Sea: Phytoplankton and chlorophyll. Working Group 9, The Baltic Marine Biologists, publication No. 5, 38 pp.

Grasshoff, K. 1975. The hydrochemistry of landlocked basins and fjords. In Chemical Oceanography, 2nd edition, part 2. Ed. by J.P. Riley and G. Skirrow. Academic Press, London.

Grasshoff, K. 1976. Methods of seawater analysis. Verlag Chemie, Weinheim, New York.

Grasshoff, K., Ehrhardt, M., and Kremling, K. (Eds.) 1983. Methods of sea water analysis. Verlag Chemie, Weinheim.

HELCOM COMBINE manual

HELCOM, 1988. Guidelines for the Baltic Monitoring Programme for the Third Stage. Part D. Biological Determinands.

Ichinose, N. et al. 1984. A problem in the spectrophotometric determination of dissolved total phosphorus in brackish anoxic waters. Analytica Chimica Acta, 156: 345-349.

Jeffrey, S.W., Mantoura, R.F.C., Wright, S.W., 1997. Phytoplankton pigments in oceanography: guidelines to modern methods. UNESCO Publishing, Paris, 661 pp.

Kirkwood, D. 1994. Nutrients: Practical notes on their determination in seawater. In ICES/HELCOM Workshop on Quality Assurance of Chemical Analytical Procedures for the Baltic Monitoring Programme. Ed. by G. Topping and U. Harms. Baltic Sea Environment Proceedings No. 58: 23-47.

Koroleff, F. 1983. Determination of phosphorus. In Methods of sea water analysis. pp. 125-139. Ed. by K. Grasshoff, M. Ehrhardt, and K. Kremling. Verlag Chemie, Weinheim.

Lindahl, O., 1986. A dividable hose for phytoplankton sampling. In Report of the ICES Working Group on Exceptional Algal Blooms, Hirtshals, Denmark, 17-19 March, 1986. ICES, C.M. 1986/L:26.

Nehring, D. 1994. Quality assurance of nutrient data with special respect to the HELCOM Baltic Monitoring Programme, pp. 5-22. InICES/HELCOM

Workshop on Quality Assurance of Chemical Analytical Procedures for the Baltic Monitoring Programme. Baltic Sea Environment Proceedings, No. 58.

Strickland, J.D.H. and Parsons, T.R., 1968. A practical handbook of seawater analysis. Fish. Res. Board of Canada, Bulletin 169, Ottawa.

UNESCO, 1994. Protocols for the Joint Global Ocean Flux Study (JGOFS). Core Measurements. IOC Manuals and Guides 29: 179 pp.

Monitoring programme: Eutrophication, Biodiversity - Water column habitats
Programme topic: Hydrochemistry

SUB-PROGRAMME: WATER COLUMN CHEMICAL CHARACTERISTICS

TABLE OF CONTENTS

REGIONAL COORDINATION

The monitoring of this sub-programme is: **Fully coordinated for and H_2S and O_2.** Not coordinated for pCO_2

- Common monitoring guidelines: HELCOM COMBINE manual.
- Common quality assurance programme: HELCOM COMBINE manual.
- Common database: ICES.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Eutrophication Biodiversity
	Ecological objectives	Natural oxygen levels
Marine strategy framework directive (MSFD)	Descriptors	D1 Biodiversity – Seabed habitats D1 Biodiversity – Water column habitats D5 Eutrophication D7 Hydrographical changes
	Criteria (Q5a)	1.6 Habitat condition 5.3 Indirect effects of nutrient enrichment 7.2 Impact of permanent hydrographical changes
	Features (Q5c)	Physical and chemical features: Annual and seasonal temperature regime and ice cover, current velocity, upwelling, wave exposure, mixing characteristics, turbidity, residence time. Spatial and temporal distribution of nutrients (DIN, TN, DIP, TP, TOC) and oxygen. pH, pCO_2 profiles or equivalent information used to measure marine acidification.
Other relevant legislation (Q8a)	Water Framework Directive	

Assessment of: (Q4k)

State/Impacts	X	temporal trends, spatial distribution, status classification
Pressures		
Human activities causing the pressures		
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)

HELCOM assessment unit Level 1: Baltic Sea	X
HELCOM assessment unit Level 2: Subbasin	
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	

MONITORING CONCEPTS

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
Regional (COMBINE)	Dissolved oxygen (O_2)	Concentration of oxygen	In situ measurement (HELCOM COMBINE manual, Part C, Annex C2, Chapter 4.3)	HELCOM COMBINE manual, Part B, Annex B2, B3, B4, B5, B6 and Annex B8 Appendix 2 and 3	See map for details	Station grid sampling, high frequency cruise sampling. See map for details.	Deep bottom oxygen debt	5.3.2	EEZ	Data available from 1891, coordinated monitoring started 1979	All HELCOM Contracting Parties
Regional (COMBINE)	Hydrogen ion concentration (pH)	pH	Sampled in conjunction with O_2 (see HELCOM COMBINE manual, Part B, Annex B14 and Annex C5)	HELCOM COMBINE manual, Part B, Annex B14	See map for details	Station grid sampling, high frequency cruise sampling. See map for details.	-	-	EEZ	Data available from 1921, coordinated monitoring started 1979	All HELCOM Contracting Parties
Regional (COMBINE)	Hydrogen sulphide (H_2S)	Other parameter	Sampled in conjunction with O_2 (see HELCOM COMBINE manual, Part C, Annex C2, Chapter 4.4 and Annex C5)	HELCOM COMBINE manual, Part B8, Appendix 4	See map for details	Station grid sampling, high frequency cruise sampling. See map for details.	-	-	EEZ	Data available from 1966, coordinated monitoring started 1979	All HELCOM Contracting Parties
National	Carbon dioxide (pCO_2)	Concentration of chemical/nutrient/pollutant in water column	Ship of opportunity	Other	Monthly	24 stations	-	-	EEZ	1992	FI

Brief description of monitoring

Full description in HELCOM COMBINE manual. Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	**O_2 / Concentration of oxygen**
Method	Measured in the water column, see HELCOM COMBINE manual.
QA/QC	The quality system is formalized in the quality manual (Part B Annex B2 in the HELCOM COMBINE manual). Guidance on the interpretation of ISO/IEC/EN 17025 'General Requirements for the Competence of Testing and Calibration of Laboratories' (formerly EN 45001 and ISO Guide 25) was given by a joint international EURACHEM/WELAC Working Group (EURACHEM/WELAC, 1992). Specific guidance to Analytical Quality Control for Water Analysis was elaborated by European - CEN/TC 230 (EN 14996) - as well as by international - ISO/TC 147 SC 7 (ISO/TR 13530) - standardisation authorities. The analytical requirements are specified, including definition of the type and nature of the sample and its environment, concentration range of interest and permissible tolerances in analytical error (Part B Annex B3 in the HELCOM COMBINE manual). It has been established, by laboratory studies, that the performance characteristics (selectivity, sensitivity, range, limit of detection and accuracy) of the method meet the specifications related to the intended use of the analytical results (Part B Annex B4 in the HELCOM COMBINE manual). According to international standard, e.g. ISO 17025, a defined analytical quality has been achieved, maintained, and proven by documentation. The establishment of a system of control charts is a basic principle applied in this context. For further information for control charts refer to ISO/TR 13530 (1997). (Part B Annex B5 in the HELCOM COMBINE manual) The comparability of the data has been ensured through an external quality assessment, such as participation in external quality schemes, ring text and/ or use of external experts (Part B Annex B6 in the HELCOM COMBINE manual).
Frequency	Mapping of oxygen conditions in the near bottom waters should take place a few times per year at set stations. It is important that this is carried out in late summer or autumn in certain critical areas. High frequency cruise station sampling should be done >12 times per year (basically monthly sampling but weekly in the vegetative period). pH is generally measured in conjunction with oxygen.
Spatial Scope	Assessment should be done on HELCOM subbasin scale, including coastal areas.

Spatial resolution	Samples are taken on COMBINE stations (listed in Part C Annex C1 of the HELCOM COMBINE manual). See map for details.

Element / parameter	**pH / pH**
Method	Measured in the water column, see HELCOM COMBINE manual.
QA/QC	Part B Annex B14 of the HELCOM COMBINE manual.
Frequency	pH is generally measured in conjunction with oxygen.
Spatial Scope	-
Spatial resolution	Based on data from ICES Data centre, ICES Station Dictionary

Element / parameter	**H_2S / Concentration of H_2S**
Method	Measured in the water column, see HELCOM COMBINE manual. H_2S is also noted but not measured from benthic samples.
QA/QC	See Annex B8 Appendix 4 of the HELCOM COMBINE manual.
Frequency	H_2S is generally measured in conjunction with oxygen.
Spatial Scope	All sub-basins.
Spatial resolution	Based on data from ICES Data centre, ICES Station Dictionary

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	For assessment purposes, at least 15 observations should be made yearly in each assessment unit. The compilation of observations is expected to be distributed spatially within the assessment unit in a non-biased way.
Gaps	For pCO_2 there is only national monitoring for the time being

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	Yes (but not for pCO_2)
Established methods for assessment?	Yes
Adequate understanding of GES?	Yes
Adequate capacity to perform assessments?	Yes

Assessment of natural variability (Q5e)

Quantitative.

DATA PROVIDERS AND ACCESS

Data access point	HELCOM, ICES database
Data type (Q10c)	Processed Data sets
Data availability (Q10c)	ICES database
Data access (Q10c)	Open access
INSPIRE standard (Q10c)	
When will data become available? (Q10c)	The data currently available is from 2012 and before, the 2013 data will be reported in May 2014 and will become available by November 2014.
Data update frequency (Q10c)	Yearly
Describe how the data and information from the programme will be made accessible to the EC/EEA	Through HELCOM web portal/via ICES
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	Yes, O_2 data e.g. used in BSEP143 Eutrophication status of the Baltic Sea 2007-2011 - A concise thematic assessment.
Data is used in the following Baltic Sea Environment Fact Sheets (BSEF)	Hydrography and Oxygen in the Deep Basins

REFERENCES

Gieskes, J.M., 1969. Effect of temperature on the pH of seawater. Limnol. Oceanogr. 14, 679-685

Grasshoff, K., Erhardt, M. and Kremling, K. (eds), 1983. Methods of seawater analysis. Verlag Chemie, Weinheim, Germany

HELCOM COMBINE Manual 2012

ISO. 1994. Water quality—Determination of pH. ISO 10523.Radiometer, Copenhagen.

Poisson, A., Culkin, F. and Ridout, P., 1990. Intercomparison of total alkalinity and total inorganic carbon determinations in seawater. UNESCO Tech. Pap. Mar. Science, 59, 69pp.

UNESCO, 1987. Thermodynamics of the carbon dioxide system in seawater. Report by the carbon dioxide sub-panel of the joint panel. UNESCO Technical Papers in Marine Science, 51, 54pp.

Wedborg, M. et al., 1994. In: Humic substances in the global environment. Eds.: N. Senesi and T.M. Miano, Elsevier

PHYTOPLANKTON

GENERAL INFORMATION

The monitoring of phytoplankton covers pigments, abundance and biomass data and concerns the water column habitats.

Sub-programme: Pigments

The sub-programme covers pigments and supports the eutrophication related HELCOM core indicator for Chlorophyll-a (summer).

Sub-programme: Species composition, abundance and biomass

The dataset on abundance and biomass of phytoplankton is extensive and the sub-programme can be used as an approximation for total phytoplankton biomass.

There are no HELCOM core indicators linked to the sub-programme at this time.

RESPONSIBLE HELCOM SUBSIDIARY BODIES

HELCOM STATE*

HELCOM PEG

Contact information: HELCOM Secretariat

*Tentative name

SUB-PROGRAMMES

Monitoring programme: Eutrophication, Biodiversity - Water column habitats
Programme topic: Phytoplankton

SUB-PROGRAMME: PIGMENTS

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **Fully coordinated.**

- Common monitoring guidelines: HELCOM COMBINE manual.
- Common quality assurance programme: HELCOM COMBINE manual.
- Common database: ICES.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Eutrophication
	Ecological objectives	Natural level of algal blooms
Marine strategy framework directive (MSFD)	Descriptors	D5 Eutrophication
	Criteria (Q5a)	5.2 Direct effects of nutrient enrichment
	Features (Q5c)	Biological features: A description of the biological communities associated with the predominant seabed and water column habitats.
Other relevant legislation (Q8a)	Water Framework Directive	

Assessment of: (Q4k)

State/Impacts	X	temporal trends, spatial distribution status classification
Pressures		
Human activities causing the pressures		
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)

HELCOM assessment unit Level 1: Baltic Sea	
HELCOM assessment unit Level 2: Subbasin	
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	X

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9j	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
Regional (COMBINE)	Phytoplankton	Concentration of chlorophyll-a	Fixed stations, in situ (HELCOM COMBINE manual, Part C, Annex C4)	National, ICESData TypeGuide and HELCOM COMBINE manual	See map for details	See map for details	Chlorophyll-a (summer)	5.2.1 Chlorophyll concentration in the water column	EEZ	1979	All HELCOM Contracting Parties
National	Phytoplankton	Concentration of chlorophyll-a	Ship-of-opportunity, flow-through	National	Continually	20% (transect)	Chlorophyll-a (summer)	5.2.1 Chlorophyll concentration in the water column	EEZ	1999	EE, FI, SE
National	Phytoplankton	Concentration of chlorophyll-a	Earth Observation, (MERIS, MODIS,VIIRS)	Other	Continually	100% (1km or 300m resolution grid)	Chlorophyll-a (summer)	5.2.1 Chlorophyll concentration in the water column	EEZ	2003	FI
National	Phytoplankton	Concentration of chlorophyll-a	Ship-of-opportunity, laboratory analysis, (HELCOM COMBINE manual, Part C, Annex C4)	National	Weekly	20%	Chlorophyll-a (summer)	5.2.1 (Chlorophyll concentration in the water column)	EEZ	1999	EE, FI, SE
National	Phytoplankton	Concentration of phycocyanin	~30 fixed stations	National	Yearly	Offshore. See map for details	-	-	EEZ	2005	FI
National	Phytoplankton	Concentration of phycocyanin (SoO)	Ship of opportunity: flow through	National	Biweekly	20% (transects)	-	-	EEZ	2005	FI
National	Phytoplankton	Concentration of phycocyanin	Earth Observation, (MERIS, MODIS,VIIRS)	National	Daily	100%	-	-	EEZ	2014	FI

Brief description of monitoring

Full description in HELCOM COMBINE manual. Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	In situ phytoplankton / Concentration of chlorophyll-a
Method	Waters samples from the water column, chlorophyll a extracted and analysed in laboratory (applies also to monitoring of concentration of phycocyanin in offshore waters). Platform: boat Mode of sampling: fixed station (COMBINE Stations, see map for details) The standard sampling depths are in the upper water column the same as for nutrients: 1 m, 5 m, 10 m, 15 m and 20 m. In COMBINE, the sample from 1 m or an integrated sample (1-10 m) could be analysed. Additional sample(s) should be obtained from chlorophyll maxima present at other depths. At least two samples should be collected. Samples are collected using a rosette sampler which is combined with a CTD system or a cast of reversing water samplers (e.g., Niskin or Nansen bottles) equipped with reversing thermometers. For further details, see: (Part C Annex C4 Chapter 13 in the HELCOM COMBINE manual).

QA/QC	The quality system is formalized in the quality guidance(Part B Annex B2 in the HELCOM COMBINE manual). Guidance on the interpretation of ISO/IEC/EN 17025 'Genera. Requirements for the Competence of Testing and Calibration of Laboratories' (formerly EN 45001 and ISO Guide 25) was given by a joint international EURACHEM/WELAC Working Group (EURACHEM/WELAC, 1992). Specific guidance to Analytical Quality Control for Water Analysis was elaborated by European - CEN/TC 230 (EN 14996) - as well as by international - ISO/TC 147 SC 7 (ISO/TR 13530) - standardisation authorities. The analytical requirements are specified, including definition of the type and nature of the sample and its environment, concentration range of interest and permissible tolerances in analytical error (Part B Annex B3 in the HELCOM COMBINE manual). It has been established, by laboratory studies, that the performance characteristics (selectivity, sensitivity, range, limit of detection and accuracy) of the method meet the specifications related to the intended use of the analytical results (Part B Annex B4 in the HELCOM COMBINE manual). According to international standard, e.g. ISO 17025, a defined analytical quality has been achieved, maintained, and proven by documentation. The establishment of a system of control charts is a basic principle applied in this context. For further information for control charts refer to ISO/TR 13530 (1997). (Part B Annex B5 in the HELCOM COMBINE manual) The comparability of the data has been ensured through an external quality assessment, such as participation in external quality schemes, ring text and/ or use of external experts (Part B Annex B6 in the HELCOM COMBINE manual).
Frequency	High frequency cruise station sampling should be done >12 times per year during the growing season (basically monthly sampling but weekly in the growing season). In Poland 1 monitoring station with 12 times per year.
Spatial Scope	Chlorophyll-a is monitored in the whole Baltic including coastal, transitional water and EEZ. Phycocyanin measured only in offshore.
Spatial resolution	Samples are taken on COMBINE stations (listed in Part C Annex C1 of the HELCOM COMBINE manual).

Element / parameter	**SoO flow-through chlorophyll-a / Concentration of chlorophyll-a**
Method	Measured in the water column with flow-through fluorometer, 5 m depth to represent mixed layer (applies also to phycocyanin). Platform: In Finland Finnmaid (commercial ship on regular route Helsinki-Travemünde) Mode of sampling: Sampling is done en route, at constant intervals. Measured at approximately 5 m depth, and represents the mixed surface layer. Flow-through fluoromete. Validation from chlorophyll-a fluorescence, phycocyanine-fluorescence and turbidity with weekly in situ measurements, of water samples with chlorophyll-a extracted and analysed in laboraratory, measurements, using multiple linear regression.
QA/QC	Fluorometers are calibrated annually in laboratory against standards. In Finland the analysis procedure is audited annually by FINAS laboratory accreditation. Accreditation measures performance characteristics (selectivity, sensitivity, range, limit of detection and accuracy) of the method to the intended use of the analytical results and comparability of data has been ensured through an external quality assessment.
Frequency	Sampling is done between March – December, during the ice-free season. Observations are made according to the ship's schedule, with appr. 1-3 day intervals between ship passing a point along it's route.
Spatial Scope	Chlorophyll-a is monitored in the whole Baltic including coastal, transitional water and EEZ.
Spatial resolution	The spatial resolution of the observations is 200 m along a transect.

Element / parameter	**Earth Observation (EO) chlorophyll-a / Concentration of chlorophyll-a**

Method	Remote sensing observations derived from satellite imagery (applies also to phycocyanin). Platform: satellite (current instruments/satellites: MODIS/Aqua and VIIRS/Suomi-NPP, during 2003-2011: MERIS/Envisat) Mode of sampling: images are observed daily, timing depends on the overpasses of the satellites. Measurements cover non-cloudy areas with 2000-3000 km wide swath. Current instruments observe images with pixel size (ground resolution) of ~1 km size. (Historical years 2003-2011: ~300 m pixel size). The sampling represents the mixed surface layer. The observed depth depends on the transparency of the water. Satellite instrument sensors detect reflected signal at several visible and near infrared wavelengths forming an image that covers a 2000-3000 km wide region at one overpass. The ground resolution of the observations depends on the instrument, varying between 300m and 1 km. These observations are transformed to radiances from which Chlorophyll-a is determined using an instrument dependent model. The observations are received from roll-on archives (dependent on the instrument mission) and processed automatically following the procedure: calibration to radiance units, atmospheric correction, cloud detection, rectification. Either a bio-optical or band ratio model is used to derive Chlorophyll-a concentrations [µg/l] from the pre-processed data. For MODIS and VIIRS, an instrument default chl-a determination (OC3, O'Reilly et al., 2000) is utilized with adjusted parameterization for the Baltic Sea. For the Baltic Sea, MUMM atmospheric correction method (Ruddick et al., 2000) is used instead of standard Gordon and Wang, 1994. References: Gordon, H.R., and Wang, M. (1994). Retrieval of water-leaving radiance and aerosol optical thickness over the oceans with SeaWiFS: a preliminary algorithm. Appl.Opt., 33, 443-452. O'Reilly, J.E., et al. (2000). In S.B. Hooker, and E.R. Firestone (Eds.), Ocean Chlorophyll-a Algorithms for SeaWiFS, OC2 and OC4: version 4. SeaWiFS Postlaunch Calibration and Validation Analyses, Part 3. NASA Tech. Memo.2000206892, Vol. 11, 9-23. NASA Goddard Space Flight Center, Greenbelt, Maryland. Ruddick, K.G., Ovidio, F., and Rijkeboer, M. (2000). Atmospheric correction of SeaWiFS imagery for turbid coastal and inland waters. Appl. Opt., 39, 897-912. Method of validation carried out by SYKE/Finland, based on the work in EUTRO-OPER (all CP's have been invited to join if they wish): Satellite instrument determinations of chl-a are annually compared against match-ups of in situ measurements and Alg@line (water samples and flow-through measurements). Currently, ICES and Finnish national monitoring programme in situ chlorophyll-a are used as reference in situ. Chl-a algorithm applied on the comparisons is a neural network based bio-optical model that takes into account the humic substances in calculations. The bio-optical module of FUB processor is mainly based on data typical to the European coastal waters. The original training ranges of water constituents in FUB are: 0.05 - 50.0 µg /l (Chl-a), 0.05 - 50.0 mg/l-1 (TSM) and 0.005 - 1.0 m-1 (aCDOM (443 nm)), but it has been found to perform well on circumstances with higher concentrations than the original training ranges. This applies specially for a CDOM that accounts for humic substances in the water. The accuracy of chl-a interpretation has been examined on different parts of the Baltic Sea (comparisons against available monitoring station, Alg@line and ICES data)
QA/QC	Quality system: The processing steps and the quality of service chain have been described in Marcoast GMES service network Service Provider Validation report (Deliverable N° C6). Comparability: The data is compared annually against in situ and Alg@line-measurements. The quality assessments are reported in ongoing validation deliverables of EU/ESA projects related to operational satellite service chains (at European level). Recent quality assessments have been made in Marcoast II and CoBiOS validation deliverables. Marcoast II project validation and service quality assessment is done under MarCoast Validation Bureau that controls the validation activities within the service chain. MarCoast II ended during 2013.
Frequency	Period of monitoring: from beginning of April to end of October. Data is collected daily. Cloud coverage causes gaps in data collection.
Spatial Scope	Chlorophyll-a is monitored in the whole Baltic including coastal, transitional water and EEZ.
Spatial resolution	Spatial resolution depends on the instrument. Currently used MODIS and VIIRS detect with 1km and 750m ground resolution (pixel size), respectively. The image area covers Baltic Sea completely during one day, excluding the cloudy areas. All HELCOM assessment units are covered.

Element / parameter	**SoO in situ chlorophyll-a / Concentration of chlorophyll-a**

Method	Measured in the water column, bottle samples taken from ship of opportunity lines. Platform: boat (ship-of-opportunity) Mode of sampling: Sampling is done en route, at fixed longitudes. Sampling is done at appr. 5 m depth, and represents the mixed surface layer. At least two samples should be taken. Water is continuously pumped through a system, taking water samples according to programming (Ferrybox sampling programme). The samples are stored in a dark refrigerator for max. 2 days. For further details of sample analysis, see: (Part C Annex C4 Chapter 13 in the HELCOM COMBINE manual).
QA/QC	The quality system is formalized in the quality guidance (Part B Annex B2 in the COMBINE manual). Guidance on the interpretation of ISO/IEC/EN 17025 'General Requirements for the Competence of Testing and Calibration of Laboratories' (formerly EN 45001 and ISO Guide 25) was given by a joint international EURACHEM/WELAC Working Group (EURACHEM/WELAC, 1992). Specific guidance to Analytical Quality Control for Water Analysis was elaborated by European - CEN/TC 230 (EN 14996) - as well as by international - ISO/TC 147 SC 7 (ISO/TR 13530) - standardisation authorities. The analytical requirements are specified, including definition of the type and nature of the sample and its environment, concentration range of interest and permissible tolerances in analytical error (Part B Annex B3 in the HELCOM COMBINE manual). It has been established, by laboratory studies, that the performance characteristics (selectivity, sensitivity, range, limit of detection and accuracy) of the method meet the specifications related to the intended use of the analytical results (Part B Annex B4 in the HELCOM COMBINE manual). According to international standard, e.g. ISO 17025, a defined analytical quality has been achieved, maintained, and proven by documentation. The establishment of a system of control charts is a basic principle applied in this context. For further information for control charts refer to ISO/TR 13530 (1997). (Part B Annex B5 in the HELCOM COMBINE manual) The comparability of the data has been ensured through an external quality assessment, such as participation in external quality schemes, ring text and/ or use of external experts (Part B Annex B6 in the HELCOM COMBINE manual).
Frequency	Sampling is done between March – December, during the ice-free season. Samples are taken weekly / biweekly / monthly.
Spatial Scope	Chlorophyll a is monitored in the whole Baltic including coastal, transitional water and EEZ.
Spatial resolution	-

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	At least 15 observations during the period June-September should be made yearly in each assessment unit is required. The compilation of observations is expected to be distributed spatially within the assessment unit in a non-biased way.
Gaps	Existing coordinated monitoring does not provide sufficient temporal coverage to achieve high confidence in the core indicator status estimate (BSEP 143). Including Earth Observation and/or Ferrybox monitoring offers means to fill this gap.

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	Yes
Established methods for assessment?	Yes
Adequate understanding of GES?	Yes
Adequate capacity to perform assessments?	Yes

Assessment of natural variability (Q5e)

Quantiattive.

DATA PROVIDERS AND ACCESS

Data access point	HELCOM, ICES database, Algabase, SYKE (Earth Observation-data)
Data type (Q10c)	Processed Data sets Data products
Data availability (Q10c)	Data in national data centre: to be specified for Ferrybox-data Data in international data centre: ICES database. To be specified for Ferrybox-data
Data access (Q10c)	Open access to data (covered by ICES data policy)
INSPIRE standard (Q10c)	
When will data become available? (Q10c)	In situ fixed stations: The data currently available is from 2011/2012 and before, the 2013 data will be reported in May 2014 and become available by November 2014.
Data update frequency (Q10c)	Yearly
Describe how the data and information from the programme will be made accessible to the EC/EEA	Through HELCOM web portal/via ICES
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Data is used in the following Baltic Sea Environment Fact Sheets (BSEF)	Chlorophyll-a concentrations, temporal variations and regional differences from satellite remote sensing
Has the data been used in HELCOM assessments?	Yes, e.g. BSEP143 Eutrophication status of the Baltic Sea 2007-2011 - A concise thematic assessment

REFERENCES

Edler, L., 1979. Recommendations for marine biological studies in the Baltic Sea: Phytoplankton and chlorophyll. Working Group 9, The Baltic Marine Biologists, publication No. 5, 38 pp.

