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AVAILABILITY OF MARINE BIODIVERSITY DATA IN ESTONIA, LATVIA, FINLAND AND SWEDEN FOR THE MARMONI PROJECT NEEDS





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Disclaimer

The analysis is produced in the frame of the LIFE+ Nature & Biodiversity project “Innovative approaches for marine biodiversity monitoring and assessment of conservation status of nature values in the Baltic Sea” (Project acronym - MARMONI). The content of this publication is the sole responsibility of the Baltic Environmental Forum and can in no way be taken to reflect the views of the European Union.



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1 Introduction

1.1 Aims of work

Although a lot of research activities have been carried out in the Baltic Sea, no one can assure that we possess complete knowledge about its environment. This statement also covers the issue of marine biodiversity.

Not taking into account the activities to be carried out within the MARMONI project, a lot of valuable data sets have been gathered, processed and stored in various institutions – state agencies, universities, scientific institutes, non-governmental organisations. Often they are not known for an interested person.

The report has been produced within the MARMONI project (Innovative approaches for marine biodiversity monitoring and assessment of conservation status of nature values in the Baltic Sea, LIFE09 NAT/lv/000238), under Action A.1.2: Analyses/stocktaking of existing data on marine biodiversity. The aim of the action was to compile background information on marine biodiversity, analyse existing data sets collected under various international and national obligations and consider options to integrate the data sets for the MARMONI project needs. The action was implemented from 1 October 2010 till 30 June 2011. The report was revised during the project implementation to update with newly identified information.

The results of Action A1.2 will serve other MARMONI actions (A2: Development of new set of indicators and monitoring concept for assessment of the status of marine biodiversity, A3: Testing of new indicator set and monitoring methods, as well as A4.1: Demonstration of biodiversity assessment) by providing background information.

The report is mostly based on the analysis of the existing metadata information, as well as interviews of biodiversity experts in each of the project states (Estonia, Latvia, Finland, and Sweden).

1.2 Defining biodiversity data according to MSFD

The Marine Strategy Framework Directive 2008/56/EC (MSFD) of the European Union is the basic political document related to the protection of the marine environment in European seas, including the Baltic Sea. Biodiversity protection is among topical issues of the Directive. According to the MSFD, every country has to carry the following activities that fit in the information cycle:

- Carrying out an initial assessment;
- Defining good environmental status;
- Defining targets and indicators;
- Developing a monitoring programme;
- Developing and implementing a programme of measures.
- The MSFD also specifies the scope of biodiversity information.

Annex I of the MSFD sets qualitative descriptors for determining good environmental status. Some of them are directly related to important biological parameters and features:

(1) 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** introduced by human activities are at levels that do not adversely alter the ecosystems.

(3) **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) 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.

Annex III of the MSFD already defines indicative lists of characteristics, which should be used in reporting on the implementation of the Directive, among those three bigger issues comprise biodiversity related characteristics:

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. This may include areas subject to intense or specific pressures or areas which merit a specific protection regime.

Biological features

— A description of the **biological communities** associated with the predominant seabed and water column habitats. This would include information on the phytoplankton and zooplankton communities, including the species and seasonal and geographical variability,

— information on **angiosperms, macro-algae** and **invertebrate bottom fauna**, including species composition, biomass and annual/seasonal variability,

— information on the structure of **fish** populations, including the abundance, distribution and age/size structure of the populations,

— 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,

— a description of the population dynamics, natural and actual range and status of **other species** occurring in the marine region or subregion which are the subject of Community legislation or international agreements,

— 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.

Physical damage

— **selective extraction** (e.g. exploration and exploitation of living and non-living resources on seabed and subsoil).

Biological disturbance

— introduction of **non-indigenous species** and translocations,

— **selective extraction of species**, including incidental non-target catches (e.g. by commercial and recreational fishing).

1.3 Where to draw the line?

As the main aim of the analyses of existing data sets was to serve development of new, also politically relevant indicators, the scope of biological information in the context of the MSFD was taken as the bases for developing an indicative list of parameters of the data sets to be searched for in the four project countries, later edited by project experts.

The search was concentrated on habitat and species data, especially those related to Descriptor 1 (biological diversity) in Annex I of the MSFD, including information from one or more of the four project areas (the Gulf of Riga in Latvia and Estonia, Hanö Bight in Sweden, Coastal area of the South West Finland, and the Gulf of Finland in Estonia and Finland).