Grasshoff, K. 1975. The hydrochemistry of landlocked basins and fjords. In Chemical Oceanography, 2nd edition, part 2. Ed. by J.P. Riley and G. Skirrow. Academic Press, London.

Grasshoff, K. 1976. Methods of seawater analysis. Verlag Chemie, Weinheim, New York.

Grasshoff, K., Ehrhardt, M., and Kremling, K. (Eds.) 1983. Methods of sea water analysis. Verlag Chemie, Weinheim.

HELCOM, 1988. Guidelines for the Baltic Monitoring Programme for the Third Stage. Part D. Biological Determinands.

Jeffrey, S.W., Mantoura, R.F.C., Wright, S.W., 1997. Phytoplankton pigments in oceanography: guidelines to modern methods. UNESCO Publishing, Paris, 661 pp.

Kirkwood, D. 1994. Nutrients: Practical notes on their determination in seawater. In ICES/HELCOM Workshop on Quality Assurance of Chemical Analytical Procedures for the Baltic Monitoring Programme. Ed. by G. Topping and U. Harms. Baltic Sea Environment Proceedings No. 58: 23-47.

Koroleff, F. 1983. Determination of phosphorus. In Methods of sea water analysis. pp. 125-139. Ed. by K. Grasshoff, M. Ehrhardt, and K. Kremling. Verlag Chemie, Weinheim.

Lindahl, O., 1986. A dividable hose for phytoplankton sampling. In Report of the ICES Working Group on Exceptional Algal Blooms, Hirtshals, Denmark, 17-19 March, 1986. ICES, C.M. 1986/L:26.

Strickland, J.D.H. and Parsons, T.R., 1968. A practical handbook of seawater analysis. Fish. Res. Board of Canada, Bulletin 169, Ottawa.

UNESCO, 1994. Protocols for the Joint Global Ocean Flux Study (JGOFS). Core Measurements. IOC Manuals and Guides 29: 179 pp.

Monitoring programme: Eutrophication, Biodiversity - Water column habitats
Programme topic: Phytoplankton

SUB-PROGRAMME: PHYTOPLANKTON SPECIES COMPOSITION, ABUNDANCE AND BIOMASS

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **Fully coordinated**.

- Common monitoring guidelines: HELCOM COMBINE manual.
- Common quality assurance programme: HELCOM COMBINE manual.
- Common database: ICES.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Biodiversity Eutrophication
	Ecological objectives	Natural level of algal blooms Natural distribution and occurrence of plants and animals Thriving and balanced communities of plants and animals No introductions of alien species from ships
Marine strategy framework directive (MSFD)	Descriptors	D1 Biodiversity D2 Non-indigenous Species D4 Food webs D5 Eutrophication
	Criteria (Q5a)	1.1 Species distribution 1.2 Population size 1.6 Habitat condition 1.7 Ecosystem structure 2.1 Abundance and state characteristics of non-indigenous species 4.3 Abundance/distribution of key trophic groups/species 5.2 Direct effects of nutrient enrichment
	Features (Q5c)	Biological features: A description of the biological communities associated with the predominant seabed and water column habitats.
Other relevant legislation (Q8a)	Water Framework Directive	

Assessment of: (Q4k)		
State/Impacts	X	temporal trends, spatial distribution, status classification
Pressures		
Human activities causing the pressures		
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)	
HELCOM assessment unit Level 1: Baltic Sea	
HELCOM assessment unit Level 2: Subbasin	
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	X

MONITORING CONCEPTS

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
Regional (COMBINE)	Abundance of phytoplankton	Population size (abundance)	HELCOM COMBINE manual, Part C, Annex C6	HELCOM COMBINE manual	See map for details	See map for details	-	1.2.1 Population abundance/ biomass 1.7.1 Composition and relative proportions of ecosystem components 2.2.2 Impacts of non-indigenous species at the level of species, habitats and ecosystem 4.3.1 Abuncance trends of functionally important groups/species	EEZ	Coordinated monitoring started in 1979	All HELCOM Contracting parties
Regional (COMBINE)	Chlorophyll-a (summer) Biomass of phytoplankton	Species abundance (biomass)	HELCOM COMBINE manual, Part C, Annex C6	HELCOM COMBINE manual	See map for details	See map for details	-	1.2.1 Population abundance/ biomass	EEZ	Coordinated monitoring started in 1979	All HELCOM Contracting Parties

Brief description of monitoring

Full description in HELCOM COMBINE manual. Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	Abundance of phytoplankton / Population size (abundance)
Method	Sampling and analytical methods are reported per sample and per parameter respectively in the data. See PART B (General guidelines on quality assurance for monitoring in the Baltic Sea) of the HELCOM COMBINE manual.
QA/QC	See PART B (General guidelines on quality assurance for monitoring in the Baltic Sea) of the HELCOM COMBINE manual. Quality assurance is a laboratory's whole sampling and analytical process from start to finish. That is an area for the scientific experts. The data centre can report what has been specified in the data: Guidelines used, method information, and Intercalibration participation etc. at a parameter level
Frequency	Abundance of phytoplankton stations and annual (2010) frequency (unique dates per subbasin) based on reported data to ICES grouped by HELCOM Subbasin and Country.
Spatial Scope	Spatial scope of abundance of phytoplankton stations 2007-2011 based on reported data to ICES grouped by HELCOM Subbasin and Country.
Spatial resolution	Data on abundance available from: Southern Baltic Proper, Kattegat, Bothnian Bay, Bothnian Sea, Northern Baltic Proper, Western Gotland Basin, Eastern Gotland Basin and the Gulf of Gdansk, Quark, Åland Sea,Archipelago Sea, Gulf of Finland. See map for details

Element / parameter	Phytoplankton biomass / Species abundance (biomass)

Method	For biomass measurements cell volume, carbon content and wet weight have been used. Biovolume could be used as a proxy for biomass. Sampling and analytical methods are reported per sample and per parameter respectively in the data. See PART B (General guidelines on quality assurance for monitoring in the Baltic Sea) of the HELCOM COMBINE manual.
QA/QC	See document HELCOM COMBINE Manuel Part B Annex B5. Quality assurance is a laboratory's whole sampling and analytical process from start to finish. The ICES data centre does not determine need for revisions of QA. That is an area for the scientific experts. The data centre can report what has been specified in the data: Guidelines used, method information, and Intercalibration participation etc. at a parameter level.
Frequency	Phytoplankton biomass stations and annual (2010) frequency (unique dates per subbasin) based on reported data to ICES grouped by HELCOM Subbasin and Country.
Spatial Scope	Spatial scope of phytoplankton biomass stations 2010 based on reported data to ICES grouped by HELCOM Subbasin and Country.
Spatial resolution	Data on biomass available from: Southern Baltic Proper, Gulf of Gdansk, Bothnian Bay, Bothnian Sea, the Quarck, Åland Sea,Archipelago Sea, Gulf of Finland. See map for details

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	Phytoplankton abundance, biomass and species composition vary fast and therefore monitoring requires frequent sampling. In many cases the monitoring programmes are restricted to less frequent sampling which limits the use of the data in assessing the state of phytoplankton communities. Efforts to find adequate core indicators are under way
Gaps	

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	Yes
Established methods for assessment?	Under development
Adequate understanding of GES?	No
Adequate capacity to perform assessments?	Nationally

Assessment of natural variability (Q5e)

Qunatitative

DATA PROVIDERS AND ACCESS

Data access point	HELCOM COMBINE, ICES database, National data centres
Data type (Q10c)	Processed Data sets

Data availability (Q10c)	ICES database
Data access (Q10c)	Open access to data (covered by ICES data policy)
INSPIRE standard (Q10c)	
When will data become available? (Q10c)	Data from the current data series for all countries is available from 2010/2011. The monitoring from 2013 will be reported in May 2014 and made available in November 2014.
Data update frequency (Q10c)	Yearly Every 2 years
Describe how the data and information from the programme will be made accessible to the EC/EEA	As the data is open access it is freely available for the EEA
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Data is used in the following Baltic Sea Environment Fact Sheets (BSEF)	Cyanobacteria biomass Phytoplankton biomass and species succession Unusual phytoplankton event
Has the data been used in HELCOM assessments?	Yes

REFERENCES

Lindahl, O., 1986. A dividable hose for phytoplankton sampling. In Report of the ICES Working Group on Exceptional Algal Blooms, Hirtshals, Denmark, 17-19 March 1986. ICES, C.M. 1986/L:26.

Olenina, I., Hajdu, S., Andersson, A.,Edler, L., Wasmund, N., Busch, S., Göbel, J., Gromisz, S., Huseby, S., Huttunen, M., Jaanus, A., Kokkonen, P., Ledaine, I.,

Niemkiewicz, E., 2006. Biovolumes and size-classes of phytoplankton in the Baltic Sea. Baltic Sea Environment Proceedings No.106, 144pp.

ZOOPLANKTON

GENERAL INFORMATION

The monitoring of zooplankton covers abundance, biomass and species composition and concerns the water column habitats.

Sub-programme: Zooplankton species composition, abundance and biomass

The aim of monitoring zooplankton is to assess the state of the Baltic Sea for the pelagic habitats where zooplankton form a link between the primary producers and fish.

This sub-programme covers three parameters: Species abundance (numbers or cover), Species abundance (biomass) and Species present (whole community or selected species only). It covers the whole Baltic Sea area.

The species composition, age distribution, abundance and biomass are used to calculate HELCOM core indicator 'Zooplankton Mean Size and Total Abundance'.

RESPONSIBLE HELCOM SUBSIDIARY BODIES

HELCOM STATE*

HELCOM Zooplankton Expert Network (ZEN)

Contact information: HELCOM Secretariat

*Tentative name

SUB-PROGRAMMES

Zooplankton species composition, abundance and biomass

Monitoring programme: Eutrophication, Biodiversity - Water column habitats
Programme topic: Zooplankton

SUB-PROGRAMME: ZOOPLANKTON SPECIES COMPOSITION, ABUNDANCE AND BIOMASS

TABLE OF CONTENTS

REGIONAL COORDINATION

The monitoring of this sub-programme is: **Partly coordinated.** Coordinated monitoring is developed by the ZEN QAI project that partially addresses quality assurance work in zooplankton analysis.

- Common monitoring guidelines: HELCOM COMBINE manual.
- Common quality assurance programme: missing
- Common database: missing. Data are hosted by analyzing laboratories and national databases. Submission of data to ICES database is not always a requirement.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Biodiversity Eutrophication
	Ecological objectives	Natural distribution and occurence of plants and animals
Marine strategy framework directive (MSFD)	Descriptors	D1 Biodiversity D2 Non-indigenous species D4 Food webs
	Criteria (Q5a)	1.6 Habitat condition 1.7 Ecosystem structure 2.1 Abundance and state characterisation of non-indigenous species, in particular invasive species 4.3 Abundance/distribution of key trophic groups/species
	Features (Q5c)	Biological features: A description of the biological communities associated with the predominant seabed and water column habitats.
Other relevant legislation (Q8a)	Habitats Directive	

Assessment of: (Q4k)		
State/Impacts	X	temporal trends, spatial distribution, status classification
Pressures		
Human activities causing the pressures		
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)	
HELCOM assessment unit Level 1: Baltic Sea	
HELCOM assessment unit Level 2: Subbasin	
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	X
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
Regional COMBINE	Zooplankton	Species abundance (numbers or cover)	Microscopic counting	HELCOM COMBINE manual	See map for details	Varies among countries, See map for details	Zooplankton mean size and total abundance	1.6.2 Relative abundance and/or biomass	EEZ	Varies among countries from 1976 to 2004	All HELCOM Contracting Parties
Regional COMBINE	Zooplankton	Species abundance (biomass)	Individual weight factors and abundance; length-weight regressions	HELCOM COMBINE manual	See map for details	Varies among countries, See map for details	Zooplankton mean size and total abundance	1.6.2 Relative abundance and/or biomass	EEZ	Varies among countries from 1976 to 2004	All HELCOM Contracting Parties
Regional COMBINE	Zooplankton	Species present (whole community or selected species only)	Taxonomic list is under revision by ZEN	Other	See map for details	Varies among countries, See map for details	Zooplankton mean size and total abundance	1.6.1 Condition of the typical species and communities	EEZ	Varies among countries from 1976 to 2004	All HELCOM Contracting Parties

Brief description of monitoring

Full description in HELCOM COMBINE manual. Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	**Zooplankton / Species abundance** (number) **Zooplankton / Species abundance** (biomass) **Zooplankton / Species present** (whole community)**,** pan-Baltic species list is currently being revised by HELCOM ZEN-QAI project
Method	Vertical column sampling, Gear: WP2, 100µm (90µm), formalin preservation, Kott subsampling, Stempel pipett, Counting at 40x to 80x magnification (varies among laboratories).
QA/QC	Ring tests (see HELCOM ZEN QAI reports for 2011 and 2012), Inter-and intra-laboratory calibrations, Accreditation procedures facilitating QA. An unresolved area with respect to QA is data quality control when submitting to a database host.
Frequency	Varies from 1-2 to 24 samples/station/year, depending on country**.**
Spatial Scope	Varies among countries, See map for details
Spatial resolution	Vertical resolution varies among the sampling stations depending on bottom depth: (1) bottom to surface, (2) bottom to halocline, halocline to thermocline, thermocline to surface, (3) bottom to thermocline, thermocline to surface, (4) discrete depth layers (e.g. 100-60 m, 60-30 m, 30-0 m).

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	Currently there is a study coordinated by Estonia to statistically test how the sampling frequency affects the usability of data for different purposes e.g. detection of long-term trends in different taxa, in population dynamics and also for indicator purposes. The HELCOM core indicator 'Zooplankton mean size and total abundance' is proposed to be tested. Generally, current monitoring might be sufficient if sampling frequency is at least monthly.

Gaps	Better individual biomass assessment would increase the indicator reliability since using length or other individual size measurements would provide a more realistic biomass values compared to the fixed individual weight values. This is related to seasonal and geographic variability in body size. Also, regular intercalibrations of sample analysis (Ring-tests) would facilitate the interlaboratory comparisons. Harmonization of sampling frequency and spatial resolution among the national monitoring programmes is needed to improve indicator-based assessment across the Baltic Sea and to increase coherency of GES targets.

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	It depends on the variability in, for example, sampling frequency among the analyzing laboratories and, importantly, on the length of the long-term data series that are important for establishing GES. In some areas (= stations) the data sets are sufficiently long and taken with high frequency. For those monitoring programmes, the answer would be YES. In others, the data go back only a few years and since GES values are area-specific, it would be a NO.
Established methods for assessment?	Under development in HELCOM CORESET II
Adequate understanding of GES?	Under development in HELCOM CORESET II
Adequate capacity to perform assessments?	

Assessment of natural variability (Q5e)

Quantitative. The natural variability is estimated using control charts and long-term data sets.

DATA PROVIDERS AND ACCESS

Data access point	ICES, COMBINE, SMHI, National Data Centres.
Data type (Q10c)	Processed Data sets
Data availability (Q10c)	ICES Database
Data access (Q10c)	Open access
INSPIRE standard (Q10c)	
When will data become available? (Q10c)	Annually
Data update frequency (Q10c)	Yearly
Describe how the data and information from the programme will be made accessible to the EC/EEA	
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	Yes

REFERENCES

SUB-PROGRAMMES

Hardbottom species

Softbottom fauna

Softbottom flora

Home / Action areas / Monitoring and assessment / Monitoring manual / Benthic community species distribution and abundance

BENTHIC COMMUNITY SPECIES DISTRIBUTION AND ABUNDANCE

GENERAL INFORMATION

The programme topic covers monitoring of benthic ecosystem elements. Monitoring is focused on biological aspects and selected species, however information on physical and chemical parameters such as substrate type, grain size, amount of organic matter, temperature, salinity and oxygen/hydrogen sulphide is also included.

Subprogramme: Hardbottom species

The hard-bottom monitoring is predominantly done in coastal waters, where the monitoring concept has been developed for the EU WFD. However, in some countries hard-bottom monitoring is also targeted for the EU Habitats Directive. The monitoring includes mainly macroalgae, but in some areas also blue mussels.

The HELCOM core indicator 'Population structure of long-lived macrozoobenthic species' is linked to this sub-programme as it includes size distribution of hardbottom dwelling blue mussels. The pre-core indicator 'Lower depth distribution limit of macrophyte species' is also linked, as macroalgae are an essential part of photic hard bottoms.

Subprogramme: Softbottom fauna

The soft-bottom macrofauna has been coordinatively monitored in the Baltic Sea since 1960s. The monitoring uses the HELCOM COMBINE method in the offshore areas, while slightly modified methods have been developed for the coastal waters for the EU WFD monitoring purposes.

The HELCOM core indicators 'State of the soft-bottom macrofauna communities', measuring Benthic Quality Indices (BQIs), and Population structure of long-lived macrozoobenthic species', measuring size distribution of species of burrowing bivalves, are linked to monitoring being carried out under this sub-programme.

Subprogramme: Softbottom flora

Monitoring of the soft-bottom vegetation includes mainly eelgrass monitoring, but also charophytes and some freshwater plant species, such as *Potamogeton* spp., have been included in the monitoring and in some countries the entire species assemblage is being monitored along transects. The monitoring focuses on coastal waters and

various national indicators have been developed for the EU WFD assessments.

The HELCOM pre-core indicator 'Lower depth distribution limit of macrophyte species' is linked to monitoring under this sub-programme as representative soft bottom species might become included.

RESPONSIBLE HELCOM SUBSIDIARY BODIES

HELCOM STATE*

Contact information: HELCOM Secretariat

*Tentative name

Monitoring programme: Biodiversity - Seabed habitats
Programme topic: Benthic community species distribution and abundance

SUB-PROGRAMME: HARDBOTTOM SPECIES

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **Not coordinated.**

The monitoring of macroalgae follows national methods which have been developed for national EU WFD assessments. Development of a basis for coordinated assessment, including monitoring, is focusing on identifying parameters and indicators which are not already bound by national legislation and also identifying the most relevant spatial scales for assessments in the marine area. The development is taking place under the HELCOM CORESET II project and parameters under consideration include various specific macroalgae parameters as well as blue mussel coverage. When core indicators are developed, the discrepancies in methods and elements monitored by countries need to be considered.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Biodiversity Eutrophication
	Ecological objectives	Clear water Natural distribution and occurrence of plants and animals Natural landscapes and seascapes Thriving and balanced communities of plants and animals
Marine strategy framework directive (MSFD)	Descriptors	D1 Biodiversity D2 Non-indigenous speices D5 Eutrophication D6 Seafloor integrity
	Criteria (Q5a)	1.1 Species distribution 1.4 Habitat distribution 1.5 Habitat extent 1.7 Ecosystem structure 2.1. Abundance and state characterisation of non-indigenous species 5.3 Indirect effects of nutrient enrichment 6.1 Physical damage, having regard to substrate characteristics
	Features (Q5c)	Biological features: A description of the biological communities associated with the predominant seabed and water column habitats. Information on angiosperms, macro-algae and invertebrate bottom fauna, including species composition, biomass and annual/seasonal variability.
Other relevant legislation (Q8a)	Habitats Directive Water Framework Directive	

Assessment of: (Q4k)		
State/Impacts	X	temporal trends, spatial distribution, status classification
Pressures		
Human activities causing the pressures		
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)	
HELCOM assessment unit Level 1: Baltic Sea	
HELCOM assessment unit Level 2: Subbasin	
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	X

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
National	Macroalgae	Areal extent of habitat	National methods	National	Yearly	Covering a couple of waterbodies per water type (by several transects per waterbody) PL: No monitoring in coastal waters, only open sea.	-	1.5.1 Habitat area	WFD CW		DE, DK, EE, FI, LT, PL, SE
National	Blue mussels	Areal extent of habitat	National methods	National	Yearly	Covering a couple of waterbodies per water type (by several transects per waterbody)	-	1.5.1 Habitat area	WFD CW		FI, SE
National	Blue mussels	Population size (abundance)	National methods	National	Yearly	Selected mussel reefs per sub-basin	-	1.6.2 Relative abundance and/or biomass	WFD CW		FI, SE
National	Blue mussels	Size of individuals (length or weight)	National methods	National	Yearly	Selected mussel reefs per sub-basin	Population structure of long-lived macrozoobenthic species	1.6.2 Relative abundance and/or biomass 6.2.4 Parameters describing the characteristics of the size spectrum of the benthic community	WFD CW		FI
National	Macroalgae (Fucus)	Species distributional range/pattern	Assessment of depth limits by video recording or diving along transects	National	Yearly	One or several "samples" (=locations) per WFD water body with 5 replicates per sample/location	Lower depth distribution limit of macrophyte species (pre-core indicator)	1.4.1 Distributional range 1.4.2 Distributional pattern	WFD CW	2006	DE, FI, SE, EE, DK, LV, LT
National	Macroalgae	Species abundance (biomass)	Sampling by divers in certain depth levels and assessment of species specific dry weight in the laboratory	National	Yearly	One or several "samples" (=locations) per WFD water body with 5 replicates per sample/location	Lower depth distribution limit of macrophyte species (pre-core indicator)	1.6.2 Relative abundance and/or biomass	WFD CW	2006	DE

National	Macroalgae	Species abundance (numbers or cover)	Sampling by divers in certain depth levels and assessment of species specific cover in the field	National	Yearly	One or several "samples" (=locations) per WFD water body with 5 replicates per sample/location	Lower depth distribution limit of macrophyte species (pre-core indicator)	1.5.1 Habitat area	WFD CW	2006	DE, FI, SE, EE, DK, LV, LT
National	Macroalgae	Species present (whole community or selected species only)	Sampling by divers in certain depth levels and assessment of species specific cover estimations in the field and dry weight in the laboratory	National	Yearly	One or several "samples" (=locations) per WFD water body with 5 replicates per sample/location	Extent of benthic biotopes (pre-core indicator)	1.6.2 Relative abundance and/or biomass	WFD CW	2006	DE, FI
National	All macrozoobentos species	Species present, abundance and biomass	Sampling by divers	National	4 yearly and other 12 at least once per 6 years		-		WFD water bodies	1995	EE

Brief description of monitoring

Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	**Macroalgae/Areal extent** (lower depth limit of the selected species, such as *Fucus vesiculosus, Furcellaria lumbricalis, Polysiphonia fucoides, Rhodomela confervoides* and *Phyllophora pseudoceranoides*). **Macroalgae/Species abundance** (numbers or cover) **Macroalgae/Species abundance** (biomass) **Macroalgae/Species present** (whole community or selected species only)
Method	Depth limit is determined in line transects at selected locations along depth gradient (across the currently existing depth limit of the species, not the whole depth range) with a towed video sledge or by divers. Cover estimations are made by divers at fixed stations, at specified depth intervals (densest part of the vegetation biotope) in an area of 20-25m2 and within frames (0,25m2), frames with 5 replicates per location. The cover estimate includes all species (or other relevant taxa) that are identifiable under water and for non-identifiable species samples are collected. The cover estimate can exceede 100% if the macrophytes grow in several layers. Biomass- and taxonomic determinations are done in laboratories on samples collected by divers at fixed stations at specified depth intervals (densest parts of the vegetation biotope) in frames (0,0625m2) with 5 replicates per location. In Poland sampling by divers is done at fixed stations (points), where three replicate samples are collected with (0,25 m2) per each depth interval.
QA/QC	National
Frequency	Varies between countries: Yearly (79%, n=277, DE, DK, EE, LT, PL, SE) Every 3rd year (13%, n=46, EE, FI, LT, SE) Every 6th year (6%, n=21, DK) Twice per year (2%, n=7, PL).
Spatial Scope	-
Spatial resolution	As hard substrate is scarce along the German coastline, often only one or two locations with macroalgae in sufficient density per water body, the rationale is often to sample where sampling is possible. In the northern Baltic Sea, hard-bottom monitoring sites are designed to cover at least the coastal water types, where representative water bodies are selected (3-5 replicate sites per monitoring area). In Finnish waters the sites are selected to include bladder wrack, red algae and blue mussels (if feasible). In Poland there is no monitoring in coastal waters, only in the open sea areas. There are only 2 transect locations in transitional waters and 4 locations in open sea stations.

Element / parameter	**Blue mussel/Areal extent** (optimum depth limit of the blue mussel zone) **Blue mussel/Population abundance** (density) **Blue mussels** (size of individuals)
Method	In Finland monitoring is planned to start in 2015. The method for abundance has been suggested, while the method for size measurements is under development.
QA/QC	National
Frequency	In Finland 1-2/6 years
Spatial Scope	WFD CW
Spatial resolution	In the northern Baltic Sea, hard-bottom monitoring sites are designed to cover selected sites along the coast. In the Finnish waters, the sites are selected to include bladder wrack, red algae and blue mussels (if available).

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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

Monitoring requirements	An appropriate assessment of the state of the hard-bottom fauna and flora along the coast requires monitoring in several coastal waterbodies. Each coastal waterbody should be monitored with a few transects, in order to decrease the impact of natural variation in the assessment. In sites meant for status classification, it is enough to carry out the monitoring every 3rd year. In sites meant for detecting temporal change, annual monitoring is required in order to create reliable time series data. For macroalgae, monitoring is to be carried out during the summer months, the exact timing depending on biogeographical characteristics (may be different in the southern and northern areas of the Baltic Sea). The small-scale spatial variation in substrate can potentially affec the measurement outcome, and has to be considered in monitoring of macroalgae depth limits, thus an area of circa 25-49 sqm should optimally be considered in a monitoring location. This can be achieved, for example, by diving horizontally along the lower depth limit of the selected species.
Gaps	The main gap in current monitoring of macroalgae is the lack of common methodology for sampling and analysis. The areal coverage of the macroalgae monitoring is quite extensive and the temporal frequency of the sampling is adequate. Blue mussel monitoring is not done in many countries and there has been no coordination in the method development. In Finland, blue mussel monitoring will start in 2015 in selected sites where macroalgae are currently monitored. In Germany only a few sites are suitable to assess the depth limit of macrophyte species on hardbottom substrates and the substrate availability is not sufficient to follow the depth gradient in sufficient detail. Suitable sites may exist outside the WFD CW area (1sm zone) in low number, but those are currently not monitored although monitoring is planned. Species composition, biomass and cover are not monitored continuously along the depth gradient, only at certain depth intervals, which were identified as appropriate for WFD purposes.