It must be stressed that the assessment is based on datasets as units and does not take into account differences in data quantity in each of them. Various datasets may contain different numbers of parameters and different amount of information. A dataset could be a set of data collected within a single project as well as a set of data collected yearly within national monitoring programmes.

Also, despite quite comprehensive search for relevant datasets, it is still possible that some relevant data sources have not been yet identified, and all conclusions are drawn based only on the identified sources.

There were some more datasets relevant for marine biodiversity identified (chemical quality of water, geological substrate of the seabed), but they go outside the scope of the assessment.

Table 1 below shows the scope of the data considered when compiling the metadata table on biodiversity data relevant for the MARMONI project. The overview on the collected metadata can be found in the Annex 1 of the current report.

Table 1. The scope of biological data for search within the MARMONI project

Data group	Subject	Data types
Habitat data	<ul style="list-style-type: none"> Sea-bed habitats (benthic) Water column habitats (pelagic) Zooplankton Phytoplankton 	<ul style="list-style-type: none"> Habitat type (coding according to the Habitats Directive if relevant; coding or relevance for other international treaties or conventions; national importance) Conservation status Spatial distribution (incl. maps, what res-

Data group	Subject	Data types
	<ul style="list-style-type: none"> • Angiosperms • Macro-algae • Invertebrates • etc 	<ul style="list-style-type: none"> • Community composition (species, biomass; coverage for bottom communities, annual/seasonal variability) • Habitat quality (food webs, level of human impact) • Human impacts on habitat (harvesting, construction, dumping, littering, recreation, traffic etc)
Species data	<ul style="list-style-type: none"> • Angiosperms • Macro-algae • Benthic invertebrates • Phytoplankton • Zooplankton • Fish • Mammals • Reptiles • Seabirds 	<ul style="list-style-type: none"> • Species name/code (according to international relevance or national importance) • Conservation status • Spatial distribution (incl. maps, what resolution) • Population size (abundance, densities, biomass) • Population structure (size/age/gender structure, fecundity, mortality, annual/seasonal variability) • Population health (diseases, genetic mutations) • Human impacts on populations (fishing/hunting/harvesting, construction, dumping, littering, recreation, traffic, etc) • Population dynamics, natural and actual range

2 General information on data availability

During biodiversity related data search, in total 67 data sets have been identified: 20 in Finland, 17 in Latvia, 16 in Estonia, and 10 in Sweden. The relatively low number of data sets in Sweden is partly due to a more centralized data maintenance approach where much data being stored in national databases. Four data sets are stored within an international organisation - International Council for the Exploration of the Sea.

Looking at the spatial coverage of the datasets, information on the Gulf of Riga and the Gulf of Finland clearly dominate followed by the Baltic Proper, which means that the four project pilot areas are comparatively better explored. Nevertheless, better coverage does not mean that there are no information gaps. Mostly, coastal areas are better covered by data sets compared to the open sea (Figure 1).

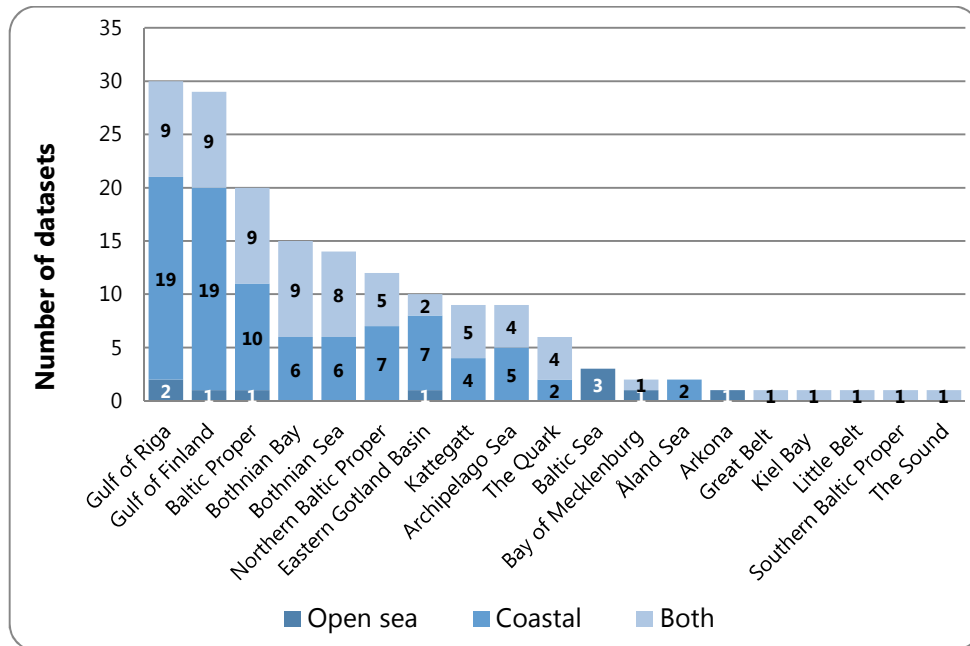


Fig. 1. Spatial distribution of the biodiversity related datasets

The datasets cover mostly species data. Often, data bases cover more than one species group. The most represented groups are fish, birds, plants and zoobenthos; while zooplankton and bacterioplankton are least represented (Figure 2).

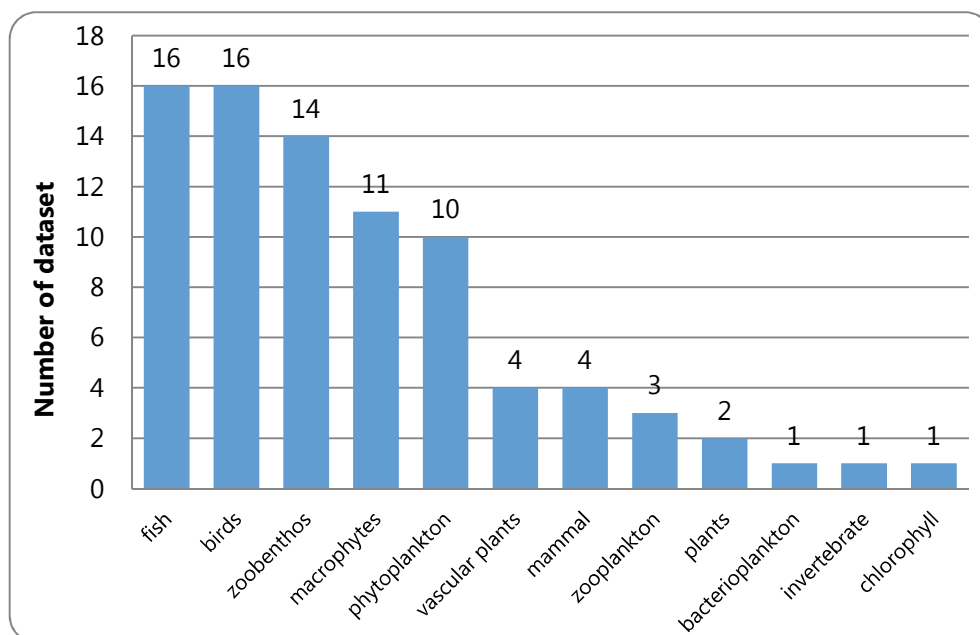


Fig. 2. Distribution of biodiversity related data by species groups

The temporal coverage of the datasets varies very much. Many datasets in Finland and Sweden have historical records since the 1960's. The data sets in Latvia and Estonia are in general much younger, most of them dates back only to the 1990's (Figure 3). A minor half (26) of all datasets are fully available for interested persons, 36 data sets have some limitations for data access. $\frac{1}{4}$ of the data sets are accessible online.



Fig. 3. Temporal distribution of the biodiversity related datasets

3 Data on specific biological features

3.1 Phytoplankton communities

10 datasets on phytoplankton have been identified. Most of the data resources concentrate in Finland and Estonia while Sweden and Latvia are represented with one dataset each.

Historical plankton data are available since 1963 in Finland, 1971 in Sweden, 1993 in Estonia, and 1996 in Latvia. Data seems to be available from all Baltic Sea areas, but the spatial resolution has not been specifically analysed.

The Swedish database contains also records on bacterioplankton and primary production. Some databases store data on chlorophyll- α concentration.

Datasets contain information on such parameters like species composition, abundance and biomass.

3.2 Zooplankton communities

Zooplankton seems to be one of the most unexplored functional groups. Three zooplankton related datasets have been identified – one in Finland, one in Sweden and one in Latvia. The Finnish and Swedish data date back to 1979, the Latvian one to 1993. The spatial coverage is satisfactory for the project needs. While the Latvian data cover the Gulf of Riga project area and Swedish data the Baltic Proper, the Finnish data cover the entire open Baltic Sea.