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	Yes for eutrofication. No for biodiversity
Established methods for assessment?	Yes
Adequate understanding of GES?	Yes
Adequate capacity to perform assessments?	Yes for eutrofication. No for biodiversity

Assessment of natural variability (Q5e)

Quantitative. For hard-bottom parameters correlation with water quality parameters is high, however the data resolution produced through monitoring may in some instances be too low to produce statistically significant correlations. Hard bottom parameters can be used to assess GES both from a biodiversity and an eutrophication perspective. The effect of natural variability on the assessment confidence, can be reduced by sampling in 3-5 replicate sites close to each other within a same coastal water type. The macroalgae indicators are intercalibrated with neighbouring countries (within same water types) in order to have comparable status classifications

DATA PROVIDERS AND ACCESS

Data access point	National databases

Data type (Q10c)	
Data availability (Q10c)	
Data access (Q10c)	
INSPIRE standard (Q10c)	
When will data become available? (Q10c)	
Data update frequency (Q10c)	Every 6th years
Describe how the data and information from the programmewill be made accessible to the EC/EEA	
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	Partly

REFERENCES

Osowiecki A., Łysiak-Pastuszak E., Kruk-Dowgiałło L., Brzeska P., Błeńska M., Kraśniewski W., Lewandowski Ł., Krzymiński W. 2010. An index-based preliminary assessment of the ecological status in the Polish marine areas of the Baltic Sea. Proceedings of the Third International Symposium on Research and management of Eutrophication in Coastal Ecosystems. 15-18 June 2010. Nyborg, Denmark. pp. 11-12.

Ruuskanen A (2014) Development and description of the Finnish Macrophyte Index (FMI). A report by Monivesi Oy, Ordered by Finnish Environment Institute. 39 pages.

Schories D, Selig U, Schubert H. 2006. Testung des Klassifi zierungsansatzes Mecklenburg-Vorpommern (innere Küstengewässer) unter den Bedingungen Schleswig-Holsteins und Ausdehnung des Ansatzes auf die Außenküste. Küstengewässer-Klassifi zierung deutsche Ostsee nach EU-WRRL. Teil A: Äußere Küstengewässer.

Steinhardt et al. (2009) The German procedure for the assessment of ecological status in relation to the biological quality element "Macroalgae & Angiosperms" pursuant to the WFD for inner coastal waters of the Baltic Sea. Rostocker Meeresbiol. Beiträge Heft 22

Monitoring programme: Biodiversity - Seabed habitats
Programme topic: Benthic community species distribution and abundance

SUB-PROGRAMME: SOFTBOTTOM FAUNA

TABLE OF CONTENTS

REGIONAL COORDINATION

The monitoring of this sub-programme is: **Partly coordinated.**

- Common monitoring guidelines: HELCOM COMBINE manual for offshore waters.
- Common quality assurance programme: missing.
- Common database: ICES Data Centre.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Biodiversity Eutrophication
	Ecological objectives	Natural distribution and occurrence of plants and animals Natural oxygen levels Thriving and balanced communities of plants and animals Viable populations of species
Marine strategy framework directive (MSFD)	Descriptors	D1 Biodiversity D2 Non-indigenous species D5 Eutrophication D6 Seafloor integrity
	Criteria (Q5a)	1.1 Species distribution 1.3 Population condition 1.6 Habitat condition 2.1 Abundance and state characterisation of non-indigenous species 6.2 Condition of benthic community
	Features (Q5c)	Biological features: A description of the biological communities associated with the predominant seabed and water column habitats. Information on angiosperms, macro-algae and invertebrate bottom fauna, including species composition, biomass and annual/seasonal variability.
Other relevant legislation (Q8a)	Habitats Directive Water Framework Directive	

Assessment of: (Q4k)		
State/Impacts	X	temporal trends, status classification
Pressures		
Human activities causing the pressures		
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)	
HELCOM assessment unit Level 1: Baltic Sea	
HELCOM assessment unit Level 2: Subbasin	
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	X
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	X

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
Regional (COMBINE)	Soft-bottom macrofauna	Population size (abundance)	HELCOM COMBINE manual, Part C Annex C8	HELCOM COMBINE manual	Yearly	3-10 offshore stations per sub-basin and 3-10 stations per coastal water type.	State of the soft-bottom macrofauna communities	1.6.2 Relative abundance and/or biomass	EEZ	1965	All HELCOM Contracting Parties
Regional (COMBINE)	Soft-bottom macrofauna	Population size (biomass)	HELCOM COMBINE manual, Part C Annex C8	HELCOM COMBINE manual	Yearly	3-10 offshore stations per sub-basin	State of the soft-bottom macrofauna communities	1.6.2 Relative abundance and/or biomass	EEZ	1965	All HELCOM Contracting Parties
National	Soft-bottom macrofauna	Size of individuals (length or weight)	National	National	Yearly	1-3 selected stations in offshore and coastal waters per sub-basin	State of the soft-bottom macrofauna communities	1.6.2 Relative abundance and/or biomass 6.2.4 Parameters describing the characteristics of the size spectrum of the benthic community	EEZ	1965	FI

Brief description of monitoring

Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	**Soft-bottom macrofauna/Population size (abundance)** **Soft-bottom macrofauna/Population size (biomass)**
Method	Offshore samples taken by van Veen grabs, while coastal samples taken by Ekman, van Ween, small van Ween, (and some other grabs). Sieve size according to Part C Annex C8 of HELCOM COMBINE manual is 1.0 mm (+ 0.5mmm optionally), but some countries take only 0.5 mm samples or even 0.25 mm samples. Number of replicates varies between 3-5.
QA/QC	HELCOM COMBINE manual
Frequency	Yearly in offshore and many coastal sites Every 3rd – 6th year in some coastal sites
Spatial Scope	Monitoring is divided, in practice, to COMBINE monitoring in the offshore and national coastal monitoring programmes, which are restricted to coastal waterbodies. Spatial strategies differ nationally: in the extremes, Sweden has aggregations of stations along the coast, while Finland has evenly distributed stations over the offshore area and coastal stations within waterbodies. National strategies have not been coordinated
Spatial resolution	All sub-basins

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	An appropriate assessments of state of the soft-bottom macrofauna require 3-6 monitoring stations per HELCOM assessment unit in offshore waters and coverage of several waterbodies per coastal water type. Monitoring is to be carried out during summer months every year if the aim is to detect temporal change or every 3-6 years (if the aim is to assess the state of the area). Replicate samples (n=3-6) need to be taken in a monitoring location to cover the small scale spatial variation of the fauna communities. Regional coherence of the assessment results also require similar sieve sizes. This has been (almost) achieved in the offshore sampling, whereas coastal sampling methods seem to vary nationally and comparability is weaker. The last 40 years of HELCOM monitoring on soft bottom macrofauna was carried out according to the HELCOM COMBINE manual and it was agreed to sample in autumn.
Gaps	

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	Yes
Established methods for assessment?	Yes
Adequate understanding of GES?	Yes
Adequate capacity to perform assessments?	Yes (but not for all parameters, e.g., not for size of individuals)

Assessment of natural variability (Q5e)

Quantitative, qualitative and expert opinion. Long time series (over 40 years) have shown the natural variability in the data set, which can be taken into account in the assessment.

DATA PROVIDERS AND ACCESS

Data access point	National databases, data reported to ICES Data Centre
Data type (Q10c)	
Data availability (Q10c)	
Data access (Q10c)	
INSPIRE standard (Q10c)	
When will data become available? (Q10c)	
Data update frequency (Q10c)	Every 1-6th years
Describe how the data and information from the programme will be made accessible to the EC/EEA	
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	Yes, e.g. BSEP116B Biodiversity in the Baltic Sea.

REFERENCES

Anon. 2007. Report of the Estonian assessment method and the preliminary evaluation of the comparability with methods from other Baltic Sea countries is presented in the Baltic Sea Milestone Report 6. Quality element: Benthic Fauna. Version 16 June 2006. Rev. 3, 30 March 2007. (GIG Milestone Reports 60). Available at this link

Błeńska M., Osowiecki A., Kraśniewski W., Piątkowska Z., Łysiak-Pastuszak E. 2010. Macrozoobenthos quality assessment in the Polish Part of the Southern Baltic Sea using a biotic index “B”. ICES Annual Science Conference Handbook. s. 217.

Blomqvist, M., Cederwall, H., Leonardsson, K. & Rosenberg, R. 2007. Bedömningsgrunder för kust och hav. Bentiska evertebrater 2006. Rapport till Naturvårdsverket 2007-04-11. 70 pp. (in Swedish with English summary)

Carletti, A. & Heiskanen, A-S. (2009): Water Framework Directive intercalibration technical report. Part 3: Coastal and transitional waters. JRC Scientifi c and Technical Reports.

HELCOM. 2009. Thematic Assessment of eutrophication. Baltic Sea Environmental Proceeding 116 B.

Monitoring programme: Biodiversity - Seabed habitats
Programme topic: Benthic community species distribution and abundance

SUB-PROGRAMME: SOFTBOTTOM FLORA

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **Not coordinated.**

The development of indicators is taking place under the HELCOM CORESET II project and will result in recommendations on monitoring.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Biodiversity Eutrophication
	Ecological objectives	Clear water Natural landscapes and seascapes Thriving and balanced communities of plants and animals
Marine strategy framework directive (MSFD)	Descriptors	D1 Biodiversity D5 Eutrophication D6 Seafloor integrity
	Criteria (Q5a)	1.6 Habitat condition 5.3 Indirect effects of nutrient enrichment 6.2 Condition of bnethic community
	Features (Q5c)	Biological features: A description of the biological communities associated with the predominant seabed and water column habitats. Information on angiosperms, macro-algae and invertebrate bottom fauna, including species composition, biomass and annual/seasonal variability.
Other relevant legislation (Q8a)	Habitats Directive Water Framework Directive	

Assessment of: (Q4k)

State/Impacts	X	status classification
Pressures		
Human activities causing the pressures		
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)

HELCOM assessment unit Level 1: Baltic Sea	
HELCOM assessment unit Level 2: Subbasin	
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	X

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
National	Angiosperms (*Zostera* and others)	Species distributional range/pattern	Assessment of depth limits by video recording or 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	Lower depth distribution limit of macrophyte species (pre-core indicator)	1.4.1 Distributional range 1.4.2 Distributional pattern	WFD CW	2006	DE
National	Macroalgae (Charophytes)	Species distributional range/pattern	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	Lower depth distribution limit of macrophyte species (pre-core indicator)	1.4.1 Distributional range 1.4.2 Distributional pattern	WFD CW	2006	DE
National	Angiosperms and macroalgae	Species abundance (numbers or cover)	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 3 replicates per sample	-	1.5.1 Habitat area	WFD CW	DE: 2006 PL: 2002	DE, PL
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 3 replicates per sample.		1.5.1 Habitat area	WFD CW	DE: 2006 PL: 2002	DE, PL

National	Angiosperms and macroalgae	Species present (whole community or selected species only)	Assessment 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	1.6.2 Relative abundance and/or biomass	WFD CW	2006	DE

Brief description of monitoring

Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	**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
QA/QC	National
Frequency	Yearly. Season: mid June to mid September
Spatial Scope	Germany: densest and largest eelgrass biotopes along the outer coastline of the Baltic Sea.
Spatial resolution	Germany: HELCOM Assessment Unit 4, within a 6-year period it is tried to cover the whole vegetated area of fjords, bays and lagoons 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 period (if possibly yearly). Others are only investigated once in a 6-year period.

Element / parameter	**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
QA/QC	National
Frequency	Yearly. Season: mid June to mid September
Spatial Scope	Germany: only in fjords, bays and coastal lagoons, where charophytes usually are distributed
Spatial resolution	Germany: HELCOM Assessment Unit 4, within a 6-year period it is tried to cover the whole vegetated area of fjords, bays and lagoons 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 period (if possibly yearly). Others are only investigated once in a 6-year period.

Element / parameter	**Angiosperms and macroalgae/Species abundance** (number or cover) **Angiosperms and macroalgae/Species abundance** (biomass) **Angiosperms and macroalgae/Species abundance** (species present)
Method	Cover estimations are made by divers at fixed stations at certain depths in an area of 20-25 m2 and in frames (1 m2), 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 (0,25m2) 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, 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 m2 with 3 replicates per each depth interval.
QA/QC	National
Frequency	Yearly. Season: mid June to mid September
Spatial Scope	
Spatial resolution	Germany: HELCOM Assessment Unit 4, within a 6-year period it is tried to cover the whole vegetated area of fjords, bays and lagoons 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 period (if possibly yearly). Others are only investigated once in a 6-year period.

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	In Germany, monitoring will concentrate on WFD coastal types (HELCOM Level 4 assessment unit). 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. 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). Seasonal timing of the programme is the main vegetation period between July and August. Assessments are conducted once within a 6-year 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).
Gaps	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 identified 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 Finland, soft-bottom macrophytes are not included in the national monitoring programme at the moment. Baseline mapping of macrophytes has been carried out in the underwater biotope inventory programme (VELMU - in Finnish), which can be used as a basis for further planning of monitoring.

Adequacy for assessment of GES (Q5d)

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 11.

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 (Q5e)

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

DATA PROVIDERS AND ACCESS

Data access point	National databases
Data type (Q10c)	
Data availability (Q10c)	
Data access (Q10c)	
INSPIRE standard (Q10c)	
When will data become available? (Q10c)	
Data update frequency (Q10c)	
Describe how the data and information from the programme will be made accessible to the EC/EEA	
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added

Has the data been used in HELCOM assessments?

REFERENCES

Krause-Jensen D, Greve TM, Nielsen K. 2005. Eelgrass as a bioindicator under the Water Framework Directive. Water Resources Management 19: 63-75.

Home / Action areas / Monitoring and assessment / Monitoring manual / Seabed habitat distribution and extent

SEABED HABITAT DISTRIBUTION AND EXTENT

GENERAL INFORMATION

The programme topic covers the monitoring relevant for assessing the state of habitats and biotopes and pressures acting on them. At present there is no coordinated monitoring of habitat distribution and extent in the HELCOM area.

Habitats and biotopes are defined through the HELCOM HUB classification, using information on the abiotic characteristics of the seabed as well as the associated biotic communities. Benthic biotope monitoring therefore requires sampling that produces information on both the physical characteristics and the biological parameters. Benthic biotope monitoring can be carried out for this specific purpose, done periodically in mapping projects, however it is also possible to use several layers of spatial information collected through separate monitoring schemes for the physical and biological parameters to gain infomration on the biotopes and habitats. Monitoring benthic biotopes requires data-aggregation to a higher spatial scale compared to the scale of sampling.

The HELCOM core indicators 'Red-listed benthic biotopes' and the pre-core indicators 'Cumulative impact on benthic habitats' and 'Distribution pattern and extent of benthic biotopes' are related to the programme topic.

Sub-programme: Habitat-forming species and substrates

The sub-programme describes monitoring of species and structures that define biotopes and habitats.

The monitoring of habitat-forming species and substrates focuses on covering wide sea areas with the purpose of providing data on extent and distribution. Very little areal monitoring data on the distribution of habitat-forming species is available at the moment, however station and transect-based monitoring of the specific species is done in all the Baltic Sea countries.

Sub-programme: Seabed habitat physical characteristics

NOTE: This sub-programme is still under development.

The sub-programme describes monitoring of the physical characteristics of the seabed biotopes and habitats.

SUB-PROGRAMMES

Habitat-forming species and substrates

Seabed habitat physical characteristics

RESPONSIBLE HELCOM SUBSIDIARY BODIES

HELCOM STATE*

Contact information: HELCOM Secretariat

*Tentative name

Monitoring programme: Biodiversity - Seabed habitats
Programme topic: Seabed habitat distribution and extent

SUB-PROGRAMME: HABITAT-FORMING SPECIES AND SUBSTRATES

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **Partly coordinated.** The BALSAM project is developing a manual for habitat monitoring in the Baltic, which will be available by March 2015.

- Common monitoring guidelines: Partly in HELCOM COMBINE manual and also national.
- Common quality assurance programme: Partly in HELCOM COMBINE manual and also national.
- Common database: missing.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Biodiversity
	Ecological objectives	Natural landscapes and seascapes
Marine strategy framework directive (MSFD)	Descriptors	D1 Biodiversity D6 Seafloor integrity
	Criteria (Q5a)	1.4 Habitat distribution 1.5 Habitat extent 1.6 Habitat condition 6.1 Physical damage, having regard to substrate characteristics 6.2 Condition of benthic community
	Features (Q5c)	Physical and chemical features: Topography and bathymetry of the seabed Habitat types: The predominant seabed and water column habitat type(s) with a description of the characteristic physical and chemical features, such as depth, water temperature regime, currents and other water movements, salinity, structure and substrata composition of the seabed. Identification and mapping of special habitat types, especially those recognised or identified under Community legislation (the Habitats Directive and the Birds Directive) or international conventions as being of special scientific or biodiversity interest. Habitats in areas which by virtue of their characteristics, location or strategic importance merit a particular reference.
Other relevant legislation (Q8a)	Habitats Directive Water Framework Directive	

Assessment of: (Q4k)		
State/Impacts	X	spatial distribution, state classification
Pressures		
Human activities causing the pressures		
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)	
HELCOM assessment unit Level 1: Baltic Sea	
HELCOM assessment unit Level 2: Subbasin	
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	X
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	X

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
National	Macroalgae (e.g. *Fucus vesiculosus*)	Species abundance (numbers or cover)	Drop-video mapping and verifying transects by divers.	National			Distribution, pattern and extent of benthic biotopes	1.1.1; 1.4; 1.5; 1.6.2; 5.2.3; 5.3.1; 6.2.2			
National	Angiosperms (*Zostera* and others)	Species distributional range/pattern	Assessment of depth limits by video recording or diving along transects	National			Distribution, pattern and extent of benthic biotopes	1.1.1; 1.4; 1.5; 1.6.2; 5.2.3; 5.3.1; 6.2.2			
Regional (COMBINE)	Soft-bottom macrofauna	Population size (abundance)	HELCOM COMBINE manual, Part C, Annex C8	HELCOM COMBINE manual	Annual	3-10 offshore stations per sub-basin and 3-10 stations per coastal water type.	Distribution, pattern and extent of benthic biotopes	1.1.1; 1.4; 1.5; 1.6.2; 5.2.3; 5.3.1; 6.2.2	EEZ	1965	All HELCOM Contracting Parties
National	Geological substrate	Coverage, extent and pattern of substrates			Regularly				EEZ		All HELCOM Contracting Parties

Brief description of monitoring

Full description on monitoring, some of the relevant parameters, such as macrozoobenthos, in HELCOM COMBINE manual. Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries, but the information will be added.

Element / parameter	Macroalgae / Species abundance Angiosperms / Species distribution Soft-bottom macrofauna / Population size
Method	Drop video mapping, diving and the HELCOM COMBINE manual
QA/QC	National and HELCOM COMBINE manual
Frequency	EE: yearly in 4 areas, at least once in 6 years in another 12 areas; monitoring started in 1995.
Spatial Scope	-
Spatial resolution	EE: spatial resolution - coastal waters WFD division - at least 3 transects in each surface water body

Element / parameter	**Macroalgae by drop videos / Macroalgae by drop videos**
Method	In Finland the monitoring has not started, however baseline mapping of the macroalgae distribution by drop video, diver transects and modeling has been carried out since 2004. The method for monitoring has been suggested.
QA/QC	National
Frequency	EE: yearly in 4 areas, at least once in 6 years in another 12 areas; monitoring started in 1995.
Spatial Scope	Mainly territorial waters but also in offshore areas.
Spatial resolution	EE: spatial resolution - coastal waters WFD division - at least 3 transects in each surface water body

Element / parameter	**Angiosperms by drop videos / Angiosperms by drop videos**
Method	In Finland the monitoring has not started, however baseline mapping of the angiosperm distribution by drop video, diver transects and modeling has been carried out since 2004. The method for monitoring has been suggested.
QA/QC	National
Frequency	-
Spatial Scope	Mainly territorial waters but also in offshore areas
Spatial resolution	-

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	The HELCOM core indicators direcly linked to the sub-programme are still at a pre-core indicator stage of development. Creating specifications for monitoring requirements is a part of the development work of the indicators. The monitoring of habitat-forming species and substrates focuses on covering wide sea areas with the purpose of providing data on extent and distribution. However, the data can also include parameters that enable state classification based on the condition of habitat-forming species. Monitoring of extent and distribution of habitat-forming species and substrates, require spatial methods such as drop video, aerial surveys (aeroplanes, satellites, remote helicopters), multiple diving transects, randomized grab samples, multibeam sonars or different combinations of these methods. As the primary focus of monitoring is not in detecting temporal change but spatial status (at certain time intervals), the monitoring frequency can be every 3 to 6 years. The quality and quantity dimensions of habitat change are traditionally considered when assessing the status of habitats. There are hardly any operational methods used to estimate the quantity of a selected habitat that would also be useful for monitoring habitat extent (area or volume). To monitor habitat extent and describe the change of habitat extent or size statistically, methods that fully cover selected areas, delineate habitat boundaries, or use a large number of point observations may be used. There are several examples of methods that could qualify for this type of monitoring, including those applied on seagrass meadows being repeatedly mapped using aqua scope, video or remote sensing. Although benthic monitoring for macrofauna and macrophytes is carried out within the COMBINE monitoring, no coordinated monitoring for habitat distribution and extent currently exists. Joint methods and guidelines will need to be agreed upon to provide data for the core indicators.
Gaps	There is very little monitoring data on the distribution of habitat-forming species currently available, whereas station or transect-based monitoring of the specific species is carried out in all the Baltic Sea countries. The latter cannot be directly used for assessing extent and distribution, as the monitoring is primarily designed to follow changes in habitat condition in specific locations. Periodically mapping the bathymetry and distribution of geological substrates is included in monitoring/inventory programmes in all the countries. No commonly agreed monitoring methods are in place, which target the extent and quality of the benthic habitats in the Baltic Sea. The 'drop-video' technique in combination with traditional methods used for characterizing benthic communities (grab sampling, SCUBA diving) could be a promising and cost-effective solution at least for certain habitats. The need for joint and standardized monitoring methods/guidelines in the whole Baltic Sea area should be discussed and agreed, considering the diversity of natural conditions, environmental gradients as well as different reporting obligations.

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	No
Established methods for assessment?	No
Adequate understanding of GES?	No
Adequate capacity to perform assessments?	No

Assessment of natural variability (Q5e)

Qualitative. The borders of habitats and biotopes are naturally a continuum, which must be considered when assessing the dirstibution, extent and pattern of a biotope.

DATA PROVIDERS AND ACCESS

Data access point	National databases
Data type (Q10c)	Processed Data sets
Data availability (Q10c)	By request
Data access (Q10c)	
INSPIRE standard (Q10c)	Habitats and Biotopes
When will data become available? (Q10c)	Species data available, but data on habitat distribution and extent missing
Data update frequency (Q10c)	Yearly
Describe how the data and information from the programme will be made accessible to the EC/EEA	
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	Yes - species data

REFERENCES

HELCOM (2013) HELCOM Underwater Biotope and habitat classification system (HELCOM HUB)

Monitoring programme: Biodiversity - Seabed habitats, , Hydrographic changes
Programme topic: Seabed habitat distribution and extent

SUB-PROGRAMME: SEABED HABITAT PHYSICAL CHARACTERISTICS

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **under development.**

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Biodiversity
	Ecological objectives	Natural distribution and occurence of plants and animals
Marine strategy framework directive (MSFD)	Monitoring Programmes	D1 Biodiversity D6 Seabed habitats
Other relevant legislation (Q8a)	Habitats Directive Water Framework Directive	

Assessment of: (Q4k)

State/Impacts	X	spatial distribution
Pressures		
Human activities causing the pressures		
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)

HELCOM assessment unit Level 1: Baltic Sea	X
HELCOM assessment unit Level 2: Subbasin	
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	
Other: Continuous map	X

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
National	Bathymetry	Bathymetric depth	National	National	As needed	Entire sea area	Supporting parameter	7 Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems	EEZ		All HELCOM Contracting Parties

National	Topography and substrate	Physical feature of habitat (e.g. sediment characteristics, topographic sturcture)	National	National	As needed	Entire sea area	Supporting parameter	6.1 Physical damage, having regard tosubstrate characteristics 7.1 Spatial characterizationof permanent alterations	EEZ	All HELCOM Contracting Parties
National	Temperature		National	National	Monthly	Station-based covering coastal and offshiore waters and sub-basins	Supporting parameter		EEZ	All HELCOM Contracting Parties
National	Salinity	Salinity	National	National	Monthly	Station-based covering coastal and offshore waters and sub-basins	Supporting parameter	7 Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems	EEZ	All HELCOM Contracting Parties

Brief description of monitoring

Full description in HELCOM COMBINE manual. Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	Bathymetry, topography and substrate
Method	Topography, substrate and bathymetry are surveyed regularly by authorities, and at least in Finland not considered as part of environmental monitoring. The information is used to support environmental monitoring and assessment activities.
QA/QC	National
Frequency	-
Spatial Scope	All sub-basins
Spatial resolution	100% coverage

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	Monitoring requires baseline mapping of the physical characteristics of the seabed (substrate, grain size, topography, bathymetry, salinity regime, temperature regime). This should be periodically monitored in order to improve the baseline maps but also to notice changes. Common methods/guidelines needed.
Gaps	Seabed physical characteristics are mapped for the entire Baltic Sea, but the level of detail and reliable resolution are not adequate for all areas. As the seabed mapping methods improve, the baseline maps are expected to improve. Benthic salinity and temperature monitoring is done alongside the monitoring for macrofauna and macrophytes and is mainly station-based. Common methods and guidelines needed.

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	No
Established methods for assessment?	Yes, but needs improvement to achieve reliable resolution

Adequate understanding of GES?	No
Adequate capacity to perform assessments?	No

Assessment of natural variability (Q5e)

Baseline mapping still needed.