The datasets contain information on such parameters like species composition, sex, stage, abundance and biomass.

3.3 Macrophytes and angiosperms

Altogether 11 datasets containing data on macrophytes and 5 datasets on angiosperms have been identified.

Macrophytes are covered by 5 datasets in Finland, 3 datasets in Sweden, 3 datasets in Estonia and 1 dataset in Latvia. The temporal coverage in Sweden dates back to the beginning of the 20th century. In Finland and Estonia, the data on macrophytes are available since the 1990's, in Latvia since 1999. Data seems to be available from all Baltic Sea areas, but the spatial resolution has not been specifically analysed.

Angiosperm data are covered to lesser extent – in 4 databases in Estonia and 1 database in Sweden. The Swedish data are recorded since 1992, Estonian – since 1995. No essential datasets on angiosperms have been identified for Latvia and Finland. Comparatively low availability of angiosperm data might be explained with a low number and abundance of species in the Northern Baltic Sea.

Datasets contain information on such parameters like species composition, abiotic conditions, coverage and abundance.

3.4 Bottom fauna

Zoobenthic communities are covered by 14 databases: 3 in Finland, 4 in Sweden, 2 in Latvia, and 5 in Estonia. The data sets for Finland, Sweden and Latvia

have long time series – since 1964, 1971 and 1976, respectively. Data seems to be available from all Baltic Sea areas, but the spatial resolution has not been specifically analysed.

Datasets contain information on parameters such as species composition, coverage, abundance, biomass, distribution and sediment composition.

3.5 Fish populations

The data on fish are most covered among all by different data resources. Altogether, 16 data sets have been recognised related to marine fish: 3 in Latvia, 5 in Estonia, 4 in Finland, 3 in Sweden, as well as 1 international. Data on off-shore surveys of the internationally managed fish species such as herring, sprat, cod were not included here. They are regularly compiled and analysed by the working groups of the International Council for the Exploration of the Sea (ICES).

4 of the recognized datasets are just historical records, the rest is being regularly updated.

Data on commercial fish catches are regularly collected and available in all project countries and areas. However, they cover only the species most valuable for fishery, and thus the majority of fish species in the Baltic Sea region are excluded. The species specific commercial catches moderately reflect the fish abundance, but various factors related to fishery have also impacts on catches. Several datasets are based on gill-net sampling or coastal trawl-surveys. Gill-nets are typical passive gears, which are set steadily in place, for waiting fish to come. There is usually high variation in the gill-net catches even in small temporal or spatial scale. Gill-nets are also highly selective and catch effectively only a small portion of the fish species living in the coastal habitats.

Most of the datasets cover several fish species, only two of them stress particular species – the flounder and the invasive in the Baltic Sea round goby. A number of the datasets contains information on population structure, like abundance, weight-, length-, and sex distribution.

Both benthic and pelagic fish are more or less covered. Information on commercial fish is much better represented compared to non-commercial fish.

3.6 Marine mammals

Data on mammals is comparatively poor and being stored in only 4 databases. The grey seal and ringed seal are covered by databases in Sweden, Finland and Estonia, one in each country. The harbour porpoise data are being stored by a database maintained by the ASCOBANS (Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas) secretariat in Bonn. The database has records from Swedish and Finish waters, as well as some old records from Estonia. Also, temporal coverage of mammal data is not good. No larger data sets for Finland and Latvia have been found.

Datasets contain information on such parameters like sightings, by-catches and stranding for the harbour porpoise, as well as counts for seals.

3.7 Seabirds

Data sets on sea birds are the second most dominant type of biodiversity related data. Sweden accounts for 3, Latvia for 9, Finland 3 and Estonia for 1 data set.

Although Latvia possesses the highest number of bird data sets scattered data, they are not regular and are scattered by investigation year and institution.

Data seems to be available from all Baltic Sea areas, but the spatial resolution has not been specifically analysed. In Sweden, the first records cover the beginning of the 20th century. For Latvia, databases contain information since the end 1980's, for Estonia – since 2000.

Datasets contain information on such parameters like species, abundance, density, distribution and population parameters.