DATA PROVIDERS AND ACCESS

Data access point	National databases
Data type (Q10c)	Unprocessed/raw Data, Processed Data sets, Data Products
Data availability (Q10c)	By request
Data access (Q10c)	-
INSPIRE standard (Q10c)	Habitats and biotopes
When will data become available? (Q10c)	-
Data update frequency (Q10c)	As needed; Seabed mapping for topography and substrate are done more or less continuously but the work is slow and it takes time to cover large sea areas.
Describe how the data and information from the programme will be made accessible to the EC/EEA	-
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	-

REFERENCES

Not published yet Visitors can't see this page. Publish it.

NON-INDIGENOUS SPECIES

GENERAL INFORMATION

Most of the data on non-indigenous species (NIS) is obtained through biological monitoring programs. These programs cover biological parameters and concern mobile and sessile species, water column and seabed habitats. NIS monitoring addresses all ecosystem components as NIS may belong to any trophic levels and affect the functioning of the system.

According to the BWM Convention, ships will be required to implement the ballast water management unless an exemption has been granted following a risk assessment to assess whether a ship is on a voyage posing a high or low risk of spreading alien species. The results of previous HELCOM projects revealed the crucial need for data on alien species and environmental conditions in ports, which is a pre-requisite for carrying out reliable risk assessments. In order to fill in those gaps, a second project on alien species (HELCOM ALIENS 2) was launched. It concluded in December 2012 providing a proposal for a regionally harmonized method for granting exemptions from BW treatment for marine traffic in the Baltic Sea.

Subprogramme: Non-indigenous species

The HELCOM core indicator 'Trends in arrival of new non-indigenous species' is linked to the monitoring undertaken in the sub-programme.

RESPONSIBLE HELCOM SUBSIDIARY BODIES

HELCOM STATE*

Contact information: HELCOM Secretariat

*Tentative name

SUB-PROGRAMMES

Non-indigenous species

Monitoring programme: Non-indigenous species, Biodiveristy - Water column habitats, Biodiveristy - Seabed habitat
Programme topic: Non-indigenous species

SUB-PROGRAMME: NON-INDIGENOUS SPECIES

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **Partly coordinated.**

The monitoring of phytoplankton, zooplankton, macrophytes and benthic fauna undertaken as part of the HELCOM COMBINE manual is coordinated and ongoing. Port monitoring has a coordinated and agreed protocol, but the monitoring itself is not ongoing and the ports that should be included in the monitoring are not agreed at Baltic scale. The monitoring is not adapted to serving the core indicator "Trends in arrival of new non-indigenous species"

Coordinated monitoring is developed in ports through the Joint HELCOM/OSPAR Task Group on Ballast Water Management Convention Exceptions (TG BALLAST)

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Biodiversity Maritime activities
	Ecological objectives	Thriving and balanced communities of plants and animals Viable populations of species No introductions of alien species from ships
Marine strategy framework directive (MSFD)	Descriptors	D1 Biodiversity D2 Non-indigenous species
	Criteria (Q5a)	1.1 Species distribution 1.7 Ecosystem structure 2.1 Abundance and state characterisation of non-indigenous species, in particular invasive species 2.2 Environmental impact of invasive non-indigenous species
	Features (Q5c)	Biological features: A description of the biological communities associated with the predominant seabed and water column habitats. An inventory of the temporal occurrence, abundance and spatial distribution of nonindigenous, exotic species or, where relevant, genetically distinct forms of native species, which are present in the marine region or subregion.
	Pressures and impacts, MSFD Annex III Table 2 (Q5c)	Biological disturbance: Introduction of non-indigenous species and translocations
	Activities (Q7a, 7b)	Man-made structures: Port Transport: shipping
Other relevant legislation (Q8a)	Ballast Water Management Convention	

Assessment of: (Q4k)

State/Impacts	X	temporal trends, spatial distribution, status classification
Pressures	X	temporal trends, spatial distribution, status classification
Human activities causing the pressures	X	
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)

HELCOM assessment unit Level 1: Baltic Sea	
HELCOM assessment unit Level 2: Subbasin	X
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
Regional (COMBINE)	Non-indigenous species	Species distributional range/pattern	All biological monitoring programs	HELCOM COMBINE manual	Yearly	Whole Baltic Sea (biological monitoring programs)	Trends in arrival of new NIS	2.1.1 Trends in abundance, temporal occurrence and spatial distribution in the wild of non-indigenous species... 2.2.1 Ratio between invasive non-indigenous species and native species in some well studied taxonomic group...	EEZ	Different programs started at different times.	All HELCOM Contracting Parties
Other	Non-indigenous species	Species present (whole community or selected species only)	Port monitoring protocol	Other	Yearly	Ports	Trends in arrival of new NIS	2.1.1	Territorial waters	Monitoring tested 2012 and 2013.	EE

Brief description of monitoring

Full description in HELCOM COMBINE manual. Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	**Phytoplankton, zooplankton, soft bottom benthos, fish, macrophytes**
Method	Biological monitoring is conducted based on HELCOM COMBINE manual. Port monitoring: according to the minimum requirements in the HELCOM/OSPAR Joint Harmonized Procedure, sampling takes place from the docks although if possible, use of a small vessel is encouraged. Stations are fixed sites within the port area. Plankton samples are taken twice a year (spring bloom and summer maximum) together with other samples (benthos, fouling species and epifauna). Sample analysis follows HELCOM COMBINE manual if not specified otherwise in the HELCOM/OSPAR Joint Harmonized Procedure.
QA/QC	QA/QC procedures are currently being discussed for port monitoring. In samples, where such procedures exist (planktons) they are followed. In groups where they don't exist, procedures will be developed (fouling, epifauna and benthos).
Frequency	The frequency of sampling differs between contracting parties and between monitored parameters in the HELCOM COMBINE manual. For exemption purposes, minimum frequency for port monitoring is five years. For MSFD purposes frequency should be increased (annually).
Spatial Scope	-
Spatial resolution	Biological monitoring covers all assessment units.

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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, frequency or sampling and replication.

Monitoring requirements	Most of the information concerning non-indigenous species (NIS) is obtained through routine biological monitoring programs as the HELCOM COMBINE manual. These on-going monitoring programs give data on NIS presence and abundance in phyto-, zooplankton and benthic communities. In some countries also shallow water habitats are covered by regular monitoring and this will give data on NIS (macrophytes, sessile organisms, mobile crustaceans and in some cases fish). The seasonal coverage of monitoring should take into account the life-cycle aspects of different taxonomic groups e.g. fish monitoring may be conducted annually but phytoplankton with a short generation time should be monitored several times a year to be able to detect new NIS. In addition to routine biological monitoring programs it is important to have NIS monitoring also in port areas because the most important vector for new introductions is shipping and thus recipient area for new NIS are ports and their vicinity. According to the HELCOM/OSPAR Joint Harmonized Procedure, exemptions are valid for maximum of five years and data used for risk assessment cannot be older than 12 months. An intermediate review (as suggested in IMO G-7) is included in the grant based on any new information on the basis of the exemption granted including but not limited to: presence of non-indigenous species, introduction pathways for NIS, changes in physical conditions in the port. For MSFD purposes, more frequent (annual) monitoring would be required. Minimum site requirement in each port is dependent on the size of the port. Further details can be found from the HELCOM/OSPAR Joint Harmonized Procedure.
Gaps	The HELCOM COMBINE manual is the basis for NIS monitoring. However additional monitoring e.g. in ports is needed. There is also a need for modifications in biological monitoring programs e.g. to change the temporal or spatial coverage, which differs between countries. The data needs for the core indicator 'Trends in arrival of NIS' are not sufficiently covered at the moment in the HELCOM COMBINE manual. Probably a monitoring different from the existing port monitoring will be needed for the trend indicator. Most of the new NIS arrive to ports and therefore those areas should be prioritized for monitoring in order to obtain reliable data for this core indicator.

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	No
Established methods for assessment?	Yes
Adequate understanding of GES?	Yes
Adequate capacity to perform assessments?	Yes

Assessment of natural variability (Q5e)

-

DATA PROVIDERS AND ACCESS

Data access point	HELCOM COMBINE manual HELCOM-OSPAR port survey database AquaNIS database Estonian Environmental Agency and Estonian Marine Institute
Data type (Q10c)	Processed Data sets Data products
Data availability (Q10c)	ICES Database
Data access (Q10c)	Open access
INSPIRE standard (Q10c)	
When will data become available? (Q10c)	HELCOM COMBINE manual data is available. Port data is already available on request. Database upload and download functions are currently being developed.
Data update frequency (Q10c)	Yearly

Describe how the data and information from the programme will be made accessible to the EC/EEA	
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	Yes
Data is used in the following Baltic Sea Environment Fact Sheets (BSEF)	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

REFERENCES

HELCOM/OSPAR Joint Harmonized Procedure

Home / Action areas / Monitoring and assessment / Monitoring manual / Inputs

INPUTS

GENERAL INFORMATION

Sub-programme: Nutrient inputs from atmosphere

This sub-programme covers atmospheric inputs of nutrients to the Baltic Sea which originate from the HELCOM Contracting Parties, Baltic Sea shipping and emissions from outside HELCOM area (i.e. North Sea shipping and non-HELCOM countries). Inputs to the sea are estimated using the EMEP model based on emission estimates reported by EMEP Contracting Parties. The model is calibrated with atmospheric deposition measurement data collected by Contracting Parties.

A HELCOM core pressure indicator on nutrient inputs is presently under development.

Sub-programme: Contaminant inputs from atmosphere

This sub-programme covers atmospheric inputs of hazardous substances to the Baltic Sea which originate from the HELCOM Contracting Parties and emissions from outside the HELCOM area (i.e. North Sea shipping and non-HELCOM countries). Inputs to the sea are estimated using the EMEP model based on emission estimates reported by EMEP Contracting Parties. The model is calibrated with atmospheric deposition measurement data collected by Contracting Parties.

Sub-programme: Nutrient inputs from landbased sources

This sub-programme covers waterborne inputs of nutrients to the Baltic Sea which originate from the Baltic Sea drainage area. Monitoring and reporting of nutrient inputs to the sea is carried out by the HELCOM Contracting Parties, and coordinated within the framework of Pollution Load Compilation projects (i.e. PLC-1 to PLC-6).

A HELCOM core pressure indicator on nutrient inputs is presently under development.

Sub-programme: Contaminant inputs from landbased sources

SUB-PROGRAMMES

Nutrient inputs from atmosphere

Contaminant inputs from atmosphere

Nutrient inputs from landbased sources

Contaminant inputs from landbased sources

Acute pollution

This sub-programme covers waterborne inputs of heavy metals to the Baltic Sea which originate from the Baltic Sea drainage area. Monitoring and reporting of heavy metal inputs to the sea is carried out by the HELCOM Contracting Parties and coordinated within the framework of Pollution Load Compilation projects (i.e. PLC-1 to PLC-6).

Sub-programme: Acute pollution

This sub-programme covers pollution by oil spills to the Baltic Sea. The HELCOM Informal Working Group on Aerial Surveillance (HELCOM IWGAS) annually compiles information on illegal oil discharges to the Baltic Seaobserved via aerial surveillance.

RESPONSIBLE HELCOM SUBSIDIARY BODIES

HELCOM PRESSURE*

RESPONSE

Contact information: HELCOM Secretariat

*Tentative name

Monitoring programme: Eutrophication
Programme topic: Inputs

SUB-PROGRAMME: NUTRIENT INPUTS FROM ATMOSPHERE

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **Fully coordinated.** Air emission and atmospheric deposition monitoring are coordinated by EMEP

- Common monitoring guidelines: at EMEP
- Common quality assurance programme: at EMEP
- Common database: EMEP

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Eutrophication
	Ecological objectives	Concentrations of nutrients close to natural levels
	Nutrient reduction scheme: Maximum Allowable Inputs (MAI) and Country-Allocated Reduction Targets (CART)	
Marine strategy framework directive (MSFD)	Descriptors	D5 Eutrophication
	Criteria (Q5a)	5.1 Nutrient levels
	Pressures and impacts (Q5c)	Nutrient and organic matter enrichment: Inputs of fertilisers and other nitrogen — and phosphorus-rich substances (e.g. from point and diffuse sources, including agriculture, aquaculture, atmospheric deposition.
Other relevant legislation (Q8a)	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy Gothenburg Protocol of the UNECE Convention on Long-Range Transboundary Air Pollution (CLRTAP) Directive 2001/81/EC of the European Parliament and the Council on National Emission Ceilings for certain pollutants (NEC Directive) Directive 2008/1/EC of the European Parliament and the Council concerning integrated pollution prevention and control	

Assessment of: (Q4k)		
State/Impacts		
Pressures	X	temporal trends, spatial distribution
Human activities causing the pressures	X	temporal trends, spatial distribution
Effectiveness of measures	X	temporal trends, spatial distribution

Scale of data aggregation for assessments: (Q10a)	
HELCOM assessment unit Level 1: Baltic Sea	
HELCOM assessment unit Level 2: Subbasin	
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	
Other: HELCOM PLC Sub-division	X

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
Regional	NOx	Input level of chemical/nutrient/pollutant from atmosphere	EMEP/MSC - W TECHNICAL REPORT 2 / 2013	Other	Monthly	EMEP grid 50x50 km	-	-		1998	All HELCOM Contracting Parties (modelling covers whole drainage area)
Regional	NHx	Input level of chemical/nutrient/pollutant from atmosphere	EMEP/MSC - W TECHNICAL REPORT 2 / 2013	Other	Monthly	EMEP grid 50x50 km	-	-		1998	All HELCOM Contracting Parties (modelling covers whole drainage area)

Brief description of monitoring

Full description in EMEP/MSC - W TECHNICAL REPORT 2 / 2013 (Appendix B).

Element / parameter	NOx / Input level of nutrient/pollutant from atmosphere NHx / Input level of nutrient/pollutant from atmosphere
Method	Dry/wet deposition of oxidized and reduced nitrogen + total nitrogen. Annual total emissions of nitrogen oxides and ammonia are officially reported every year to the UN ECE Secretariat by the HELCOM Contracting Parties and compiled by EMEP/MSC-W. The methodology for data collection is based on combination of emission measurements and emission estimates based on activity data and emission factors. The atmospheric depositions of oxidized and reduced nitrogen are calculated with the latest version of EMEP/MSC-W model in Oslo. The latest available official emission data for the HELCOM countries are used in the model computations. Both official data and expert estimates were used for modeling atmospheric transport and deposition of nitrogen compounds to the Baltic Sea. Atmospheric depositions of oxidized and reduced nitrogen were computed for the entire EMEP domain, which includes Baltic Sea basin and catchment. EMEP/MSC-W model is a multi-pollutant, three-dimensional Eulerian model which takes into account processes of emission, advection, turbulent diffusion, chemical transformations, wet and dry depositions and inflow of pollutants into the model domain. Complete description of the model and its applications is available on the EMEP web. Calculations of atmospheric transport and depositions of nitrogen compounds are performed annually two years in arrears on the basis of emission data officially submitted by Parties to CLRTAP Convention and expert estimates. The chemical Transport Model EMEP/ MSC-W is used. For more information: Simpson, D., Benedictow, A., Berge, H., Bergstrom, R., Emberson, L.D., Fagerli, H.,Flechard, C.R., Hayman, G.D., Gauss, M., Jonson, J.E., Jenkin, M.W., Nyri, A, Richter,C., Semeena, V.S, Tsyro, S., Tuovinen, J.-P., Valdebenito,A., and Wind, P., The EMEP MSC-W chemical transport model technical description. Atmospheric Chem-istry and Physics, 12, 7825-7865

QA/QC	There are gaps in time series of national emissions which have to be corrected by experts. No official information about the uncertainty of provided nitrogen emission data have been sent to EMEP from both EMEP and HELCOM Contracting Parties and hence further work on emission uncertainty is required. Submitted emissions data are passing through QA/QC procedure and stored in the EMEP Centre for Emission inventories and Projections (CEIP) in Vienna, Austria. Reviews about the consistency, comparability and trends of national inventories are available at CEIP. There are gaps in time series of national emissions which have to be corrected by experts. The results of the EMEP Unified model are routinely compared with available measurements at EMEP and HELCOM stations. The comparison of calculated versus measured data indicates that the model predicts the observed air concentrations of nitrogen within the accuracy of approximately 30%. Further work is required on reducing uncertainties in emission data and better parameterization of physical processes in the EMEP Unified model.
Frequency	Every year
Spatial Scope	EMEP uses a 50×50 km grid cell for calculation of deposition and input data are also aggregated using the PLC water sub-basin division to allow for harmonized HELCOM pollution load assessments covering both air- and waterborne inputs.
Spatial resolution	50×50 km grid

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	Data on atmospheric deposition of nitrogen is needed to assess the amount of nutrient input to the sea to allow for follow-up of effectiveness of implemented measures (under e.g. BSAP, Gothenburg Protocol, National Emission Ceiling Directive), for the core pressure indicator on nutrient inputs as well as follow-up of progress towards the agreed BSAP country-wise nutrient reduction targets (CART). Pressure data should also be useable for HELCOM holistic assessments (i.e. pressure index). Deposition data is calculated as total annual inputs per 50*50 km grid (available via the EMEP website). (EMEP Steering Body has decided to have this 0.1x0.1 degree grid as the official reporting resolution by 2017 where all countries are requested to deliver emission data in this resolution by then. So until then HELCOM submission will still be in 50km resolution, same as the official emission reporting submissions.)
Gaps	Air emission and atmospheric deposition monitoring are coordinated by EMEP. Although there are rather many stations, not all of those are measuring all components. Also not all stations have long time series. Not all national monitoring stations are included in the list of "HELCOM stations" but could be used by EMEP. According to EMEP there are some problems with the representativeness of the stations that cause challenges when verifying the EMEP model results. Thorough analysis of the monitoring data would improve the understanding of the development in the atmospheric deposition and also offer recommendations on how to improve and possibly expand monitoring.

Targets - Adequacy for assessment of progress with targets (Art. 10) (Q6b)

This section indicates whether the programme provides suitable and sufficient data and information to enable assessment of progress towards achievement of the relevant environmental targets (using indicators identified by MS under Art. 10).

Suitable and sufficient data?	Yes
Established methods for assessment?	Yes
Adequate capacity to perform assessments?	Yes
Will the data and information collected enable the regular updating of targets? (Q6c)	Yes

Description of Targets (Q6d)	The BSAP nutrient reduction scheme's maximum allowable inputs (MAI) of nutrients can be implemented by measures taken to reduce waterborne and airborne nutrient inputs. Also the effects of reductions in air emissions outside the HELCOM area (following implementation of Gothenburg Protocol) are expected to contribute to fulfillment of MAI. Annual datasets of contributions for different sources (countries and shipping) to N deposition to the Baltic, allows for follow-up of progress towards MAI and country-wise allocation of nutrient reduction (CART). It should be noted that the MAI (which can be considered as an "environmental target") does not include separate targets for waterborne and airborne inputs. Also the core pressure indicator on nutrient inputs combine airborne and nutrient inputs.
Gap-filling date Targets (Q6e)	Considered adequate in 2014
Plans for targets (Q6f)	Not applicable - targets exists.

Measures - nature of the activity and/or pressure covered by the programme (spatial distribution, frequency of activity)

How the monitoring is considered adequate to identify which activities and pressures that are causing environmental degradation and how it can help identifying new measures (Q7b)

Spatial distribution/extent of activity	EMEP Contracting Parties report emissions of heavy metals from different sources and these data are used to model deposition on the Baltic Sea. Data covers the whole EMEP domain. Allows assessment of the main contributors to the deposition to the Baltic Sea – of the substances listed in the parameters table.
Intensity of activity	Data on annual emissions reported by countries to EMEP annually
Temporal changes in activity	Data series available covering emissions and deposition since 1995
Type of activity (within broad category f, e.g. fisheries, tourism/recreation)	Emissions from e.g. industries, agriculture, combustion and other sources (more information in EMEP report)

Measures - Adequacy for assesssments of measures (Art. 13) (Q7e)

The monitoring supports assessment of follow up measures.

Adequate data?	Yes
Established methods for assessment?	Yes
Adequate understanding of GES?	No
Adequate capacity to perform assessments?	Yes
Addresses activities/pressures?	Yes
Addresses effectiveness of measures?	No
Gap-filling date Activities and Measures (Q7f)	Considered adequate in 2014 In time for the next assessment due in 2018

DATA PROVIDERS AND ACCESS

Data access point	EMEP Database
Data type (Q10c)	Processed Data sets, Modelled data
Data availability (Q10c)	EMEP website
Data access (Q10c)	Open access
INSPIRE standard (Q10c)	
When will data become available? (Q10c)	Results are approved at the EMEP steering group meetings in September (2 years in arrears)
Data update frequency (Q10c)	Yearly

Describe how the data and information from the programme will be made accessible to the EC/EEA	Data is available at EMEP website
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	Yes

REFERENCES

EMEP/MSC - W TECHNICAL REPORT 2 / 2013 as well as previous annual reports by EMEP to HELCOM

Baltic Sea Environment Fact Sheet on emissions and depositions of nitrogen

Recommendation 24-1 Monitoring of airborne pollution load

Monitoring programme: Contaminants
Programme topic: Inputs

SUB-PROGRAMME: CONTAMINANT INPUTS FROM ATMOSPHERE

TABLE OF CONTENTS

REGIONAL COORDINATION

The monitoring of this sub-programme is: **Fully coordinated.**

- Common monitoring guidelines: at EMEP
- Common quality assurance programme: at EMEP
- Common database: EMEP

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Hazardous substances
	Ecological objectives	Concentrations of hazardous substances close to natural levels
Marine strategy framework directive (MSFD)	Descriptors	D8 Contaminants
	Criteria (Q5a)	8.1 Concentration of contaminants
	Pressures and impacts (Q5c)	Contamination by hazardous substances: Introduction of synthetic compounds (e.g. priority substances under Directive 2000/60/EC which are relevant for the marine environment such as pesticides, antifoulants, pharmaceuticals, resulting, for example, from losses from diffuse sources, pollution by ships, atmospheric deposition and biologically active substances). Introduction of non-synthetic substances and compounds (e.g. heavy metals, hydrocarbons, resulting, for example, from pollution by ships and oil, gas and mineral exploration and exploitation, atmospheric deposition, riverine inputs), water abstraction).
Other legislation (Q8a)	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy 1998 Aarhus Protocol on Persistent Organic Pollutants (POPs) and Kiev Protocol on Pollutant Release and Transfer Registersof the UNECE Convention on Long-Range Transboundary Air Pollution (CLRTAP) Directive 2008/1/EC of the European Parliament and the Council concerning integrated pollution prevention and control; Minamanta Convention on Mercury	

Assessment of: (Q4k)		
State/Impacts		
Pressures	X	temporal trends, spatial distribution
Human activities causing the pressures	X	temporal trends, spatial distribution
Effectiveness of measures	X	temporal trends, spatial distribution

Scale of data aggregation for assessments: (Q10a)	
HELCOM assessment unit Level 1: Baltic Sea	
HELCOM assessment unit Level 2: Subbasin	
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	
Other: HELCOM PLC Sub-division	X

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
Regional	Cd	Input level of chemical/nutrient/pollutant from atmosphere	EMEP/MSC - W TECHNICAL REPORT 2 / 2013	Other	Monthly	EMEP grid 50x50 km	-			1998	All HELCOM Contracting Parties (modelling covers whole drainage area)
Regional	Pb	Input level of chemical/nutrient/pollutant from atmosphere	EMEP/MSC - W TECHNICAL REPORT 2 / 2013	Other	Monthly	EMEP grid 50x50 km	-			1998	All HELCOM Contracting Parties (modelling covers whole drainage area)
Regional	Hg	Input level of chemical/nutrient/pollutant from atmosphere	EMEP/MSC - W TECHNICAL REPORT 2 / 2013	Other	Monthly	EMEP grid 50x50 km	-			1998	All HELCOM Contracting Parties (modelling covers whole drainage area)
Regional	Dioxines / Furans	Input level of chemical/nutrient/pollutant from atmosphere	EMEP/MSC - W TECHNICAL REPORT 2 / 2013	Other	Monthly	EMEP grid 50x50 km	-			1998	All HELCOM Contracting Parties (modelling covers whole drainage area)

Brief description of monitoring

Full description in EMEP/MSC - W TECHNICAL REPORT 2 / 2013 (Appendix B).

Element / parameter	Cd / Input level of chemical/nutrient/pollutant from atmosphere Pb / Input level of chemical/nutrient/pollutant from atmosphere Hg / Input level of chemical/nutrient/pollutant from atmosphere Dioxines / Furans / Input level of chemical/nutrient/pollutant from atmosphere

Method	Annual total emissions of Pb, Cd, Hg and Dioxines/Furanes are officially reported every year to the UN ECE Secretariat by the HELCOM Contracting Parties and compiled by EMEP/MSC-E. The methodology for data collection is based on combination of emission measurements and emission estimates based on activity data and emission factors. The atmospheric depositions of Pb, Cd, Hg and Dioxines/Furanes are calculated with the latest version of EMEP/MSC-E Eulerian Heavy Metal transport model MSCE-HM in Moscow. The latest available official emission data for the HELCOM countries are used in the model computations. Both official data and expert estimates were used for modeling atmospheric transport and deposition of contaminants to the Baltic Sea. Atmospheric depositions of Pb, Cd, Hg and Dioxines/Furanes were computed for the entire EMEP domain, which includes Baltic Sea basin and catchment. EMEP/MSC-E Eulerian Heavy Metal transport model MSCE-HM'is a multi-pollutant, three-dimensional Eulerian model which takes into account processes of emission, advection, turbulent diffusion, chemical transformations, wet and dry depositions and inflow of pollutants into the model domain. Complete description of the model and its applications is available on the EMEP web. Calculations of atmospheric transport and depositions of Pb, Cd, Hg and Dioxines/Furanes are performed annually two years in arrears on the basis of emission data officially submitted by Parties to CLRTAP Convention and expert estimates.
QA/QC	There are gaps in time series of national emissions which have to be corrected by experts. No official information about the uncertainty of provided contaminants emission data have been sent to EMEP from both EMEP and HELCOM Contracting Parties and hence further work on emission uncertainty is required. Submitted emissions data are passing through QA/QC procedure and stored in the EMEP Centre for Emission inventories and Projections CEIP in Vienna, Austria. There are gaps in time series of national emissions which have to be corrected by experts. The results of the MSC-E Eulerian Heavy Metal transport model (MSCE-HM) are routinely compared with available measurements at EMEP and HELCOM stations. The comparison of calculated versus measured data indicates that the model predicts the observed air concentrations of Cadmium, Lead and Mercury within the accuracy of approximately 70%, 40% and 10% respectively with measured concentrations. PCDD/Fs are not regularly measured by the EMEP monitoring network. Evaluation of modelling results on PCDD/Fs against measurements was performed in framework of the studies of EMEP region pollution by dioxins and furans (Shatalov et al., 2012; Gusev et al., 2013). For this purpose available measurements made by various national and international campaigns reported in literature were used. It was found that the agreement between calculated and measured total PCDD/F toxicities was within a factor of two for more than 50% of available measurements atbackground locations. More detailed information on the comparison of model estimates and observed PCDD/F concentrations can be found in the EMEP Status Reports (Shatalov et al., 2012; Gusev et al., 2013). Further work is required on reducing uncertainties in emission data and better parameterization of physical processes in the EMEP Unified model.
Frequency	Every year
Spatial Scope	EMEP uses a 50×50 km grid cell for calculation of deposition and input data are also aggregated using the PLC water sub-basin division to allow for harmonized HELCOM pollution load assessments covering both air- and waterborne inputs.
Spatial resolution	Data from monitoring stations are used to validate and calibrate the deposition model. The spatial resolution of monitoring data are so scarce that only 6-14 stations provide data of the concentrations in air and precipitation for Hg, Pb and Cd. Dioxines are not regularly measured by EMEP monitoring network.