4 View of national experts

To assess the state of the art of biodiversity related data and obtain an assessment of their quality and quantity, a special questionnaire was designed and 18 experts representing various biodiversity competences were interviewed in all four project countries. In total, 30 experts were asked to share their thoughts, mostly by e-mail and phone. In overall, more than a half of the addressees responded. The questionnaire included 11 questions. The reflection of the interviews includes 10 questions, because the 11th question on expectations from the MARMONI project was weakly responded.

4.1 Which type of marine biodiversity data do you deal with?

Most of the respondents represented experts on benthic habitats, followed by nature conservation (Figure 4). Mostly, the experts had more than one competence.

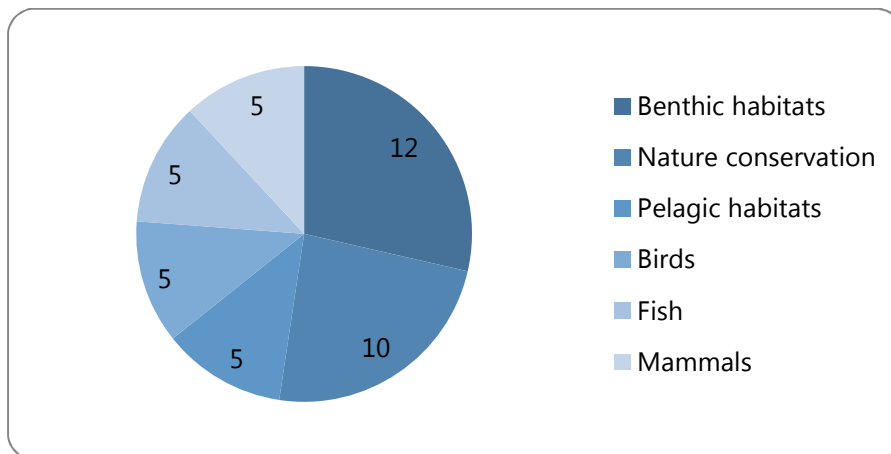


Fig. 4. Distribution of answers for Question 1: Which type of marine biodiversity data do you deal with?

4.2 What parts of the information cycle does your work cover?

Competences of the interviewed experts within the information cycle (monitoring, data processing, data storage, and reporting) were quite equally distributed with a slight domination of experts dealing with reporting (Figure 5).

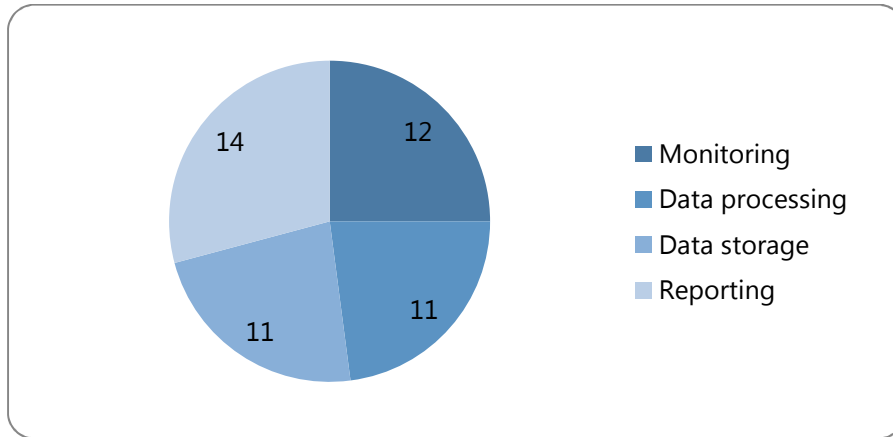


Fig. 5. Distribution of answers for Question 2: What parts of the information cycle does your work cover?

4.3 What needs your data sets are mostly currently serving?

The existing data sets serve monitoring, reporting and assessment, management and spatial planning as well as scientific research needs.

4.4 What is the main driver for maintaining marine data sets you are dealing with?

International obligations (EU directives and policy documents, conventions) received the highest score in ranking driving factors for maintaining marine biodiversity data sets, leaving the self-sufficient scientific interest in the last place (Figure 6).