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	Data on atmospheric deposition of nitrogen is needed to assess the amount of nutrient input to the sea to allow for follow-up of effectiveness of implemented measures (under e.g. BSAP, Gothenburg Protocol, National Emission Ceiling Directive), for the core pressure indicator on nutrient inputs as well as follow-up of progress towards the agreed BSAP country-wise nutrient reduction targets (CART). Pressure data should also be useable for HELCOM holistic assessments (i.e. pressure index). Deposition data is calculated as total annual inputs per 50*50 km grid (available via the EMEP website). (EMEP Steering Body has decided to have this 0.1x0.1 degree grid as the official reporting resolution by 2017 where all countries are requested to deliver emission data in this resolution by then. So until then HELCOM submission will still be in 50km resolution, same as the official emission reporting submissions.)
Gaps	Air emission and atmospheric deposition monitoring are coordinated by EMEP. Although there are rather many stations, not all of those are measuring all components. Also not all stations have long time series. Not all national monitoring stations are included in the list of "HELCOM stations" but could be used by EMEP. According to EMEP there are some problems with the representativeness of the stations that cause challenges when verifying the EMEP model results. Thorough analysis of the monitoring data would improve the understanding of the development in the atmospheric deposition and also offer recommendations on how to improve and possibly expand monitoring.

Targets - Adequacy for assessment of progress with targets (Art. 10) (Q6b)

This section indicates whether the programme provides suitable and sufficient data and information to enable assessment of progress towards achievement of the relevant environmental targets (using indicators identified by MS under Art. 10).

Suitable and sufficient data?	Yes
Established methods for assessment?	Yes
Adequate capacity to perform assessments?	Yes
Will the data and information collected enable the regular updating of targets? (Q6c)	Yes
Description of Targets (Q6d)	There has been no formal agreement on targets for atmospheric deposition of hazardous substance. Annual deposition (including normalized input) are reported by EMEP to HELCOM annually. The Baltic Sea Environment Fact Sheet "Atmospheric deposition of heavy metals on the Baltic Sea" contains data on annual deposition and once targets are agreed on, appropriate figure(s) could be produced. No sufficient emission assessment or deposition modeling exist for numerous substances.
Gap-filling date Targets (Q6e)	Currently no plan
Plans for targets (Q6f)	There is a need to develop a HELCOM core indicator on inputs of contaminants and associated targets for such indicator. The contaminants input indicator may combine atmospheric and waterborne inputs into one report. There is no time table for development of such indicator or associated target.

Measures - nature of the activity and/or pressure covered by the programme (spatial distribution, frequency of activity)

How the monitoring is considered adequate to identify which activities and pressures that are causing environmental degradation and how it can help identifying new measures (Q7b)

Spatial distribution/extent of activity	EMEP Contracting Parties report emissions of heavy metals from different sources and these data are used to model deposition on the Baltic Sea. Data covers the whole EMEP domain. Allows assessment of the main contributors to the deposition to the Baltic Sea – of the substances listed in the parameters table.
Intensity of activity	Data on annual emissions reported by countries to EMEP annually
Temporal changes in activity	Data series available covering emissions and deposition since 1995
Type of activity (within broad category f, e.g. fisheries, tourism/recreation)	Emissions from e.g. industries, agriculture, combustion and other sources (more information in EMEP report)

Measures - Adequacy dor assesssments of measures (Art. 13) (Q7e)

The monitoring supports assessment of follow up measures.

Adequate data?	Yes
Established methods for assessment?	Yes
Adequate understanding of GES?	No
Adequate capacity to perform assessments?	Yes
Addresses activities/pressures?	Yes
Addresses effectiveness of measures?	Yes
Gap-filling date Activities and Measures (Q7f)	Considered adequate in 2014

DATA PROVIDERS AND ACCESS

Data access point	EMEP Database

Data type (Q10c)	Processed Data sets, Modelled data
Data availability (Q10c)	EMEP website
Data access (Q10c)	Open access
INSPIRE standard (Q10c)	
When will data become available? (Q10c)	Results are approved at the EMEP steering group meetings in September (2 years in arrears)
Data update frequency (Q10c)	Yearly
Describe how the data and information from the programme will be made accessible to the EC/EEA	Data is available at EMEP website
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	Yes

REFERENCES

EMEP/MSC - W TECHNICAL REPORT 2 / 2013 as well as previous annual reports by EMEP to HELCOM

Baltic Sea Environment Fact Sheet on emissions and depositions of heavy metals and PCDDF

Recommendation 24-1 Monitoring of airborne pollution load

Monitoring programme: Eutrophication
Programme topic: Inputs

SUB-PROGRAMME: NUTRIENT INPUTS FROM LANDBASED SOURCES

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **Fully coordinated.**

- Common monitoring guidelines:Waterborne Pollution Load Compilation (PLC) guidelines for monitoring and reporting of data.
- Common quality assurance programme: recommendations included in the PLC Guidelines.
- Common database: PLC database - presently being modernized by HELCOM PLUS project to improve data quality assurance and access via online we application.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Eutrophication
	Ecological objectives	Concentrations of nutrients close to natural levels
	Nutrient reduction scheme: Maximum Allowable Inputs (MAI) and Country-Allocated Reduction Targets (CART)	
Marine strategy framework directive (MSFD)	Descriptors	D5 Eutrophication
	Criteria (Q5a)	5.1 Nutrient levels
	Pressures and impacts (Q5c)	Nutrient and organic matter enrichment: Inputs of fertilisers and other nitrogen — and phosphorus-rich substances (e.g. from point and diffuse sources, including agriculture, aquaculture, atmospheric deposition. Inputs of organic matter (e.g. sewers, mariculture, riverine inputs).
	Activities (Q7a, Q7b)	Land based activities/industries: industry discharges Land based activities/industries: agricultural run-off Land based activities/industries: municipal waste water Uses Activities Other
Other relevant legislation (Q8a)	Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources. Council Directive 91/271/EEC concerning urban waste-water treatment. Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy. Directive 2008/1/EC of the European Parliament and the Council concerning integrated pollution prevention and control.	

Assessment of: (Q4k)		
State/Impacts		
Pressures	X	temporal trends, spatial distribution
Human activities causing the pressures	X	temporal trends, spatial distribution
Effectiveness of measures	X	temporal trends, spatial distribution

Scale of data aggregation for assessments: (Q10a)	
HELCOM assessment unit Level 1: Baltic Sea	
HELCOM assessment unit Level 2: Subbasin	
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	
Other: HELCOM PLC Sub-division	X

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
PLC	NTot	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	min. 12 times a year recommended	~300 monitored rivers and estimated 23 un-monitored areas in the Baltic Sea catchment			WFD TW	1994	Most of the CPs - missing only from some un-monitored areas
PLC	PTot	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	min. 12 times a year recommended	~300 monitored rivers and estimated 23 unmonitored areas in the Baltic Sea catchment			WFD TW	1994	Most of the CPs - missing only from some unmonitored areas
PLC	Water discharge	Freshwater input rates from rivers		Other	min. 12 times a year recommended	~300 monitored rivers and estimated 23 unmonitored areas in the Baltic Sea catchment			WFD TW	1994	Most of the CPs - missing only from some unmonitored areas
PLC	NH4-N	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	min. 12 times a year recommended	~300 monitored rivers and estimated 23 unmonitored areas in the Baltic Sea catchment			WFD TW	1994	Most of the CPs - missing only from some unmonitored areas
PLC	NO2-N	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	min. 12 times a year recommended	~300 monitored rivers and estimated 23 unmonitored areas in the Baltic Sea catchment			WFD TW	1994	Most of the CPs - missing only from some unmonitored areas
PLC	NO23-N	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	min. 12 times a year recommended	~300 monitored rivers and estimated 23 unmonitored areas in the Baltic Sea catchment (can be reported as sum of NO2 and NO3)				1994	Most of the CPs - missing only from some unmonitored areas
PLC	NO3-N	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	min. 12 times a year recommended	~300 monitored rivers and estimated 23 unmonitored areas in the Baltic Sea catchment			WFD TW	1994	Most of the CPs - missing only from some unmonitored areas

PLC	PO4-P	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	min. 12 times a year recommended	~300 monitored rivers and estimated 23 unmonitored areas in the Baltic Sea catchment	WFD TW	1994	Most of the CPs - missing only from some unmonitored areas
PLC	Ntot	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	Large point sources: 12 Small point sources: 2-6	Direct Municipal wastewater treatment plants (MWWTP), either individually or as aggregated			All HELCOM Contracting Parties
PLC	Ptot	Input level of chemical/nutrient/pollutant from land-based sources	PLC Water Guidelines	Other	Large point sources: 12 Small point sources: 2-6	Direct Municipal wastewater treatment plants (MWWTP), either individually or as aggregated			All HELCOM Contracting Parties
PLC	PO4-P	Input level of chemical/nutrient/pollutant from land-based sources	PLC Water Guidelines	Other	Large point sources: 12 Small point sources: 2-6	Direct Municipal wastewater treatment plants (MWWTP), either individually or as aggregated			Only partially reported – often missing
PLC	NH4-N	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	Large point sources: 12 Small point sources: 2-6	Direct Municipal wastewater treatment plants (MWWTP), either individually or as aggregated			Only partially reported – often missing
PLC	BOD5/7	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	Large point sources: 12 Small point sources: 2-6	Direct Municipal wastewater treatment plants (MWWTP), either individually or as aggregated			Only partially reported – often missing
PLC	FLOW	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	Large point sources: 12 Small point sources: 2-6	Direct Municipal wastewater treatment plants (MWWTP), either individually or as aggregated			Most of the Contracting Parties
PLC	Ntot	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	Large point sources: 12 Small point sources: 2-6	Direct Industrial plants (INDUSTRY), either individually or as aggregated			All HELCOM Contracting Parties
PLC	Ptot	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	Large point sources: 12 Small point sources: 2-6	Direct Industrial plants (INDUSTRY), either individually or as aggregated			All HELCOM Contracting Parties
PLC	FLOW	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	Large point sources: 12 Small point sources: 2-6	Direct Industrial plants (INDUSTRY), either individually or as aggregated			Most of the Contracting Parties

PLC	Ntot	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	Large point sources: 12 Small point sources: 2-6	Direct Fish farm (FISH FARM) either individually or as aggregated		Most of the Contracting Parties
PLC	Ptot	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	Large point sources: 12 Small point sources: 2-6	Direct Fish farm (FISH FARM) either individually or as aggregated		Most of the Contracting Parties
PLC	BOD5/7	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	Large point sources: 12 Small point sources: 2-6	Direct Fish farm (FISH FARM) either individually or as aggregated		Only partially reported - often missing
PLC	Ntot	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	Every 6 years	Loads by sources (diffuse and point sources) of ~300 monitored rivers and estimated 23 unmonitored areas in the Baltic Sea catchment		Most of the Contracting Parties
PLC	Ptot	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	Every 6 years	Loads by sources (diffuse and point sources) of ~300 monitored rivers and estimated 23 unmonitored areas in the Baltic Sea catchment		Most of the Contracting Parties
PLC	Ntot	Other parameter	PLC Water Guidelines	Other	Every 6 years	Retention of ~300 monitored rivers and estimated 23 unmonitored areas in the Baltic Sea catchment		Most of the Contracting Parties
PLC	Ptot	Other parameter	PLC Water Guidelines	Other	Every 6 years	Retention of ~300 monitored rivers and estimated 23 unmonitored areas in the Baltic Sea catchment		Most of the Contracting Parties

Brief description of monitoring

Element / parameter	**Annual nutrient loads, loads of organic matter, water discharges and river flows/ Input level of chemical/nutrient/pollutant from land-based sources (annually reported)**
Method	Parameters have been monitored from rivers as well as from direct point sources. Inputs from unmonitored areas are estimated. Annual total loads of nitrogen, phosphorus and their fractions are reported every year by the HELCOM Contracting Parties and compiled by the PLC Data Manager at the Marine Research Centre, Finnish Environment Institute (MK/SYKE). The data collection is based on combination of monitored data (measurements at monitoring stations close to river mouth) and estimates of unmonitored areas. Monitored data are collected on flows and concentrations and total loads calculated. The estimates of unmonitored areas are based on proportion calculations of surfaces of monitored and unmonitored areas and monitored loads. These estimates / calculations have been carried out by the CPs.

QA/QC	No official information about the uncertainty of nutrient loads, loads of organic matter or flow data have been reported to HELCOM (PLC Data Manager). Further work on input uncertainty is required. The QA/QC procedure are being developed when modernizing the PLC data base (HELCOM PLUS). There are gaps in time series of national inputs which will be corrected by HELCOM LOAD Core Group. National sampling QA/QC, coordinated HELCOM QA/QC for input calculations.
Frequency	Annual reporting of river catchments are based on continuous flow and weekly/monthly concentration (a few time a year) concentration analysis. Sampling frequency of point sources varies from continuous to occasional sampling. Frequency 1/year to 1/week. An overview of monitoring by Contracting Parties in 2012 was compiled by the PLC-6 project.
Spatial Scope	Covers most of the inputs from the drainage area divided by nine Baltic Sea sub-basins (based on the PLC division).
Spatial resolution	Reported by country, sub-basin and river catchment. Point sources as either as aggregated by sub-basin and by country or by river catchment and as best point sources are reported individually with known location. This varies between the Contracting Parties.

Element / parameter	**Ntot and Ptot / Input level of chemical/nutrient/pollutant from land-based sources (reported periodically)**
Method	For periodic assessments, the total N and total P are reported by sources, i.e. diffuse sources (agriculture, scattered dwellings, atmospheric deposition to fresh water, storm water and overflow and natural background load) and from point sources (MWWTP, INDUSTRY and Fish farm). Periodic nutrient loads by sources have been calculated by well-known and described methods or by using a country specific method.
QA/QC	No official information about the uncertainty of nutrient loads have been reported to HELCOM (PLC Data Manager). Further work on input uncertainty is required. The QA/QC procedure are being developed when modernizing the PLC data base (HELCOM PLUS). There are gaps in time series of national inputs which will be corrected by HELCOM LOAD Core Group. National sampling QA/QC, coordinated HELCOM QA/QC for input calculations.
Frequency	Based on calculations and periodically carried out every six years (next assessment (PLC-6) will be based on data collected during 2012 (Gemany and Poland) and 2014 (all other Contracting Parties).
Spatial Scope	Covers most of the inputs from the drainage area divided by nine Baltic Sea sub-basins (based on the PLC division).
Spatial resolution	Reported by country, sub-basin and river catchment. Point sources as either as aggregated by sub-basin and by country or by river catchment and as best individually with location. This varies between the Contracting Parties.

Element / parameter	**Retention of nutrients (periodically) / other parameter**
Method	Nutrient retention have been calculated by either well-known and described methods or by using a country specific method.
QA/QC	No official information about the uncertainty of nutrient retention has been reported to HELCOM (PLC Data Manager). The QA/QC procedure are being developed when modernizing the PLC data base (HELCOM PLUS). There are gaps in time series of national inputs which will be corrected by HELCOM LOAD Core Group. National sampling QA/QC, coordinated HELCOM QA/QC for input calculations
Frequency	Based on calculations and periodically carried out every six years(of 2012/2014 data).
Spatial Scope	Covers most of the inputs from the drainage area divided by nine Baltic Sea sub-basins (based on the PLC division).
Spatial resolution	Reported by country, sub-basin and river catchment.

Assessment of natural variability (Q5e)

A description of the methodology used for normalizing input data is given in the PLC-5 report (BSEP 128), and the PLC-6 project has produced a report on statistical methods to calculate uncertainties on national datasets including methodology for filling in data gaps and missing data and development of standardized methodology for evaluating countries progress in fulfilling BSAP nutrient reduction targets.

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	Data on waterborne inputs of nutrients are needed to assess the amount of nutrient input to the sea to allow for follow-up of effectiveness of implemented measures (under e.g. river basin management plans, BSAP), for the core pressure indicator on nutrient inputs as well as follow-up of progress towards the agreed BSAP country-wise nutrient reduction targets (CART). Pressure data should also be useable for HELCOM holistic assessments (i.e. pressure index). Regular annual reporting of waterborne nutrient inputs is needed from all Contracting Parties in order to ensure a reliable MAI/CART follow-up scheme.
Gaps	There are gaps in data reported by Contracting Parties to the HELCOM PLC database. PLC projects have on a case-by-case basis filled in data gaps, but this is time consuming and requires separate endorsement of the data by the countries. A description of the latest PLC dataset (for PLC-5.5) is given in chapter 1.2 in BSEP 141.

Targets - Adequacy for assessment of progress with targets (Art. 10) (Q6b)

This section indicates whether the programme provides suitable and sufficient data and information to enable assessment of progress towards achievement of the relevant environmental targets (using indicators identified by MS under Art. 10).

Suitable and sufficient data?	Yes
Established methods for assessment?	Yes
Adequate capacity to perform assessments?	Yes
Will the data and information collected enable the regular updating of targets? (Q6c)	Yes
Description of Targets (Q6d)	The BSAP nutrient reduction scheme's maximum allowable inputs (MAI) of nutrients can be implemented by measures taken to reduce waterborne and airborne nutrient inputs. Also the effects of reductions in air emissions outside the HELCOM area (following implementation of Gothenburg Protocol) are expected to contribute to fulfillment of MAI. Annual datasets of contributions for different sources (countries and shipping) to N deposition to the Baltic, allows for follow-up of progress towards MAI and country-wise allocation of nutrient reduction (CART). It should be noted that the MAI (which can be considered as an "environmental targets") does not include separate targets for waterborne and airborne inputs. Also the core pressure indicator on nutrient inputs combine airborne and nutrient inputs.
Gap-filling date Targets (Q6e)	Considered adequate in 2014
Plans for targets (Q6f)	Not applicable. Targets exist.

Measures - nature of the activity and/or pressure covered by the programme (spatial distribution, frequency of activity)

How the monitoring is considered adequate to identify which activities and pressures that are causing environmental degradation and how it can help identifying new measures (Q7b)

Spatial distribution/extent of activity	The next periodic PLC assessment (PLC-6) will assess inputs from point sources, monitored and unmonitored areas in 2014 (2012 for DE and PL). Countries will also report calculated inputs from different sources within the Baltic Sea catchment area, e.g. point sources (WWTP, industry, fish farms), diffuse (agriculture, scattered swellings, storm waters, atmospheric deposition), and natural background sources.

Intensity of activity	By assessing the contribution of different sources to the inputs as well as trend in inputs from different sources, it is possible to identify where measures have resulted in reduced inputs and where there is still potential to reduce pollution.
Temporal changes in activity	Data series available covering emissions and deposition since 1994
Type of activity (within broad category f, e.g. fisheries, tourism/recreation)	Municipalities, industry, agriculture, fish farms

Measures - Adequacy dor assesssments of measures (Art. 13) (Q7e)

The monitoring supports assessment of follow up measures.

Adequate data?	Yes
Established methods for assessment?	Yes
Adequate understanding of GES?	Yes
Adequate capacity to perform assessments?	Yes
Addresses activities/pressures?	Yes
Addresses effectiveness of measures?	No
Gap-filling date Activities and Measures (Q7f)	Considered adequate in 2014 NOTE: Already “adequate” but can be improved. The imlpementation of the new HELCOM PLUS database is expected to improve data reporting by Contracting Parties as well as facilitate filling in of data gaps.

Assessment of natural variability (Q5e)

Quantitative.

DATA PROVIDERS AND ACCESS

Data access point	HELCOM PLC
Data type (Q10c)	Processed data sets, Modelled data: Total inputs are estimated based on measurements, modelling is used for periodic assessments of e.g. inputs from diffuse sources
Data availability (Q10c)	The HELCOM PLUS project is modernizing the PLC database and developing a web application to allow for improved access to the PLC data (to be ready in late 2016)
Data access (Q10c)	Open (moratorium for quality checking and verifying data)
INSPIRE standard (Q10c)	
When will data become available? (Q10c)	Data reporting deadline is 31 October each year (e.g. 2012 data should be reported by 31 Oct 2013). For periodic assessments, reporting of monitored data is also 31 October, but modelled results should be reported by the end of the year (31 December).
Data update frequency (Q10c)	Yearly, Every 6 years
Describe how the data and information from the programme will be made accessible to the EC/EEA	Currently an MS Access database containing the data is hosted by the Database Manager Finnish Environment Institute (SYKE). The on-going HELCOM PLUS project is working to transfer the database to an SQL database and building a web interface to allow for reporting and quality checking of the data as well as open access for viewing and downloading approved datasets.
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	Yes, e.g. BSEP128 Fifth Baltic Sea Pollution Load Compilation (PLC-5).

REFERENCES

Review of the Fifth Baltic Sea Pollution Load Compilation for the 2013 HELCOM Ministerial Meeting (2013) (BSEP 141)

Fifth Baltic Sea Pollution Load Compilation (PLC-5) An Executive Summary (BSEP 128A)

Fifth Baltic Sea Pollution Load Compilation (2011) (BSEP 128)

Recommendation 26-2 Compilation of waterborne pollution load (PLC Water)

Monitoring programme: Contaminants
Programme topic: Inputs

SUB-PROGRAMME: CONTAMINANT INPUTS FROM LANDBASED SOURCES

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **Fully coordinated.**

- Common monitoring guidelines: Waterborne Pollution Load Compilation (PLC) guidelines for monitoring and reporting of data.
- Common quality assurance programme: recommendations included in the PLC Guidelines.
- Common database: PLC database - presently being modernized by HELCOM PLUS project to improve data quality assurance and access via online we application.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Hazardous substances
	Ecological objectives	Concentrations of hazardous substances close to natural levels
Marine strategy framework directive (MSFD)	Descriptors	D8 Contaminants
Other relevant legislation (Q8a)	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy	
	1998 Aarhus Protocol on Persistent Organic Pollutants (POPs) and Kiev Protocol on Pollutant Release and Transfer Registersof the UNECE Convention on Long-Range Transboundary Air Pollution (CLRTAP)	
	Directive 2008/1/EC of the European Parliament and the Council concerning integrated pollution prevention and control	
	Minamanta Convention on Mercury	

Assessment of: (Q4k)

State/Impacts		
Pressures	X	temporal trends, spatial distribution
Human activities causing the pressures	X	temporal trends, spatial distribution
Effectiveness of measures	X	temporal trends, spatial distribution

Scale of data aggregation for assessments: (Q10a)

HELCOM assessment unit Level 1: Baltic Sea	
HELCOM assessment unit Level 2: Subbasin	
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	
Other: HELCOM PLC Sub-division	X

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
PLC	Cd	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	min. 12 times a year recommended	~300 monitored rivers and estimated 23 unmonitored areas in the BS catchment		8.1.1 Concentration of contaminants	WFD TW	1994	Not all CPs, i.e., several years missing of different CPs
PLC	Hg	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	min. 12 times a year recommended	~300 monitored rivers and estimated 23 unmonitored areas in the BS catchment		8.1.1 Concentration of contaminants	WFD TW	1994	Not all CPs, i.e., several years missing of different CPs
PLC	Pb	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	min. 12 times a year recommended	~300 monitored rivers and estimated 23 unmonitored areas in the BS catchment		8.1.1 Concentration of contaminants	WFD TW	1994	Not all CPs, i.e., several years missing of different CPs
PLC	Cd	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	12 times a year recommended	Direct MWWTPs (>10.000 PE) either individually or as aggregated		8.1.1 Concentration of contaminants	WFD TW	1994	Not all CPs, i.e., several years missing of different CPs
PLC	Hg	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	12 times a year recommended	Direct MWWTPs (>10.000 PE) either individually or as aggregated		8.1.1 Concentration of contaminants	WFD TW	1994	Not all CPs, i.e., several years missing of different CPs
PLC	Pb	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	12 times a year recommended	Direct MWWTPs (>10.000 PE) either individually or as aggregated		8.1.1 Concentration of contaminants	WFD TW	1994	Not all CPs, i.e., several years missing of different CPs
PLC	Zn	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	12 times a year recommended	Direct MWWTPs (>10.000 PE) either individually or as aggregated		8.1.1 Concentration of contaminants	WFD TW	1994	Not all CPs, i.e., several years missing of different CPs
PLC	Cu	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	12 times a year recommended	Direct MWWTPs (>10.000 PE) either individually or as aggregated		8.1.1 Concentration of contaminants	WFD TW	1994	Not all CPs, i.e., several years missing of different CPs
PLC	Ni	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	12 times a year recommended	Direct MWWTPs (>10.000 PE) either individually or as aggregated		8.1.1 Concentration of contaminants	WFD TW	1994	Not all CPs, i.e., several years missing of different CPs

PLC	Cr	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	12 times a year recommended	Direct MWWTPs (>10.000 PE) either individually or as aggregated	8.1.1 Concentration of contaminants	WFD TW	1994	Not all CPs, i.e., several years missing of different CPs
PLC	Cd	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	Large point sources: 12 Small point sources: 2-6	Direct INDUSTRY either individually or as aggregated	8.1.1 Concentration of contaminants	WFD TW	1994	Not all CPs, i.e., several years missing of different CPs
PLC	Hg	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	Large point sources: 12 Small point sources: 2-6	Direct INDUSTRY either individually or as aggregated	8.1.1 Concentration of contaminants	WFD TW	1994	Not all CPs, i.e., several years missing of different CPs
PLC	Pb	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	Large point sources: 12 Small point sources: 2-6	Direct INDUSTRY either individually or as aggregated	8.1.1 Concentration of contaminants	WFD TW	1994	Not all CPs, i.e., several years missing of different CPs
PLC	Zn	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	Large point sources: 12 Small point sources: 2-6	Direct INDUSTRY either individually or as aggregated	8.1.1 Concentration of contaminants	WFD TW	1994	Not all CPs, i.e., several years missing of different CPs
PLC	Cu	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	Large point sources: 12 Small point sources: 2-6	Direct INDUSTRY either individually or as aggregated	8.1.1 Concentration of contaminants	WFD TW	1994	Not all CPs, i.e., several years missing of different CPs
PLC	Ni	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	Large point sources: 12 Small point sources: 2-6	Direct INDUSTRY either individually or as aggregated	8.1.1 Concentration of contaminants	WFD TW	1994	Not all CPs, i.e., several years missing of different CPs
PLC	Cr	Input level of chemical/ nutrient/ pollutant from land-based sources	PLC Water Guidelines	Other	Large point sources: 12 Small point sources: 2-6	Direct INDUSTRY either individually or as aggregated	8.1.1 Concentration of contaminants	WFD TW	1994	Not all CPs, i.e., several years missing of different CPs

Brief description of monitoring

Element / parameter	**Annual total loads of heavy metals / Input level of chemical/nutrient/pollutant from land-based sources**
Method	The methodology for data collection is based on combination of monitored discharges and concentration measurements at fixed stations and estimates of unmonitored areas based on surface areas and loads of respective monitored areas. Flow data on a daily basis and concentrations from a few samples to once a month and as maximum weekly samples.
QA/QC	There are gaps in time series of national reporting which haven't been amended by experts. No official information about the uncertainty of provided heavy metal load data have been sent to the Data manager by the HELCOM Contracting Parties and hence further work on uncertainty is required. In many cases heavy metal concentrations are below the limit of detections and therefore not reported.

Frequency	Frequency 1/year to 1/week. An overview of monitoring by Contracting Parties in 2012 was compiled by the PLC-6 project.
Spatial Scope	PLC monitoring takes place in the terrestrial catchment area and covers inputs to the entire Baltic Sea. Coverage of most of the catchment of the Baltic Sea: Monitored rivers and unmonitored areas and direct point source loads.
Spatial resolution	Reported by country, sub-basin and river catchment. Point sources as either as aggregated by sub-basin and by country or by river catchment and as best point sources are reported individually with known location. This varies between the Contracting Parties.

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	Data on waterborne inputs of hazardous substances are needed to assess the amount of inputs to the Baltic Sea. These can be used to identify pollution hot spots, assess the effectiveness of measures taken to reduce pollution loads (e.g. implementation of BSAP, HELCOM Recommendations, WFD river basin management plans and other international requirements). The data are presently used for HELCOM pollution load assessments and the intention is to in the near future develop a core pressure indicator on inputs of contaminants. Pressure data should also be useable for HELCOM holistic assessments (i.e. pressure index).
Gaps	Typically missing are: 1) individual parameters of some sources (not analyzed by the CP as they are not nationally mandatory parameters or obliged to report by polluter) 2) National reporting for loads on Unmonitored areas have not been established and no reporting occurred.

Targets - Adequacy for assessment of progress with targets (Art. 10) (Q6b)

This section indicates whether the programme provides suitable and sufficient data and information to enable assessment of progress towards achievement of the relevant environmental targets (using indicators identified by MS under Art. 10).

Suitable and sufficient data?	No
Established methods for assessment?	Yes
Adequate capacity to perform assessments?	Yes
Will the data and information collected enable the regular updating of targets? (Q6c)	Yes
Description of Targets (Q6d)	There has been no formal agreement on targets for waterborne inputs of hazardous substance. Contracting Parties report total inputs of selected hazardous substance on a anual basis. These data have been assessed in the periodic PLC reports (e.g. PLC-4 and PLC-5). A core indicator on inputs of hazardous substances should be developed - once targets are agreed on, appropriate figure(s) could be produced. It should be noted however that data quality is questionable and hence the uncertainty high. No sufficient emission assessment or deposition modeling exist for numerous substances.
Gap-filling date Targets (Q6e)	Currently no concrete plan
Plans for targets (Q6f)	There is a need to develop a HELCOM core indicator on inputs of contaminants and associated targets for such indicator. The contaminants input indicator may combine atmospheric and waterborne inputs into one report. There is no time table for development of such indicator or associated target.

Measures - nature of the activity and/or pressure covered by the programme (spatial distribution, frequency of activity)

How the monitoring is considered adequate to identify which activities and pressures that are causing environmental degradation and how it can help identifying new measures (Q7b)

Spatial distribution/extent of activity	The PLC monitoring programme covers inputs of selected hazardous substances from the Baltic Sea catchment area.
Intensity of activity	Annual reporting of total inputs by countries to the PLC data manager
Temporal changes in activity	Data series covering waterborne inputs since 1994 (with data missing from some countries for some years)
Type of activity (within broad category f, e.g. fisheries, tourism/recreation)	Inputs from via rivers and point sources (e.g. industry, WWTP)

Measures - Adequacy dor assesssments of measures (Art. 13) (Q7e)

The monitoring supports assessment of follow up measures.

Adequate data?	Yes
Established methods for assessment?	No
Adequate understanding of GES?	No
Adequate capacity to perform assessments?	Yes
Addresses activities/pressures?	Yes
Addresses effectiveness of measures?	Yes
Gap-filling date Activities and Measures (Q7f)	Currently no concrete plan

Assessment of natural variability (Q5e)

No systematic trend analysis has been made on waterborne inputs of heavy metals due to the poor quality of data.

DATA PROVIDERS AND ACCESS

Data access point	HELCOM PLC
Data type (Q10c)	Processed data sets, modelled data: Total inputs are estimated based on measurements, modelling is used for periodic assessments of e.g. estimating inputs from unmonitored
Data availability (Q10c)	The HELCOM PLUS project is modernizing the PLC database and developing a web application to allow for improved access to the PLC data (to be ready in late 2016)
Data access (Q10c)	Open access
INSPIRE standard (Q10c)	
When will data become available? (Q10c)	Data series from 1994, annual reporting deadline is on 31 October.
Data update frequency (Q10c)	Yearly
Describe how the data and information from the programme will be made accessible to the EC/EEA	Currently an MS Access database containing the data is hosted by the Database Manager Finnish Environment Institute (SYKE). The on-going HELCOM PLUS project is working to transfer the database to an SQL database and building a web interface to allow for reporting and quality checking of the data as well as open access for viewing and downloading approved datasets.
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	Yes

REFERENCES

Review of the Fifth Baltic Sea Pollution Load Compilation for the 2013 HELCOM Ministerial Meeting (2013) (BSEP 141)

Fifth Baltic Sea Pollution Load Compilation (PLC-5) An Executive Summary (BSEP 128A)

Fifth Baltic Sea Pollution Load Compilation (2011) (BSEP 128)

Recommendation 26-2 Compilation of waterborne pollution load (PLC Water)

Monitoring programme: Contaminants
Programme topic: Inputs

SUB-PROGRAMME: ACUTE POLLUTION

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **Fully coordinated**

The monitoring and data reporting are coordinated by the HELCOM Informal Working Group on Aerial Surveillance (HELCOM IWGAS) which works to implement the aerial surveillance cooperation as laid down in Chapter 7, Part 1 of the HELCOM Response Manual.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Maritime activities
	Ecological objectives	No illegal pollution
Marine strategy framework directive (MSFD)	Descriptors	D8 Contaminants
	Criteria (Q5a)	8.1 Concentration of contaminants
	Pressures and impacts (Q5c)	Introduction of non-synthetic substances and compounds (e.g. heavy metals, hydrocarbons, resulting, for example, from pollution by ships and oil, gas and mineral exploration and exploitation, atmospheric deposition, riverine inputs), water abstraction).
	Activities (Q7a, Q7b)	Transport: Shipping
Other relevant legislation (Q8a)	Bonn Agreement (Agreement for cooperation in dealing with pollution of the North Sea by oil and other harmful substances)	

Assessment of: (Q4k)		
State/Impacts	X	temporal trends, spatial distribution, state classification
Pressures	X	temporal trends, spatial distribution, state classification
Human activities causing the pressures	X	temporal trends, spatial distribution, state classification
Effectiveness of measures	X	temporal trends, spatial distribution, state classification

Scale of data aggregation for assessments: (Q10a)	
HELCOM assessment unit Level 1: Baltic Sea	X
HELCOM assessment unit Level 2: Subbasin	
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	
Other	

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
RESPONSE	Mineral oil	Input level of chemical/ nutrient/ pollutant from sea-based sources	HELCOM RESPONSE Manual Vol 1	Other	Other	Baltic Sea		8.1.1 Concentration of contaminants	EEZ	1988	All Baltic Sea coastal states have agreed to participate in the collaboration to the best of their ability.

Brief description of monitoring

Full description in HELCOM RESPONSE Manual.

Element / parameter	**Mineral oil / Input level of chemical/nutrient/pollutant from sea-based sources**
Method	See HELCOM RESPONSE Manual Volume 1, Chapter 7
QA/QC	The volume of the spills confirmed/observed as mineral oil is calculated using the Bonn Agreement Oil Appearance Code (BAOAC). The minimum value is reported.
Frequency	According to the HELCOM RESPONSE Manual Volume 1, Chapter 7, all Baltic Sea coastal states should endeavor to fly - as a minimum - twice per week over regular traffic zones including approaches to major sea ports as well as in regions with regular offshore activities. Other regions with sporadic traffic and fishing activities should be covered once per week. In general more flights are conducted during daylight compared to darkness. Coordinated Extended Pollution Control Operation (CEPCO) Flights are arranged yearly where surveillance aircraft of several countries adjoining the chosen CEPCO Flight routines have to maintain for 24 hours (or even more) a continuous surveillance flying along the prefixed flight patterns. In practice, some countries conduct more aerial surveillance than other countries.
Spatial Scope	According to the HELCOM RESPONSE Manual Volume 1, Chapter 7, each Baltic Sea coastal state operates at least in its own response region during regular national flights. In addition the States organise and participate in specific joint Coordinated Extended Pollution Control Operation (CEPCO) Flights in the Baltic Sea. Closer cooperation with neighbouring countries, within e.g. sub-regional agreements, is appreciated.
Spatial resolution	Vertical resolution varies among the sampling stations depending on bottom depth: (1) bottom to surface, (2) bottom to halocline, halocline to thermocline, thermocline to surface, (3) bottom to thermocline, thermocline to surface, (4) discrete depth layers (e.g. 100-60 m, 60-30 m, 30-0 m).

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	Data on accidental and illegal discharges of oil and other substances from sea-based sources is needed to assess input of contaminants to the sea to be able to follow up the effectiveness of enforcement of international regulations. Good progress is being made towards reaching the objective "no illegal discharges" of the BSAP. Baltic Sea costal states annually report the number of oil discharges observed in the Baltic Sea (Input quantity per area per time).
Gaps	For continuing efficient aerial surveillance in the Baltic Sea resources are needed for keeping up the regular flight frequency. Resources are also needed for renewing and overhaul of aircraft and necessary equipment. Improvements of existing remote sensing systems are needed so that they can function efficiently also at night and in bad weather conditions. Training is needed for aircrews and cooperation between countries will need to be improved even further, for example concerning diplomatic clearances. Sampling methods will need to be standardized to be able to use the information as evidence to court for the prosecution of offenders of oil discharge. As part of the existing monitoring, aerial surveillance could in the future also cover other substances than mineral oil.

Assessment of natural variability (Q5e)

Expert opinion. The volume of the spills confirmed/observed as mineral oil is calculated using the Bonn Agreement Oil Appearance Code (BAOAC).

Targets - Adequacy for assessment of progress with targets (Art. 10) (Q6b)

This section indicates whether the programme provides suitable and sufficient data and information to enable assessment of progress towards achievement of the relevant environmental targets (using indicators identified by MS under Art. 10).

Suitable and sufficient data?	Yes
Established methods for assessment?	Yes
Adequate capacity to perform assessments?	No
Will the data and information collected enable the regular updating of targets? (Q6c)	Yes
Description of Targets (Q6d)	Enforcement of international regulations – No illegal discharges Illegal discharges are defined as discharges violating the provisions of MARPOL Annex I (Regulations for the Prevention of Pollution from Oil), taking also into account the status of the Baltic Sea as a special area for the purposes of MARPOL Annex I. Please note that this allows for smaller operational discharges of oil (undiluted concentration up to 15 ppm) -presuming a number of conditions listed in MARPOL Annex I are met.
Gap-filling date Targets (Q6e)	Considered adequate in 2014
Plans for targets (Q6f)	No plan for additional targets.

Measures - nature of the activity and/or pressure covered by the programme (spatial distribution, frequency of activity)

How the monitoring is considered adequate to identify which activities and pressures that are causing environmental degradation and how it can help identifying new measures (Q7b)

Spatial distribution/extent of activity	According to the HELCOM Response Manual, Volume 1, Chapter 7, each Baltic Sea coastal state operates at least in its own response region during regular national flights. In addition the States organise and participate in specific joint Coordinated Extended Pollution Control Operation (CEPCO) Flights in the Baltic Sea.

Intensity of activity	According to the HELCOM Response Manual, Volume 1, Chapter 7, all Baltic Sea coastal states should endeavor to fly - as a minimum - twice per week over regular traffic zones including approaches to major sea ports as well as in regions with regular offshore activities. Other regions with sporadic traffic and fishing activities should be covered once per week. In general more flights are conducted during daylight compared to darkness. Coordinated Extended Pollution Control Operation (CEPCO) Flights are arranged yearly where surveillance aircraft of several countries adjoining the chosen CEPCO Flight routines have to maintain for 24 hours (or even more) a continuous surveillance flying along the prefixed flight patterns. In practice, some countries conduct more aerial surveillance than other countries.
Temporal changes in activity	Data series on mineral oil spills are available since 1988.
Type of activity (within broad category f, e.g. fisheries, tourism/recreation)	Shipping

Measures - Adequacy dor assesssments of measures (Art. 13) (Q7e)

The monitoring supports assessment of follow up measures.

Adequate data?	
Established methods for assessment?	
Adequate understanding of GES?	
Adequate capacity to perform assessments?	
Addresses activities/pressures?	
Addresses effectiveness of measures?	
Gap-filling date Activities and Measures (Q7f)	Considered adequate in 2014

DATA PROVIDERS AND ACCESS

Data access point	HELCOM Map and Data service
Data type (Q10c)	Processed Data sets
Data availability (Q10c)	HELCOM Map and Data service
Data access (Q10c)	Open access
INSPIRE standard (Q10c)	
When will data become available? (Q10c)	Annually, e.g. Year 2013 data by the second half of 2014.
Data update frequency (Q10c)	Yearly
Describe how the data and information from the programme will be made accessible to the EC/EEA	Open access to data at HELCOM Map and Data service, annual reports on aerial surveillance in the Baltic Sea.
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	Yes

References

HELCOM RESPONSE Manual

HELCOM Recommendation 34E/4

HELCOM Recommendation 28E/12

Home / Action areas / Monitoring and assessment / Monitoring manual / Concentration of contaminants

CONCENTRATIONS OF CONTAMINANTS

SUB-PROGRAMMES

Contaminants in water

Contaminants in sediment

Contaminants in biota

GENERAL INFORMATION

The monitoring of contaminant concentrations covers several chemical parameters in fish, shellfish, water and sediments. HELCOM core indicators for concentrations of hazardous substances include:

Hexabromocyclodocecane (HBCD), Perfluorooctane sulphonate (PFOS), Polychlorinated biphenyls (PCB) and dioxins and furans, Polyaromatic hydrocarbons and their metabolites, Metals (lead, cadmium and mercury), Radioactive substances: Caesium-137 in fish and surface waters, and Tributyltin (TBT) and imposex.

The programme covers all of the HELCOM core indicators related to hazardous substances, but not in all matrices and areas.

Sub-programme: Contaminants in water

HELCOM monitoring covers a wide range of contaminant concentrations in water including, but not limited to, metals, polybrominated diphenyl ethers (PBDEs), tributyltin (in ion form) and polychlorinated biphenyls (PCBs).

HELCOM Monitoring of radioactive substances monitoring (MORS) covers concentrations of radionuclides in seawater. Obligatory radionuclides include Cs-137 and Cs-134, if possible. Sr-90 should be monitored regularly, on a selected number of samples.

Sub-programme: Contaminants in sediment

HELCOM monitoring covers a wide range of contaminant concentrations in sediment including, but not limited to, metals, tributyltin (in ion form) and polychlorinated biphenyls (PCBs).

HELCOM Monitoring of radioactive substances (MORS) covers concentrations of radionuclides in sediment. Obligatory radionuclides include gamma-emitters (K-40, Cs-137 and other γ-emitters identified in the γ-spectrum).

Sub-programme: Contaminants in biota

HELCOM monitoring covers a wide range of contaminant concentrations in biota including, but not limited to, metals, tributyltin, polychlorinated biphenyls (PCBs), dioxins and furans. Finally, HELCOM monitoring is under development regarding these substances: hexabromocyclododecane (HBCD), perfluorooctane sulphonate (PFOS) and polybrominated diphenyl ethers (PBDEs).

Current monitoring on contaminants can theoretically be used to follow progress towards the HELCOM objective 'Fish safe to eat'. However, there is no specific monitoring programme for the objective and methodologies e.g. relating to species size, matrix, traceability of origin differ and the relationship between the two strands of monitoring has not been clarified yet.

HELCOM monitoring of radioactive substances covers oncentrations of radionuclides in biota including fish, aquatic plants and benthic animals. Obligatory radionuclides include gamma-emitters (K-40, Cs-137 and other relevant γ-emitters identified in the γ-spectrum).

RESPONSIBLE HELCOM SUBSIDIARY BODIES

HELCOM STATE*

HELCOM MORS Expert group (radioactive substances)

Contact information: HELCOM Secretariat

*Tentative name

Monitoring programme: Contaminants
Programme topic: Concentration of contaminants

SUB-PROGRAMME: CONTAMINANTS IN WATER

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **Partly coordinated**.

- Common monitoring guidelines: HELCOM COMBINE manual, MORS Guidelines, and different approaches e.g. CEMP manual, ICES guidelines, ISO/CEN standards (see References).
- Common quality assurance programme: HELCOM COMBINE manual, ISO/CEN standards and QUASIMEME.
  Radioactive substances: MORS Guidelines defines methodologies for sample treatment, analysis and intercomparison. Reported data is manually quality assured by the HELCOM Secretariat and results are reported and verified in annual MORS EG meetings.
- Common database: COMBINE, MORS.

There is no current plan for coordinated monitoring of contaminants in water, other than radionucleides, unless national EQS are established for another matrix.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Hazardous substances
	Ecological objectives	Concentrations of hazardous substances close to natural levels Radioactivity at pre-Chernobyl level
Marine strategy framework directive (MSFD)	Descriptors	D8 Contaminants
	Criteria (Q5a)	8.1 Concentration of contaminants
	Features (Q5c)	Other features: A description of the situation with regard to chemicals, including chemicals giving rise to concern, sediment contamination, hotspots, health issues and contamination of biota (especially biota meant for human consumption)
Other relevant legislation (Q8a)	Water Framework Directive	

Assessment of: (Q4k)

State/Impacts	X	temporal trends, spatial distribution, status classification
Pressures		
Human activities causing the pressures		
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)

HELCOM assessment unit Level 1: Baltic Sea	X
HELCOM assessment unit Level 2: Subbasin	X
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
Regional (COMBINE)	PCB	Concentration of chemical/nutrient/pollutant in water column	HELCOM COMBINE manual, PartD and different approaches e.g. CEMP manual, ICES guidelines, ISO/CEN standards (see References)	HELCOM COMBINE manual Part B, Annex B12, Appendix 1, ISO/CEN standards and QUASIMEME	Other. See "Brief description of monitoring"	No stations reported for the MORE project		8.1.1 Concentration of the contaminants measured in the relevant matrix	EEZ	DE: 2005 (also data from 1998) LT: 2010 LV: 2010 (data also from 1998 and 2005)	DE, LT, LV
Regional (COMBINE)	PAH	Concentration of chemical/nutrient/pollutant in water column	HELCOM COMBINE manual, PartD and different approaches e.g. CEMP manual, ICES guidelines, ISO/CEN standards (see References)	HELCOM COMBINE manual Annex B11, Appendix 1 and 2, ISO/CEN standards and QUASIMEME	LT 1 time per year (summer); from 2011 4 times per year (1 time per season)	EE: few places close to WWTP outfalls		8.1.1 Concentration of the contaminants measured in the relevant matrix	Coastal Waters, Terittorial waters, Transitional waters EEZ	LT: 2007	EE, LT
Regional (COMBINE)	Metals	Concentration of chemical/nutrient/pollutant in water column	HELCOM COMBINE manual, PartD and different approaches e.g. CEMP manual, ICES guidelines, ISO/CEN standards (see References)	HELCOM COMBINE manual Annex B11, Appendix 1 and 2, ISO/CEN standards and QUASIMEME	Other. See "Brief description of monitoring"	No stations reported for the MORE project		8.1.1 Concentration of the contaminants measured in the relevant matrix	EEZ	DE: 2005 (also data from 1998) FI: 1979 LT: 2007 LV: 2005 (data also from 1998) SE: 2005 (data also from 1998)	DE, FI, LT, LV, SE
National	PBDE	Concentration of chemical/nutrient/pollutant in water column	Different approaches e.g. CEMP manual, ICES guidelines, ISO/CEN standards (see References)	Other	Other			8.1.1 Concentration of the contaminants measured in the relevant matrix	EEZ	DE: 2011	DE
Other	Harmful and priority substances	Concentration of chemical/nutrient/pollutant in water column	ISO 5667-3, ISO 5667-9,	ISO TS 13530, ISO 11352, DIN EN ISO/IEC 17025	As needed	WWTP outfalls		8.1.1 Concentration of the contaminants measured in the relevant matrix	Coastal sea	2014	EE
Regional (MORS)	Radionuclides: Radiocesium and Sr-90	Concentration of chemical/nutrient/pollutant in water column	MORS Guidelines	MORS Guidelines	Yearly	See map for details	Radioactive substances: Cs-137 in fish and surface waters	8.1.1 Concentration of the contaminants measured in the relevant matrix	EEZ	1984	All HELCOM Contracting Parties

Brief description of monitoring

Full description in HELCOM COMBINE manual. Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	All contaminants / Concentration of chemical/pollutant in water column
Method	All contaminants listed are measured in the water column. Sampling and analytical methods are reported per sample and per parameter respectively. See HELCOM COMBINE manual. Finland monitors oil concentration in water in offshore stations in all the sub-basins yearly. The monitoring started in 1979.

QA/QC	See Part B Annex B11 of HELCOM COMBINE manual
Frequency	Varies from 1-2 to 24 samples/station/year, depending on country**.**
Spatial Scope	EEZ / Whole Baltic Sea for assessment
Spatial resolution	See map for details

Element / parameter	**PCB / Concentration of chemical/pollutant in water column**
Method	All contaminants listed are measured in the water column. Sampling and analytical methods are reported per sample and per parameter respectively. See HELCOM COMBINE manual.
QA/QC	See Part B Annex B11 of HELCOM COMBINE manual.
Frequency	Varies from 1-2 to 24 samples/station/year, depending on country. DE: regular sampling through: • BSH: May/June, Aug/Sept and Oct/Nov, annually • IOW: Jan/Feb and Jul/Aug, annually • LLUR: Jan/Feb and Jul/Aug, annually
Spatial Scope	EEZ / Whole Baltic Sea for assessment
Spatial resolution	Polychlorinated biphenyls (PCB) are measured in the Bay of Mecklenburg, Kiel Bay and Southern Baltic Proper.

Element / parameter	**Metals / Concentration of chemical/pollutant in water column**
Method	All contaminants listed here are measured in the water column. Sampling and analytical methods are reported per sample and per parameter respectively. See HELCOM COMBINE manual
QA/QC	See Part B Annex B11 of HELCOM COMBINE manual.
Frequency	Varies from 1-2 to 24 samples/station/year, depending on country. DE: regular sampling for metals as specified in the measuring programme: • BSH: Jan/Feb, Mar, Aug/Sep and Oct/Nov, annually • LLUR: Jan/Feb and Jul/Aug, annually
Spatial Scope	EEZ / Whole Baltic Sea for assessment
Spatial resolution	Metals are measured in the Southern Baltic Proper, Bay of Mecklenburg, Kiel Bay, Bothnian Bay, the Quark, Bothnian Sea, Archipelago Sea, Åland Sea, Northern Baltic Proper, Gulf of Finland.

Element / parameter	**Radionuclides / Concentration of chemical/pollutant in water column**
Method	Obligatory radionuclides: Radiocesium: Cs-137 and Cs-134, if possible. Sr-90. Voluntary radionuclides: H-3; Tc-99; Pu-239, 240; Am-241; natural radionuclides (e.g. Po-210) Sampling and analytical methods are reported per sample and per parameter respectively. See MORS Guidelines.
QA/QC	Quality assurance is a laboratory's whole sampling and analytical process from start to finish. MORS Guidelines define methodologies for sample treatment, analysis and intercomparison. Reported data is manually quality assured by HELCOM secretariat and results reported and verified in annual MORS EG meeting.
Frequency	Annual. DE: season: Aug/Sep and Jun/Jul
Spatial Scope	EEZ / Whole Baltic Sea for assessment
Spatial resolution	See map for details

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	Core indicators are primarily based on monitoring samples from biota, secondarily from sediments and lastly from water.
Gaps	Assessment of gaps has not been carried out.

Adequacy for assessment of GES (Q5d)

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

Adequate data?	Yes for determination of state. No for temporal changes.
Established methods for assessment?	Yes
Adequate understanding of GES?	Yes for metals i.e. EQS for metals in water.
Adequate capacity to perform assessments?	Nationally

Assessment of natural variability (Q5e)

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DATA PROVIDERS AND ACCESS

Data access point	Contaminants: ICES DOME Radioactive substances: HELCOM MORS
Data type (Q10c)	Processed Data sets
Data availability (Q10c)	Contaminants: ICES DOME Radioactive substances: HELCOM MORS
Data access (Q10c)	Open access
INSPIRE standard (Q10c)	
When will data become available? (Q10c)	Contaminants: Annually Radioactive substances: Annually
Data update frequency (Q10c)	Yearly
Describe how the data and information from the programme will be made accessible to the EC/EEA	
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	Yes, e.g. BSEP120B Hazardous substances in the Baltic Sea.