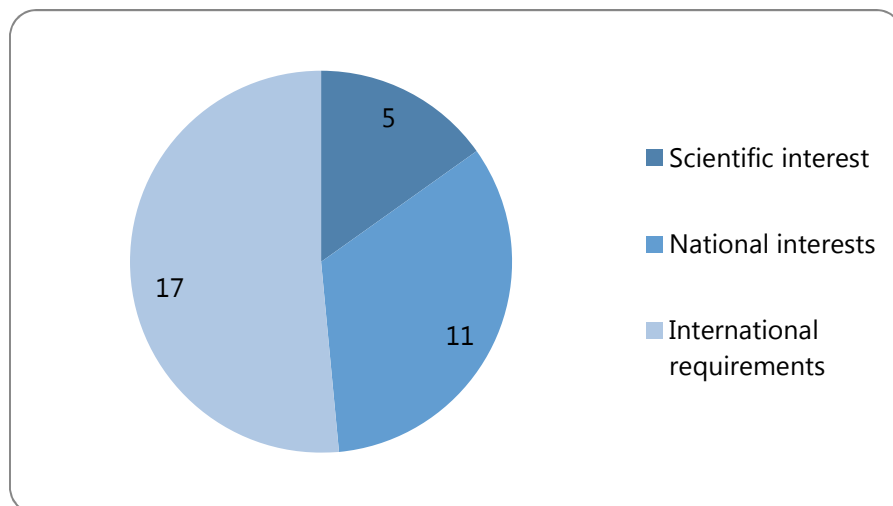


Fig. 6. Distribution of answers for Question 4: What is the main driver for maintaining marine data sets you are dealing with?

4.5 Do your data sets serve objectives of any of the directives/policy documents?

At present, the data sets serve the requirements of different international policy documents, mostly the Marine Framework Strategy Directive (although the di-

rective is just at the beginning of its implementation), Habitats Directive, Water Framework Directive, and Baltic Sea Action Plan (Figure 7).

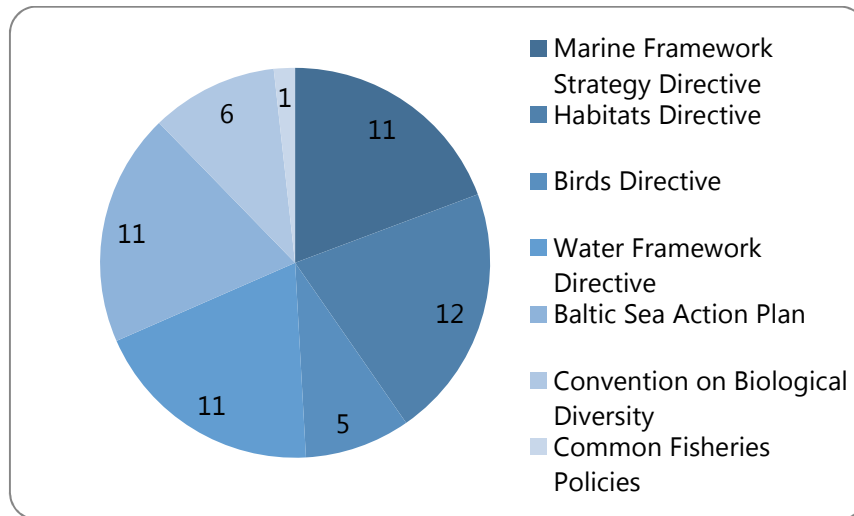


Fig. 7. Distribution of answers for Question 5: Do your data sets serve objectives of any of the directives/policy documents?

4.6 Do the data sets sufficiently cover national/international needs?

The view that the current data sets do not sufficiently cover international and national reporting needs clearly dominated (Figure 8).