REFERENCES

Common implementation strategy for the Water Framework Directive (2000/60/EC). Guidance Document No. 19. European Commission 2010. Guidance on surface water chemical monitoring under the Water Framework Directive. Luxemburg: office for Official Publications of the European Communities

Determination of Hexabromocyclododecane (HBCD) in sediment and biota. ICES TIMES No. 44 (2

Determination of parent and alkylated polycyclic aromatic hydrocarbons (PAHs) in biota andsediment. ICES TIMES No. 45 (2009)

Determination of perfluoroalkyl compounds in water, sediment, and biota – ICES TIMES No. 48 (2010)

Determination of polybrominated diphenyl ethers (PBDEs) in sediment and biota. ICES TIMES No. 46 (2009)

DIN EN ISO/IEC 17025

DIN EN ISO5667-3, 2004-05

ISO TS 13530, ISO 11352

ISO 5667-9, 1992-10

JAMP Guidelines for the analysis of PFCs in water

LST EN ISO 17993:2004

MORS Guidelines

QUASIMEME

Technical guidance on monitoring for the MSFD

Monitoring programme: Contaminants
Programme topic: Concentration of contaminants

SUB-PROGRAMME: CONTAMINANTS IN SEDIMENT

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REGIONAL COORDINATION

The monitoring of this sub-programme is: **Partly coordinated**

- Common monitoring guidelines in COMBINE manual, ISO/IEC 17025 and other guidelines (see References).
- Common quality assurance programme: HELCOM COMBINE manual, ISO/CEN standards and QUASIMEME.
  Radioactive substances: MORS Guidelines defines methodologies for sample treatment, analysis and intercomparison. Reported data is manually quality assured by the HELCOM Secretariat and results are reported and verified in annual MORS EG meetings.
- Common databases: COMBINE, MORS.

There is no current plan for coordinated monitoring of contaminants in sediments, other than radionuclides. Under the Water Framework Directive, no EQS values have so far been set in sediments. However, countries are encouraged to perform long term trend analysis of concentrations of persistent substances that tend to accumulate in sediment, in order to ensure that such concentrations do not significantly increase (such as Hg, PAHs, HCHs, HCB, PBDE, TBT, PCB, PFOS, PCDD/F, HBCDD).

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Hazardous substances
	Ecological objectives	Concentrations of hazardous substances close to natural levels Radioactivity at pre-Chernobyl level
Marine strategy framework directive (MSFD)	Descriptors	D8 Contaminants
	Criteria (Q5a)	8.1 Concentration of contaminants
	Features (Q5c)	Other features: A description of the situation with regard to chemicals, including chemicals giving rise to concern, sediment contamination, hotspots, health issues and contamination of biota (especially biota meant for human consumption)
Other relevant legislation (Q8a)	Water Framework Directive	

Assessment of: (Q4k)		
State/Impacts	X	temporal trends, spatial distribution, status classification
Pressures		
Human activities causing the pressures		
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)	
HELCOM assessment unit Level 1: Baltic Sea	X
HELCOM assessment unit Level 2: Subbasin	X
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
Regional (COMBINE)	PCBs	Concentration of chemical/nutrient/pollutant in/on seabed substrate	HELCOM COMBINE Manual, Part D. ISO/IEC 17025 and other guidelines (see References)	HELCOM COMBINE manual , ISO/CEN standards and QUASIMEME	Other	See map for details		8.1.1 Concentration of the contaminants measured in the relevant matrix	EEZ	DE: 2000, 2008 DK: 1999 with some interuptions in the mid 2000's SE: 2000, infrequently through the 2000's PL: 1998	DE, DK, PL, SE
Regional (COMBINE)	PAH	Concentration of chemical/nutrient/pollutant in/on seabed substrate	HELCOM COMBINE Manual, Part D. ISO/IEC 17025 and other guidelines (see References)	HELCOM COMBINE manual Annex B13, Appendix 1 and 2, ISO/CEN standards and QUASIMEME	Other, LT: 1 time per year (summer)	See map for details		8.1.1	EEZ, Terittorial waters, Transitional waters	LT: 2007	DE, DK, LT, PL, SE
Regional (COMBINE)	tributyltin (TBT)	Concentration of chemical/nutrient/pollutant in/on seabed substrate	HELCOM COMBINE Manual, Part D. ISO/IEC 17025 and other guidelines (see References)	HELCOM COMBINE manual, ISO/CEN standards and QUASIMEME	Other	See map for details		8.1.1	EEZ	DE: 2000, 2004, 2008 DK: 1999 with a few gaps LT: 2011 LV: 2011 SE: 2000 - 2004, 2008	DE, DK, FI, LT, LV, SE
Regional (COMBINE)	Metals	Concentration of chemical/nutrient/pollutant in/on seabed substrate	HELCOM COMBINE Manual, Part D. ISO/IEC 17025 and other guidelines (see References)	HELCOM COMBINE manual Part B, Annex B13, Appendix 3 and 4, ISO/CEN standards and QUASIMEME	Other	See map for details		8.1.1	EEZ	DE: 2000 DK: 1999 LT: 2007, data also from 2004 LV: 2007, data also from 2004 SE: 2000	DE, DK, LT, LV, SE
National	Furans	Concentration of chemical/nutrient/pollutant in/on seabed substrate	Different approaches e.g. CEMP manual, ICES guidelines, ISO/CEN standards (see References)	Other	Other			8.1.1	EEZ	DK: 2007	DK
Other	Hg, Cd, As, Pb, Zn, Ni, Cr, Cu, Co	Concentration of chemical/nutrient/pollutant in/on seabed substrate	ISO 5667-15, ISO/IEC 17025, ISO 5667-19 and ISO 5667-12	ISO/IEC 17025	One-off	Stations in the Gulf of Finland		8.1.1	EEZ	2014	EE

Regional (MORS)	Radionuclides: Gamma-emitters	Concentration of chemical/nutrient/pollutant in/on seabed substrate	MORS Guidelines	MORS Guidelines	Yearly	See map for details	8.1.1	EEZ	1984	All HELCOM Contracting Parties

Brief description of monitoring

Full description in HELCOM COMBINE manual. Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	**PCBs / Concentration of chemical/pollutant in/on seabed substrate**
Method	Sampling and analytical methods are reported per sample and per parameter respectively in the data. See HELCOM COMBINE manual.
QA/QC	Quality assurance is a laboratory's whole sampling and analytical process from start to finish. See HELCOM COMBINE manual.
Frequency	Varies from 1-2 to 24 samples/station/year, depending on country. DE: • BSH: May/Jun, annually • IOW: Jun/Jul, annually • LLUR: Jul/Aug, every 2nd year • LUNG: Jul/Aug/Sep, every 3rd year
Spatial Scope	EEZ / Whole Baltic Sea for assessment
Spatial resolution	Measured in the following HELCOM sub basins: Kiel Bay, Kattegat, Southern Baltic Proper, The Sound, Great Belt, Bay of Mecklenburg and Little Belt. See map for details

Element / parameter	**TBT / Concentration of chemical/pollutant in/on seabed substrate**
Method	Sampling and analytical methods are reported per sample and per parameter respectively in the data. See HELCOM COMBINE manual.
QA/QC	Quality assurance is a laboratory's whole sampling and analytical process from start to finish. See HELCOM COMBINE manual.
Frequency	Varies from 1-2 to 24 samples/station/year, depending on country.
Spatial Scope	EEZ / Whole Baltic Sea for assessment. Bothnian Sea, Gulf of Finland.
Spatial resolution	Measured in: Kiel Bay, Kattegat, Southern Baltic Proper, Great Belt, Bay of Mecklenburg, Little Belt, The Sound. See map for details

Element / parameter	**Metals / Concentration of chemical/pollutant in/on seabed substrate**
Method	Sampling and analytical methods are reported per sample and per parameter respectively in the data. See HELCOM COMBINE manual.
QA/QC	Quality assurance is a laboratory's whole sampling and analytical process from start to finish. See HELCOM COMBINE manual - Part B, Annex B13, Appendix 3 and 4,
Frequency	Varies from 1-2 to 24 samples/station/year, depending on country. DE: • BSH: Mar, annually • IOW: Jun/Jul, annually • LLUR: Jul/Aug, every 2nd year • LUNG: Jul/Aug/Sep, every 3rd year
Spatial Scope	EEZ / Whole Baltic Sea for assessment
Spatial resolution	Measured in: Bay of Mecklenburg, Southern Baltic Proper, Kiel Bay, Kattegat, The Sound, Great Belt, Little Belt. See map for details

Element / parameter	**Other contaminants / Concentration of chemical/pollutant in/on seabed substrate**

Method	Sampling and analytical methods are reported per sample and per parameter respectively in the data. See HELCOM COMBINE manual.
QA/QC	Quality assurance is a laboratory's whole sampling and analytical process from start to finish. See HELCOM COMBINE manual.
Frequency	Varies from 1-2 to 24 samples/station/year, depending on country**.**
Spatial Scope	EEZ / Whole Baltic Sea for assessment
Spatial resolution	All other contaminants in sediment are measured in: Kiel Bay, Kattegat, Southern Baltic Proper, The Sound, Great Belt, Bay of Mecklenburg, Little Belt. For CEMP: furans are monitored in: Kattegat and Skagerrak, TBT only in Kattegatt. National monitoring is only reported for Denmark and Germany, of which furans are monitored in Great Belt, Kiel Bay, Little Belt. TBT is measured in Bay of Mecklenburg, Kiel Bay, Little Belt, Great Belt. Metals are reported from Great Belt Kiel Bay Bay of Mecklenburg Little Belt. All the remaining national contaminants data is reported from Great Belt, Kiel Bay, Bay of Mecklenburg and Little Belt.

Element / parameter	**Radionuclides / Concentration of chemical/pollutant in/on seabed substrate**
Method	Obligatory radionuclides: Gamma-emitters: K-40, Cs-137 and other γ-emitters identified in the γ-spectrum. Voluntary radionuclides: Sr-90; Pu-239, 240; Am-241; natural radionuclides (e.g. Po-210). Sampling and analytical methods are reported per sample and per parameter respectively in the data. See MORS Guidelines.
QA/QC	Quality assurance is a laboratory's whole sampling and analytical process from start to finish. MORS Guidelines defines methodologies for sample treatment, analysis and intercomparison. Reported data is manually quality assured by HELCOM secretariat and results reported and verified in annual MORS EG meeting.
Frequency	Annual
Spatial Scope	EEZ / Whole Baltic Sea for assessment
Spatial resolution	See map for details

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	Core indicators rely primarily on monitoring data from biota, secondarily from sediments and lastly from water. Under the Water Framework Directive, no EQS values have so far been set in sediments. However, countries are encouraged to perform long term trend analysis of concentrations of persistent substances that tend to accumulate in sediment, in order to ensure that such concentrations do not significantly increase (such as Hg, PAHs, HCHs, HCB, PBDE, TBT, PCB, PFOS, PCDD/F, HBCDD). To this end, sediments are suitable for revealing past recent history of contaminants.
Gaps	Assessment of gaps has not been carried out.

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	Adequate for determination of state but not for temporal changes.
Established methods for assessment?	Yes
Adequate understanding of GES?	Yes, thresholds are available for many substances.
Adequate capacity to perform assessments?	Nationally

Assessment of natural variability (Q5e)

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DATA PROVIDERS AND ACCESS

Data access point	Contaminants: ICES DOME Radioactive substances: HELCOM MORS
Data type (Q10c)	Processed Data sets
Data availability (Q10c)	Contaminants: ICES database Radioactive substances: HELCOM MORS
Data access (Q10c)	Open access
INSPIRE standard (Q10c)	
When will data become available? (Q10c)	Contaminants: Annually Radioactive substances: Annually
Data update frequency (Q10c)	Yearly
Describe how the data and information from the programme will be made accessible to the EC/EEA	
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	Yes, e.g. BSEP120B Hazardous substances in the Baltic Sea.

REFERENCES

HELCOM COMBINE Manual

Common Implementation Strategy for the Water Framework Directive (2000/60/EC). Guidance Document No. 25. European Commission 2010. Guidance on chemical monitoring of sediment and bioa under the Water Framework Directive, Technical Report 2010.3991. ISBN 978-92-79-16224-4.

DIN EN ISO 5667-15, 2009. Water quality -- Sampling -- Part 15: Guidance on the preservation and handling of sludge and sediment samples

DIN EN ISO/IEC 17025, 2005: General requirements for the competence of testing and calibration laboratories

IOC Manual of Quality control Procedures

ISO 5667-19, 2004: Water quality -- Sampling -- Part 19: Guidance on sampling of marine sediments

ISO 5667-12: Water quality -- Sampling -- Part 12: Guidance on sampling of bottom sediments

ISO 13877:1998

MORS Guidelines

QUASIMEME

Monitoring programme: Contaminants
Programme topic: Concentration of contaminants

SUB-PROGRAMME: CONTAMINANTS IN BIOTA

TABLE OF CONTENTS

REGIONAL COORDINATION

The monitoring of this sub-programme is: **Fully coordinated.**

- Common monitoring guidelines: HELCOM COMBINE manual, MORS Guidelines and other guidelines (see References).
- Common quality assurance programme: HELCOM COMBINE manual, QUASIMEME, DIN EN ISO/IEC 17025. Radioactive substances: MORS Guidelines defines methodologies for sample treatment, analysis and intercomparison. Reported data is manually quality assured by HELCOM secretariat and results reported and verified in annual MORS EG meeting.
- Common database: COMBINE, MORS.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Hazardous substances
	Ecological objectives	Concentrations of hazardous substances close to natural levels All fish safe to eat Radioactivity at pre-Chernobyl level
Marine strategy framework directive (MSFD)	Descriptors	D8 Contaminants D9 Contaminants in seafood
	Criteria (Q5a)	8.1 Concentration of contaminants
	Features (Q5c)	Other features: A description of the situation with regard to chemicals, including chemicals giving rise to concern, sediment contamination, hotspots, health issues and contamination of biota (especially biota meant for human consumption)
Other relevant legislation (Q8a)	Water Framework Directive	

Assessment of: (Q4k)

State/Impacts	X	temporal trends, spatial distribution, status classification
Pressures		
Human activities causing the pressures		
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)

HELCOM assessment unit Level 1: Baltic Sea	X
HELCOM assessment unit Level 2: Subbasin	X
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	X

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
Regional (COMBINE)	PCBs, dioxins and furans	Concentration of chemical/nutrient/ pollutant in biota	HELCOM COMBINE manual, PartD and different approaches e.g. CEMP manual, ICES guidelines, ISO/CEN standards (see References)	HELCOM COMBINE manual Part B, Annex B12, Appendix 1 and 3, QUASIMEME and DIN EN ISO/IEC 17025	Other	See map for details	Polychlorinated biphenyls and dioxins and furans	8.1.1 Concentration of the contaminants measured in the relevant matrix	EEZ	DE: 1995 DK: 1998 EE: 2003 FI: 1998 PL: 1998 SE: 1979	DE, DK, EE, FI, PL, SE
Regional (COMBINE)	PAH	Concentration of chemical/nutrient/ pollutant in biota	HELCOM COMBINE manual, PartD and different approaches e.g. CEMP manual, ICES guidelines, ISO/CEN standards (see References)	HELCOM COMBINE manual Part B, Annex B12, Appendix 1 and 2, QUASIMEME and DIN EN ISO/IEC 17025	Other	See map for details	Polyaromatic hydrocarbons and their metabolites	8.1.1 Concentration of the contaminants measured in the relevant matrix	Coastal Waters/ EEZ	FI: 2014	DE, FI, DK, PL, SE
National	BDE and PBDE	Concentration of chemical/nutrient/ pollutant in biota	Different approaches e.g. CEMP manual, ICES guidelines, ISO/CEN standards (see References)	QUASIMEME and DIN EN ISO/IEC 17025	Other	See map for details	PBDE	8.1.1 Concentration of the contaminants measured in the relevant matrix	EEZ	DE: 2007 DK: 2004 FI: 2012 PL: 2012 data only from 2009 SE: 1980	DE, DK, FI, PL, SE
National	PFOA, PFOS and PFOSA	Concentration of chemical/nutrient/ pollutant in biota	Different approaches e.g. CEMP manual, ICES guidelines, ISO/CEN standards (see References)	QUASIMEME and DIN EN ISO/IEC 17025	Other	See map for details	PFOS	8.1.1 Concentration of the contaminants measured in the relevant matrix	EEZ	DE: 2011 DK: data only from 2011 FI: 2012 PL: 2014 SE: data between 2005-2008	DE, DK, FI, PL, SE
National	HBCDD	Concentration of chemical/nutrient/ pollutant in biota	Different approaches e.g. CEMP manual, ICES guidelines, ISO/CEN standards (see References)	QUASIMEME and DIN EN ISO/IEC 17025	Other	See map for details	HCBD	8.1.1 Concentration of the contaminants measured in the relevant matrix	EEZ	DE: 2011 DK: 2011 FI: 2012 PL: 2012 SE: 1980	DE, DK, FI, PL, SE
Regional (COMBINE)	Tributyltin (TBT)	Concentration of chemical/nutrient/ pollutant in biota	HELCOM COMBINE manual, PartD and different approaches e.g. CEMP manual, ICES guidelines, ISO/CEN standards (see References)	HELCOM COMBINE manual, QUASIMEME and DIN EN ISO/IEC 17025	Other	See map for details	Tributyltin (TBT) and imposex	8.1.1 Concentration of the contaminants measured in the relevant matrix	EEZ	DE: 2011 DK: 1998 PL: 2012 SE: 2008, sporadic years reported before 2008	DE, DK, PL, SE

Regional (COMBINE)	Metals	Concentration of chemical/nutrient/ pollutant in biota	HELCOM COMBINE manual, PartD and different approaches e.g. CEMP manual, ICES guidelines, ISO/CEN standards (see References)	HELCOM COMBINE manual Part B, Annex B12, Appendix 1, 4 and 5, QUASIMEME and DIN EN ISO/IEC 17025	Other	See map for details	Metals (lead, cadmium and mercury)	8.1.1 Concentration of the contaminants measured in the relevant matrix	EEZ	DE: 1995, data also reported for 1992 DK: 1998 EE: 2003, data also from 1986 FI: 1998 LT: 2007 PL: 1998 SE: 1980	DE, DK, EE, FI, LT, PL,SE
National	BDE	Concentration of chemical/nutrient/ pollutant in biota	Different approaches e.g. CEMP manual, ICES guidelines, ISO/CEN standards (see References)	Other	Other			8.1.1 Concentration of the contaminants measured in the relevant matrix	EEZ	DK: 2006, 2008	DK
National	PFOS	Concentration of chemical/nutrient/ pollutant in biota	Different approaches e.g. CEMP manual, ICES guidelines, ISO/CEN standards (see References)	Other			PFOS	8.1.1 Concentration of the contaminants measured in the relevant matrix	EEZ	SE: 2005	SE
Regional (MORS)	Radionuclides: gamma-emitters	Concentration of chemical/nutrient/ pollutant in biota	MORS Guidelines	MORS Guidelines	Yearly	Yearly, See map for details	Radioactive substances: Cs-137 in fish and surface waters	8.1.1 Concentration of the contaminants measured in the relevant matrix	EEZ	1984	DE, DK, EE, FI, LT, PL, SE

Brief description of monitoring

Full description in HELCOM COMBINE manual. Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	**PCB, Dioxins, furans / Concentration of chemical/pollutant in biota**
Method	Measured in: In tissue of Platichthys flesus, Zoarces viviparous, Mytilus edulis, Perca fluviatilis, Clupea harengus, Limanda limanda (by DE in Kiel Bay). In the eggs of Uria aalge, Sterna hirundo, Haematopus ostralegus. Sampling and analytical methods are reported per sample and per parameter respectively in the data. HELCOM COMBINE manual.
QA/QC	Quality assurance is a laboratory's whole sampling and analytical process from start to finish. See HELCOM COMBINE manual.
Frequency	DE: • UBA: kelb , mussels: Baltic Sea: 2x/year(06/12), annually • LUNG: mussels, every 2nd or 3rd year • LLUR: 2x/yr (Mar/Oct) FI: 1-6 years intervals, depending on station; time series stations yearly
Spatial Scope	EEZ / Whole Baltic Sea for assessment
Spatial resolution	Polychlorinated biphenyls (PCB) and dioxins and furans are measured in the following subbasins: Great Belt, Little Belt, Kattegat, Southern Baltic Proper, Kiel Bay, Bay of Mecklenburg, Arkona Basin, Bothnian Bay, Bothnian Sea, Northern Baltic Proper, Gulf of Gdansk, Gulf of Finland, Quark, Archipelago Sea. See map for details

Element / parameter	**PAH / Concentration of chemical/pollutant in biota**

Method	FI and SE: Monitored in bivalves See HELCOM COMBINE manual.
QA/QC	See HELCOM COMBINE manual.
Frequency	FI: Survey type SE: Yearly
Spatial Scope	FI: Coastal sites
Spatial resolution	Coastal Waters / EEZ

Element / parameter	**PBDE / Concentration of chemical/pollutant in biota**
Method	Measured in: *Platichthys flesus, Zoarces viviparous, Mytilus edulis, Clupea harengus, Gadus morhua, Uria aalge, Sterna hirundo, Haematopus ostralegus, Limanda limanda* (by DE in Kiel Bay). Sampling and analytical methods are reported per sample and per parameter respectively in the data.
QA/QC	Quality assurance is a laboratory's whole sampling and analytical process from start to finish.
Frequency	DE: • UBA: kelb , mussels: Baltic Sea: 2x/year(06/12), annually • LUNG: mussels, every 2nd or 3rd year • LLUR: 2x/yr (Mar/Oct) FI: 1-6 years intervals, depending on station; time series stations yearly
Spatial Scope	EEZ / Whole Baltic Sea for assessment
Spatial resolution	PBDE and BDE measured in the following areas: Great Belt, Little Belt, Kattegat, Kiel Bay, Arkona Basin, Southern Baltic Proper, Gulf of Gdansk, Bothnian Bay, the Quarck, Bothnian Sea, Archipelago Sea, Northern Baltic Proper, Gulf of Finland. See map for details SE: Northern Baltic Proper, Bothnian Sea, Bothnian Bay.

Element / parameter	**PFOS, PFOSA / Concentration of chemical/pollutant in biota**
Method	Measured in the following species: *Platichthys flesus, Zoarces viviparous, Clupea harengus, Uria aalge, Sterna hirundo, Haematopus ostralegus, Perca fluviatilis.* Sampling and analytical methods are reported per sample and per parameter respectively in the data.
QA/QC	Quality assurance is a laboratory's whole sampling and analytical process from start to finish.
Frequency	Yearly DE: • UBA: kelb , mussels: Baltic Sea: 2x/year(06/12), annually • LUNG: mussels, every 2nd or 3rd year • LLUR: 2x/yr (Mar/Oct)
Spatial Scope	EEZ / Whole Baltic Sea for assessment
Spatial resolution	PFOS and PFOSA are measured in the following areas: Great Belt, Kattegat, Little Belt, Southern Baltic Proper, Bothnian Bay, Northern Baltic Proper, Bothnian Sea, Gulf of Finland. See map for details SE: Northern Baltic Proper, Bothnian Sea, Bothnian Bay.

Element / parameter	**HBCDD / Concentration of chemical/pollutant in biota**

Method	Measured in the following species: *Mytilus edulis, Platichthys flesus, Clupea harengus, Zoarces viviparous, Gadus morhua, Uria aalge, Sterna hirundo, Haematopus ostralegus, Perca fluviatilis.* Sampling and analytical methods are reported per sample and per parameter respectively in the data.
QA/QC	Quality assurance is a laboratory's whole sampling and analytical process from start to finish.
Frequency	DE: • UBA: kelb , mussels: Baltic Sea: 2x/year(06/12), annually • LUNG: mussels, every 2nd or 3rd year • LLUR: 2x/yr (Mar/Oct) FI: 1-6 years intervals, depending on station; time series stations yearly
Spatial Scope	EEZ / Whole Baltic Sea for assessment
Spatial resolution	HBCDD: are measured in the following areas: Gulf of Gdansk, Southern Baltic Proper, Great Belt, Little Belt, Kattegat, Bothnian Bay, Bothnian Sea, Gulf of Finland. See map for details SE (HBCDD): Northern Baltic Proper, Bothnian Sea, Bothnian Bay.

Element / parameter	**TBT / Concentration of chemical/pollutant in biota**
Method	Measured in the following species: *Mytilus edulis, Zoarces viviparous, Mya arenaria, Platichthys flesus, Clupea harengus, Perca fluviatilis.* Sampling and analytical methods are reported per sample and per parameter respectively in the data. See HELCOM COMBINE manual.
QA/QC	Quality assurance is a laboratory's whole sampling and analytical process from start to finish. See HELCOM COMBINE manual
Frequency	DE: • UBA: kelb , mussels: Baltic Sea: 2x/year(06/12), annually • LUNG: mussels, every 2nd or 3rd year • LLUR: 2x/yr (Mar/Oct)
Spatial Scope	EEZ / Whole Baltic Sea for assessment
Spatial resolution	TBT is measured in the following areas: The Sound, Kattegat, Great Belt, Southern Baltic Proper, Little Belt, Bay of Mecklenburg, Gulf of Gdansk. See map for details. SE: Kattegat, Northern Baltic Proper, Bothnian Sea.

Element / parameter	**Metals / Concentration of chemical/pollutant in biota**
Method	Measured in the following species: *Platichthys flesus, Mytilus edulis, Zoarces viviparous, Mya arenaria, Perca fluviatilis, Macoma balthica, Clupea harengus, Gadus morhua, Uria aalge, Sterna hirundo, Haematopus ostralegus, Limanda limanda (by DE in Kiel Bay).* Sampling and analytical methods are reported per sample and per parameter respectively in the data. See HELCOM COMBINE manual.
QA/QC	Quality assurance is a laboratory's whole sampling and analytical process from start to finish. See HELCOM COMBINE manual.
Frequency	DE: • UBA: kelb and mussels:Baltic Sea: 2x/year (06/12) • LUNG: mussels: every 2nd or 3rd year, annually
Spatial Scope	EEZ / Whole Baltic Sea for assessment

Spatial resolution	Metals are measured in the following subbasins: Great Belt, The Sound, Southern Baltic Proper, Kattegat, Little Belt, Kiel Bay, Bay of Mecklenburg, Arkona Basin, Bothnian Bay, Bothnian Sea, Northern Baltic Proper, Gulf of Gdansk. See map for details

Element / parameter	**Radionuclides: Gamma-emitters / Concentration of chemical/pollutant in biota**
Method	Measured in the following species: • Fish (measured species depends on the location): *Clupea harengus, Gadus morhua, Platichthys flesus, Pleuronectes plates, Perca fluviatilis, Esox luciu, Limanda limanda* (by DE in Kiel Bay). • Benthic invertebrates: *Mya arenaria, Macoma balthica, Saduria entomon* • Aquatic plants: *Fucus vesiculosus* Measured radionuclides: • Obligatory: Gamma-emitters: K-40, Cs-137 and other γ-emitters identifies in the γ-spectrum . ◦ Voluntary: ◦ Fish: Sr-90; natural radionuclides (e.g. Po-210) ◦ Benthic invertebrates: Sr-90; Tc-99; natural radionuclides (e.g. Po-210); Pu-239, 240; Am-241 ◦ Aquatic plants: Sr-90; Tc-99; Pu-239, 240; Am-241; natural radionuclides Sampling and analytical methods are reported per sample and per parameter respectively in the MORS database. See MORS Guidelines for detailed description.
QA/QC	Quality assurance is a laboratory's whole sampling and analytical process from start to finish. MORS Guidelines defines methodologies for sample treatment and analysis and intercomparison. Reported data is manually quality assured by HELCOM secretariat and results reported and verified in annual MORS EG meeting.
Frequency	Yearly
Spatial Scope	EEZ / Whole Baltic Sea for assessment
Spatial resolution	See map for details

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	There is currently no common agreement within HELCOM concerning the statistical requirements to fulfill the assessment regarding contaminants (statistical power).
Gaps	Assessment of gaps has not been carried out.

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	Yes
Established methods for assessment?	Yes
Adequate understanding of GES?	Yes (environmental quality standards)
Adequate capacity to perform assessments?	Yes, for HELCOM core indicators.

Assessment of natural variability (Q5e)

Quantitative. The programme generates information both of within and between - year variation, further used in power analysis .

DATA PROVIDERS AND ACCESS

Data access point	Contaminants: ICES database Radioactive substances: HELCOM MORS database
Data type (Q10c)	Processed Data sets
Data availability (Q10c)	Contaminants: ICES database Radioactive substances: HELCOM MORS database
Data access (Q10c)	Open access
INSPIRE standard (Q10c)	Not defined for concentrations of contaminants
When will data become available? (Q10c)	Contaminants: Annually Radioactive substances: Annually
Data update frequency (Q10c)	Yearly
Describe how the data and information from the programme will be made accessible to the EC/EEA	
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	Yes, e.g. BSEP120B Hazardous substances in the Baltic Sea.

REFERENCES

COMBINE Manual

Common implementation strategy for the Water Framework Directive (2000/60/EC). Guidance Document No. 19. European Commission 2010. Guidance on surface water chemical monitoring under the Water Framework Directive. Luxemburg: office for Official Publications of the European Communities.

CEMP Monitoring Manual (OSPAR)

Determination of polychlorinated biphenyls (PCBs) in sediment and biota. ICES TIMES No. 53 (2013)

Determination of polychlorinated dibenzo-p-dioxins, polychlorinated dibenzofurans, and dioxin-like polychlorinated biphenylsin biota and sediment. ICES TIMES No. 50 (2012)

JAMP Guidelines for Monitoring Contaminants in Biota. OSPAR Commission, Ref.-No. 99-02 (Revision. 2012)

Mariani et al. (draft report) Analytical methods for Biota Monitoring under the Water Framework Directive: Existing standards and proposal for a multi-residue approach for biota EQSs. JRC Technical Reports (draft).

Monitoring organotins in marine biota. ICES TIMES No. 47 (2010)

MORS Guidelines

CONTAMINANTS IN SEAFOOD

GENERAL INFORMATION

NOTE: This programme topic is under development.

General information on monitoring of contaminants in biota can be retrieved from the programme topic Concentration of contaminants.

Currently there is no monitoring programme for contaminants in seafood. However, monitoring of contaminants in biota has been conducted in HELCOM monitoring programmes, which also include species that are used for food consumption. There are European regulations for sampling and analyzing contaminants in food. Sampling arrangements within countries may differ, e.g. size range for seafood sampling may differ from environmental monitoring. The analyzed matrix, analysis methods and quality standards used for food consumption analyses are not identical to environmental quality standards.

SUBPROGRAMMES

Subprogramme: Imposex

Home / Action areas / Monitoring and assessment / Monitoring manual / Biological effects of contaminants

BIOLOGICAL EFFECTS OF CONTAMINANTS

GENERAL INFORMATION

NOTE: The programme topic is still under development.

Monitoring of biological effects provides the link between concentrations of contaminants, and the effect contaminants may have on the status of biodiversity. The monitoring undertaken is currently linked to the HELCOM core indicator Tributyltin (TBT) and imposex, other potential indicators are currently being developed and tested. The response time of bioeffect indicators to a change in the concentration of contaminants can vary significantly, some bioeffect parameters change within hours showing the acute stress of the organism, while other parameters track the change in reproductive capacity of a certain species which can have long-term effects on population size.

Sub-programme: Imposex

NOTE: This sub-programme is still under development.

RESPONSIBLE HELCOM SUBSIDIARY BODIES

HELCOM STATE*

Contact information: HELCOM Secretariat

*Tentative name

Monitoring programme: Contaminants
Programme topic: Biological effects of contaminants

SUB-PROGRAMME: IMPOSEX

NOTE: This sub-programme is still under development.

TABLE OF CONTENTS

REGIONAL COORDINATION

The monitoring of this sub-programme is: **Not coordinated**

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Hazardous substances
	Ecological objectives	Concentrations of hazardous substances close to natural levels Radioactivity at pre-Chernobyl level
Marine strategy framework directive (MSFD)	Descriptors	D8 Contaminants in seafood
	Criteria (Q5a)	8.1 Concentration of contaminants
	Features (Q5c)	Other features: A description of the situation with regard to chemicals, including chemicals giving rise to concern, sediment contamination, hotspots, health issues and contamination of biota (especially biota meant for human consumption)
	Pressures and impacts (Q5c)	
	Activities (Q7a, Q7b)	
Other relevant legislation (Q8a)	Water Framework Directive	

Assessment of: (Q4k)

State/Impacts	X	temporal trends, spatial distribution, status classification
Pressures		
Human activities causing the pressures		
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)

HELCOM assessment unit Level 1: Baltic Sea	X
HELCOM assessment unit Level 2: Subbasin	X
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	X

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9b	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q 9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
Regional (COMBINE)	Imposex in snails	Biological effects of contaminants	National	Other	Other		Tributyltin (TBT) and imposex	8.1.1 Concentration of the contaminants measured in the relevant matrix	EEZ	DK: 1998	DK, SE

Brief description of monitoring

Element / parameter	
Method	
QA/QC	
Frequency	
Spatial Scope	
Spatial resolution	

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

Monitoring is to be carried out to fullfill assessment requirements, which are outlined e.g. in HELCOM core indicators. The requirements on monitoring can include number of stations, the sampling frequency and replication.

Monitoring requirements	
Gaps	

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	No
Established methods for assessment?	No
Adequate understanding of GES?	No
Adequate capacity to perform assessments?	No

Assessment of natural variability (Q5e)

DATA PROVIDERS AND ACCESS

Data access point	
Data type (Q10c)	
Data availability (Q10c)	
Data access (Q10c)	
INSPIRE standard (Q10c)	
When will data become available? (Q10c)	
Data update frequency (Q10c)	Yearly
Describe how the data and information from the programme will be made accessible to the EC/EEA	
Contact points in the Contracting parties	
Has the data been used in HELCOM assessments?	

REFERENCES

LITTER

GENERAL INFORMATION

The monitoring of litter covers amount and composition of marine litter. Currently no coordinated monitoring of marine litter exists in the region. National monitoring programmes concern macroscopic litter on the beaches, water surface, on the seafloor and in biota, and microlitter in the surface water and sediments, depending on Contracting Party.

There are no HELCOM core or pre-core indicators on litter but plans for development.

Sub-programme: Microlitter particle abundance and characteristics

The monitoring of litter microparticles concerns water column, beach and bottom sediments, depending on the national programmes.

Sub-programme: Macrolitter characteristics and abundance/volume

The monitoring of macrolitter concerns beach, water surface, seafloor and biota.

RESPONSIBLE HELCOM SUBSIDIARY BODIES

HELCOM PRESSURE*

Contact information: HELCOM Secretariat

*Tentative name

SUB-PROGRAMMES

Microlitter particle abundance and characteristics

Macrolitter characteristics and abundance/volume

Monitoring programme: Litter
Programme topic: Litter

SUB-PROGRAMME: MICROLITTER PARTICLE ABUNDANCE AND CHARACTERISTICS

TABLE OF CONTENTS

REGIONAL COORDINATION

The monitoring of this sub-programme is: **Not coordinated.**

Currently monitoring is carried out at national level. Common indicators and monitoring protocols will be developed as part of the HELCOM CORESET II project.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Hazardous substances Maritime activities
	Ecological objectives	Concentrations of hazardous substances close to natural levels
Marine strategy framework directive (MSFD)	Descriptors	D10 Litter
	Criteria (Q5a)	10.1 Characteristics of litter in the marine and coastal environment 10.2 Impacts of litter on marine life
	Features (Q5c)	Other features: A description of any other features or characteristics typical of or specific to the marine region or subregion.
Other relevant legislation (Q8a)	Currently no relevant legislation	

Assessment of: (Q4k)

State/Impacts	X	trends, state classification
Pressures		
Human activities causing the pressures		
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)

HELCOM assessment unit Level 1: Baltic Sea	
HELCOM assessment unit Level 2: Subbasin	
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	
Other: National	X

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
National	Microlitter in water surface	Quantity and type of microparticles	Manta trawl	National	Yearly	25 stations	-	10.1.3 Trends in the amount, distribution and, where possible, composition of micro-particles (in particular micro-plastics...	EEZ	2014	FI
National	Microlitter in water and in sediments	Quantity and type of microparticles	Plankton nets and Nemisto corer/Van Veen grab	National	Yearly	6 stations	-	10.1.3	EEZ	2015	PL
National	Microlitter in sand	Quantity and type of microparticles	Sieving	National	Seasonal	-	-	10.1.3	EEZ	2014	LT

Brief description of monitoring

Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	**Microlitter on water surface**
Method	Microlitter on water surface/Quantity and type of microparticles: Manta trawl survey
QA/QC	National
Frequency	Yearly
Spatial Scope	EEZ EE: pilot study started in 2014, continued in 2015; four areas in the GoF.
Spatial resolution	25 stations

Element / parameter	**Microlitter in water and in sediments**
Method	Microlitter in water will be monitored by sampling in the water column with plankton nets and bottom sediments sampling with Nemisto corer or van Veen grab. The amount and the composition (as far as possible) of the microparticles will be analysed.
QA/QC	National
Frequency	Yearly
Spatial Scope	EEZ
Spatial resolution	6 stations

Element / parameter	**Microlitter in sand**
Method	Sieving 5 cm of surface sand of 50cmx50cm quadrat with 2 mm sieve
QA/QC	National
Frequency	Seasonally
Spatial Scope	EEZ
Spatial resolution	-

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	The study of the presence of microparticles in different compartments is being subject of study under several national and regional projects in the HELCOM area. The assessment of monitoring requirements is considered from two perspectives: 1. close to the hot spots (i.a. wastewater treatment facilities) 2. in the open sea (concentration in zooplankton, mussels and fish).
Gaps	There is ongoing national monitoring in several Contracting Parties, although there is no coordinated monitoring programme in force.

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	No
Established methods for assessment?	No
Adequate understanding of GES?	No
Adequate capacity to perform assessments?	No

Assessment of natural variability (Q5e)

Expert opinion.

DATA PROVIDERS AND ACCESS

Data access point	National databases
Data type (Q10c)	Processed Data sets
Data availability (Q10c)	-
Data access (Q10c)	-
INSPIRE standard (Q10c)	
When will data become available? (Q10c)	-
Data update frequency (Q10c)	-
Describe how the data and information from the programme will be made accessible to the EC/EEA	
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	No

REFERENCES

Guidance on Monitoring of Marine Litter in European Seas. JRC, 2013

Monitoring programme: Litter
Programme topic: Litter

SUB-PROGRAMME: MACROLITTER CHARASTERISTICS AND ABUNDANCE/VOLUME

TABLE OF CONTENTS

REGIONAL COORDINATION

The monitoring of this sub-programme is: **Not coordinated.**

Currently monitoring is carried out at national level. Common indicators and monitoring protocols will be developed as part of the HELCOM CORESET II project.

PURPOSE OF MONITORING (Q4K)

Follow up of progress towards:

Baltic Sea Action Plan (BSAP)	Segments	Hazardous substances Maritime activities
	Ecological objectives	Concentrations of hazardous substances close to natural levels
Marine strategy framework directive (MSFD)	Descriptors	D10 Litter
	Criteria (Q5a)	10.1 Characteristics of litter in the marine and coastal environment 10.2 Impacts of litter on marine life
	Features (Q5c)	Other features: A description of any other features or characteristics typical of or specific to the marine region or subregion.
Other relevant legislation (Q8a)	Currently no relevant legislation	

Assessment of: (Q4k)

State/Impacts	X	temporal trends, state classification
Pressures		
Human activities causing the pressures		
Effectiveness of measures		

Scale of data aggregation for assessments: (Q10a)

HELCOM assessment unit Level 1: Baltic Sea	
HELCOM assessment unit Level 2: Subbasin	
HELCOM assessment unit Level 3: Subbasins with coastal and offshore division	
HELCOM assessment unit Level 4: Subbasins with coastal WFD division	
Other: National	X

MONITORING CONCEPTS TABLE

Coordination	Elements Q9a (Q5c)	Parameter Q9a (Q5c)	Method Q9c, Q9d	QA/QC Q9e, 9f	Frequency Q9h, 9i	Spatial resolution Q9g, 9i	Link to HELCOM core indicators	Link to MSFD GES characteristics Q5b	Spatial scope Q4i	Monitoring started Q4h	CPs monitoring
National	Anthropogenic litter	Quantity and type of litter items	Bottom trawl	National	2/annually	50 transects	-	10.1.2 Trends in the amount of litter in the water column (including floating at the surface) and deposited on the sea-floor...	EEZ	2010	DK
National	Seafloor litter	Quantity and type of litter items	Bottom trawl	National	4 surveys per year		-	10.1.2 Trends in the amount of litter in the water column (including floating at the surface) and deposited on the sea-floor...	EEZ	2010	DK
National	Litter in biota	Quantity and type of litter in animal stomachs	OSPAR EcoQO	OSPAR	Opprotunity basis	1	-	10.2.1 Trends in the amount and composition of litter ingested by marine animals..	EEZ	2002	DK
National	Beach litter	Quantity and type of litter items	OSPAR beach litter guideline	OSPAR	1 survey a year	1	-	10.1.1 Trends in the amount of litter washed ashore and/or deposited on coastlines...	EEZ		DK
National	Beach litter	Quantity and type of litter items	UNEP/IOC (MARLIN);	National	3 times a year (spring, summer, autumn)	10	-	10.1.1 Trends in the amount of litter washed ashore and/or deposited on coastlines...	EEZ	April 14, 2014 (8 monitoring areas were part of the Project MARLIN monitoring programme and have been monitored since April 23, 2012)	EE
National	Beach litter	Quantity and type of litter items	UNEP-methodology	National	3 per year	9 beaches	-	10.1.1 Trends in the amount of litter washed ashore and/or deposited on coastlines...	EEZ	2012	FI
National	Beach litter	Quantity and type of litter items	OSPAR Guidelines	OSPAR	4 per year	27 beaches	-	10.1.1 Trends in the amount of litter washed ashore and/or deposited on coastlines...	EEZ	2011/2012, first with less stations	DE
National	Beach litter	Quantity and type of litter items	OSPAR Guidelines	OSPAR	4 per year	3 beaches, as part of the Marine Litter Beach Monitoring Mecklenburg-Western Pomerania (see above)	-	10.1.1 Trends in the amount of litter washed ashore and/or deposited on coastlines...	EEZ	2012	DE
National	Seafloor litter	Quantity and type of litter items	Fishing for litter	National		About 30 fishermen	-	10.1.2 Trends in the amount of litter in the water column (including floating at the surface) and deposited on the sea-floor...	Heiligen-hafen, Burgstaaken/ Fehmarn and Sassnitz	2012	DE

National	Beach litter	Quantity and type of litter items	OSPAR Guidelines	OSPAR	4 per year	3 beaches	-	10.1.1 Trends in the amount of litter washed ashore and/or deposited on coastlines...	Fehmarn	2011	DE
National	Floating macrolliter	Quantity and type of litter items	Aerial survey	National	Four times per year/each season	Entire German Baltic Sea	-	10.1.2 Trends in the amount of litter in the water column (including floating at the surface) and deposited on the sea-floor...	EEZ	2002	DE
National	Beach litter (between 2,5 cm and 50 cm)	Quantity and type of litter items	OSPAR Guidelines	OSPAR	Seasonal	4 beaches	-	10.1.1 Trends in the amount of litter washed ashore and/or deposited on coastlines...	EEZ	2012	LT
National	Seafloor litter	Quantity and type of litter items	Bottom trawling	National	Seasonal	49 trawls	-	10.1.2 Trends in the amount of litter in the water column (including floating at the surface) and deposited on the sea-floor...	EEZ	2012	LT
National	Beach litter	Quantity and type of litter items	Sieving	National	Seasonal		-	10.1.1 Trends in the amount of litter washed ashore and/or deposited on coastlines...	EEZ	2014	LT
National (draft monitoring program - not accepted yet)	Beach litter	Quantity and type of litter items	National methodology	National	Seasonal		-	10.1.1 Trends in the amount of litter washed ashore and/or deposited on coastlines...	EEZ	2015	PL
National (draft monitoring program - not accepted yet)	Floating litter	Quantity and type of litter items	Visual ship-based observations and samplings	National	Yearly	6 stations, 2 transects	-	Properties and quantities of ML do not cause harm to the coastal and marine environment	EEZ	2015	PL
National (draft monitoring program - not accepted yet)	Seafloor litter	Quantity and type of litter items	Fishing for litter	National	Every 2 years		-	Properties and quantities of ML do not cause harm to the coastal and marine environment	EEZ	2015	PL
National	Beach litter	Quantity and type of litter items	MARLIN methodology	National	3 times a year	10 stations	-	10.1.1 Trends in the amount of litter washed ashore and/or deposited on coastlines...	EEZ	2014	SE
National	Beach litter (macrolitter). Draft monitoring program, not accepted yet.	Quantity and type of litter items	UNEP Guidelines	National	3 times/year	23 stations	-	10.1.1 Trends in the amount of litter washed ashore and/or deposited on coastlines...	EEZ	2012	SE

National	Seafloor litter	Quantity and type of litter items	Bottom trawling	National	2 times a year. From 50 stations the first quarter and from 30 stations the fourth quarter	30-50 stations	-	10.1.2 Trends in the amount of litter in the water column (including floating at the surface) and deposited on the sea-floor...	EEZ	2011	SE

Brief description of monitoring

Detailed information on monitoring frequency and spatial resolution has not yet been collected from all countries but will be added.

Element / parameter	**Anthropogenic litter/Quantity and type of litter items**
Method	Bottom trawl survey usually used for fish but litter is recorded.
QA/QC	National
Frequency	2/annually
Spatial Scope	EEZ
Spatial resolution	50

Element / parameter	**Seafloor litter/Quantity and type of litter items**
Method	IBTS/BITS programmes
QA/QC	IBTS/BITS protocol
Frequency	4 surveys per year / - / Seasonal
Spatial Scope	EEZ
Spatial resolution	-

Element / parameter	**Seafloor litter/Quantity and type of litter items**
Method	IBTS/BITS programmes / Fishing for litter / Bottom trawling
QA/QC	IBTS/BITS protocol
Frequency	4 surveys per year / - / Seasonal
Spatial Scope	Heiligen hafen, Burstaaken/Fehrmarn and Sassnitz
Spatial resolution	About 30 fishermen

Element / parameter	**Beachlitter/Quantity and type of litter items** (EE)
Method	Litter items > 2,5 cm (in the longest dimension), 100-1000 m sampling units/assessment areas. UNEP/IOC; UNEP Operational Guidelines for Comprehensive Beach Litter Assessment (2009)
QA/QC	National
Frequency	3 times a year (spring, summern, autumn)
Spatial Scope	EEZ
Spatial resolution	10

Element / parameter	**Beach litter/Quantity and type of litter items** (DE)
Method	OSPAR beach litter monitoring, 100 m long, x m wide (OSPAR Commission 2010: Guideline for Monitoring Marine Litter on the Beaches in the OSPAR Maritime Area, Edition 1.0).

QA/QC	OSPAR
Frequency	4 per year
Spatial Scope	EEZ
Spatial resolution	27 beaches/ 3 as part of the Marine Litter Beach Monitoring Mecklenburg-Western Pomerania

Element / parameter	**Beach litter/Quantity and type of litter items** (LT)
Method	Sieving 5 cm of surface sand of 50cmx50cm quadrat with 2 mm sieve
QA/QC	OSPAR/National
Frequency	Seasonal
Spatial Scope	EEZ
Spatial resolution	4 beaches

Element / parameter	Beach litter/Quantity and type of litter items (PL)
Method	In the monitoring programme the Polish coastline is divided into 10 areas of 50 km length. Each of these areas will be further divided into segments of 5 km length. In each of the segments (as far as possible) monitoring of litter [washed ashore and left] will be conducted. Litter will be counted, classified and characterized in terms of composition and collected if possible. It is assumed that a close cooperation with local administration bodies of seaside communes and with non-governmental organizations will be conducted.
QA/QC	National
Frequency	Yearly
Spatial Scope	EEZ
Spatial resolution	-

Element / parameter	**Litter in the water column & floating litter/Quantity and type of litter items** (PL)
Method	The monitoring will be carried out within the monitoring cruises devoted to other parameters (hydrochemistry and biology). The methodology will be based on visual ship-based observations of floating litter at monitoring stations and at transects, and categorization of material and size.
QA/QC	National
Frequency	Yearly
Spatial Scope	EEZ
Spatial resolution	6 stations, 2 transects

Element / parameter	**Litter in the water column & seafloor litter/Quantity and type of litter items** (PL)
Method	Litter monitoring will be integrated with fish monitoring (trawling for fish stock assessments). Also the results of projects focusing on marine litter on seafloor, coordinated by non-governmental organizations (eg. WWF Poland) will be used.
QA/QC	National
Frequency	Every 2 years
Spatial Scope	EEZ
Spatial resolution	-

ASSESSMENT REQUIREMENTS

Monitoring requirements and gaps

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.

Monitoring requirements	There is wide experience and data collected on beach litter, litter in the seafloor and fishing gear/lost fishing nets in the HELCOM area. Beach litter monitoring is seasonal and associated to clean-up activities. Seafloor litter collection is integrated to bottom trawling for fish stocks assessment, so therefore the selection of the sampling stations as well as frequency is associated to the casuistic of the species of interest. Finally, information provided from fishing for litter initiatives contributes to the assessment of the quality of the open water.
Gaps	There is on going national monitoring in several Contracting Parties, although no coordinated monitoring programme is in force.

Adequacy for assessment of GES (Q5d)

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 11.

Adequate data?	Yes
Established methods for assessment?	No
Adequate understanding of GES?	No
Adequate capacity to perform assessments?	No

Assessment of natural variability (Q5e)

Expert opinion.

DATA PROVIDERS AND ACCESS

Data access point	National databases
Data type (Q10c)	Processed Data sets
Data availability (Q10c)	-
Data access (Q10c)	-
INSPIRE standard (Q10c)	
When will data become available? (Q10c)	-
Data update frequency (Q10c)	-
Describe how the data and information from the programme will be made accessible to the EC/EEA	
Contact points in the Contracting parties	Contact point to national monitoring programmes will be added
Has the data been used in HELCOM assessments?	No

REFERENCES

MARLIN (2013) Final Report of Baltic Marine Litter Project MARLIN - Litter Monitoring and Raising Awareness.

OSPAR (2010) Guideline for Monitoring Marine Litter on the Beaches in the OSPAR Maritime Area.

UNEP/IOC (2009) UNEP/IOC Guidance on Survey and Monitoring of Marine Litter

Home / Action areas / Monitoring and assessment / Monitoring manual / Underwater noise

UNDERWATER NOISE

GENERAL INFORMATION

At present there is no regular environmental monitoring of noise in the Baltic Sea region.

The ongoing Life+ project Baltic Sea Information on the Acoustic Soundscape (BIAS) will produce soundscape maps by end of 2015, showing the underwater noise generated by commercial vessels, the major source of human-induced underwater noise in the Baltic Sea. Seasonal soundscape maps will be produced for the demersal, pelagic and surface zones. These soundscape maps will serve as a baseline for future development of monitoring and assessment of noise in the Baltic Sea.

The information on sub-programmes refer to monitoring intended to be developed in HELCOM, currently development of appropriate indictators is carried out under HELCOM CORESET II.

Sub-programme: Ambient noise

NOTE: This sub-programme is still under development.

The BIAS project has surveyed national needs and requirements of information on noise and will recommend monitoring of ambient noise in the Baltic Sea, including:

- Suggestions on how to share common responsibilities,
- Establishment of a common field survey plan, including a deployment scheme and geographical positions of sensors,
- Permits for deployment of sensors,
- Procurement of sensors and field vessels,
- Design and preparation of anchoring rig,
- Field survey using sensors placed in different soundscape environments,
- Data analyses and quality assurance.

Sub-programme: Registry of impulsive sounds

NOTE: This sub-programme is still under development.

There is currently no regionally organized registry of impulsive sounds in the Baltic Sea region. Such registry would make an account of the number of days with activities that create impulsive sounds that can be harmful for marine animals and make it possible to evaluate cumulative impacts of noise.

SUB-PROGRAMMES

Ambient noise

Registry of impulsive sounds

A registry of sound would require information on e.g. position data of the activity, licensing block/area, date of operation, source operation. It is proposed to register impulsive sounds according to regional definition of thresholds and areal sub-divisions. A registry could be implemented as a GIS-based (or similar) planning tool where sound levels of events are stored.

RESPONSIBLE HELCOM SUBSIDIARY BODIES

HELCOM PRESSURE*

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