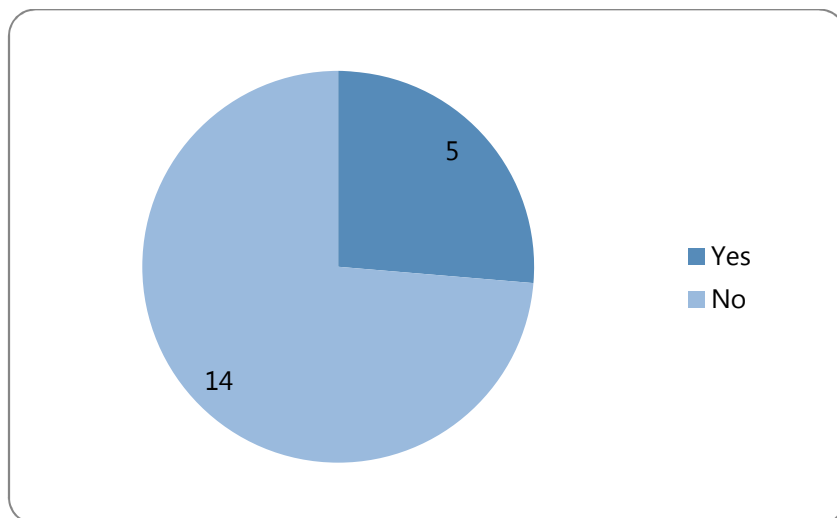


Fig. 8. Distribution of answers for Question 6: Do the data sets sufficiently cover national/international needs?

Lack of funding for collecting, processing and assessing data was stressed as the main reason for insufficiency of data. The situation might become even more complicated in future due to economic breakdowns. The economic situation in some countries, e.g. Latvia, may lead to even more reduced marine biodiversity monitoring. Also, data coverage is not sufficient in both, geographical and time scale. Although the quality of data in the sense of collection method and analysis is good, the sampling frequency is too low to provide appropriate basis for drawing scientifically sound conclusions.

More extensive monitoring is needed for habitat areas, status of typical species and habitat functions. In the Eastern part of the Baltic Sea, marine data has a very project based character – a lot of data come not from regular monitoring, but from investigations within projects (e.g. “Marine Protected Areas in the Eastern Baltic Sea”).

Marine monitoring programme should be developed to meet the requirements of the Marine Strategy Framework Directive, especially for monitoring of open sea, monitoring of alien species and monitoring of Natura 2000 habitats.

4.7 What should be improved in the data sets?

Assessing the need to improve different qualities of data sets, the experts clearly ranked the need to improve the spatial resolution of data as the highest priority. Also, half of the experts believed that improvement of the scope and temporal resolution of data is needed. Only a third of the interviewed experts marked also the quality of data to be improved (Figure 9).

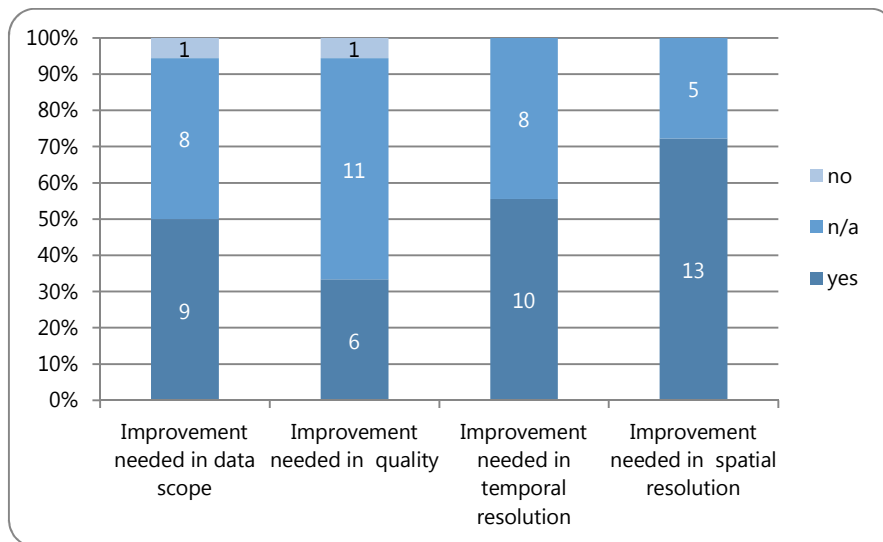


Fig. 9. Distribution of answers for Question 7: What should be improved in the data sets?

4.7.1 Data scope

Data scope should include all the key species (hard bottom, shallow soft and sandy bottoms), invasive/alien species, species that have responded positively to changes (e.g. species favouring eutrophic conditions like *Ceratophyllum demersum*), as well as non-commercial fish. There are some data existing for benthos but almost nothing for pelagic, e.g. primary production. Regarding marine birds, additional data from stopover sites during migration time should be gathered, also winter data from the offshore areas of the Baltic coast is insufficient.

4.7.2 Data quality

The experts emphasised that higher resolution datasets on a spatial scale are needed along with measurements of the most important environmental parameters to obtain good estimates of the distribution of marine species and underwater habitats.

It was stressed that some areas of the Baltic Sea are perhaps assessed too detailed compared to some other regions (effort costs are too large for the data achieved).

Also the need to improve the census methods for seals was mentioned.

4.7.3 Temporal resolution of data

The experts stressed that monitoring frequency should be improved. Often no long time-lines exist, the data collection is not regular, and data is very scattered and project-based. Harmonisation of intervals of data collection for monitoring with reporting intervals was proposed.

Speaking more specifically, the need to improve the temporal resolution for coastal fish species and monitoring of coastal water quality and phytoplankton was pointed out.

4.7.4 Spatial resolution of data

The experts emphasised the need for better datasets to construct reliable spatial prediction models and to validate the models that are produced. The spatial pattern of monitoring systems should be tailored for each individual species.

Not all the key sites in the Baltic Sea are covered with regular censuses. There are marine areas not covered by any monitoring. Especially in the Eastern Coast, data often covers only project areas. Also, open sea is not sufficiently covered by monitoring programmes.

Specifically, spatial resolution should be improved for the benthic and coastal fish data sets.

4.8 What are the major gaps in the national datasets in relation to filling the reporting requirements of different directives/policy documents (please comment the documents of your competence)?

4.8.1 Marine Strategy Framework Directive

The experts mentioned scarcity of the data on most of the key species and habitats, not to mention the genetic diversity. Some of the descriptors of the Good Environmental Status are not covered by data at all. Some of the requested parameters have never been considered. Often the temporal and spatial resolution is not sufficient for, e.g. development of indicators.

Although the demands of the directive are still open, monitoring programmes should be amended with open sea monitoring, alien species monitoring and, in some countries, monitoring of Natura 2000 habitats.

From specific problems, information on hard bottom habitats, especially their animal community, is seriously lacking in Finland, although it is the most typical near-shore habitat.

4.8.2 Habitats Directive

The experts concluded that there are not enough data on the distribution and state of the habitat types listed in the Annex I of the Directive. Major data gaps occur for shallow and coastal habitats, as well as the status of the typical species. Knowledge on habitat functions is also not complete.

Habitat distribution data is there only for project areas, but lacking for the whole marine area and therefore it is not possible to evaluate how big part of each habitat type is protected. Methods for assessing the (favourable) conservation status and the (good) environmental status of marine habitats should be elaborated. Currently such methods do not exist.

Existing data is located in different institutions and sometimes there are delays in their operative use.

Methodologically, the definitions of some of the habitats are unclear, as well as delineation methods are not enough developed.

4.8.3 Birds Directive

Data is too scattered for reporting and evaluation. Similarly to the Habitats Directive, the existing data are located in different institutions and sometimes there are delays in their operative use.

The Birds Directive also stipulates information about important habitats for birds, but currently the knowledge of experts on benthic habitats used by birds as feeding grounds is still insufficient.

4.8.4 Water Framework Directive

The Directive covers only a fraction of marine waters – the coastal zone. Data coverage for biological parameters is not comprehensive. Ecological indices are still under preparation.

Due to the data scarcity, it is difficult to prove the statistical and thus sometimes also logical link between pressures and outcomes, resulting again in problem with indicator development.

As regards specific parameters, the coverage and frequencies of phytoplankton monitoring in some of the coastal water areas of the Baltic Sea is not sufficient (e.g. Finland).

As regards the comments for *the Baltic Sea Action Plan* and *Convention on Biological Diversity*, they stay in line with the comments on the four EU directives.

Data gaps in relation to the EU Common Fisheries Policy were not directly commented.

4.9 How well do you find the monitoring and methods of your national datasets harmonized in the Baltic context?

The majority of experts found that harmonisation is good in the Baltic context. The guidelines and standards of HELCOM and EU are being followed.

Some data collection is very well harmonised, e.g. for grey seals, water birds, fish, deep sea fauna and plankton, as well as abiotic parameters.

Still harmonisation of data sets is needed. The level of harmonisation of different parameters is not even. E.g. for the Water Framework Directive needs, benthos indices for soft bottoms in coastal waters are well developed and harmonised. On the other hand, all countries have developed their own macrophyte indices.

Some older data sets cannot be used for comparison between the countries or with newer data sets. Also, harmonised data storage in all countries should be implemented.

4.10 Are there any changes to be expected in your national monitoring programme in the near future?

Most of the experts responded that some changes are expected in the national monitoring programmes (Figure 10).

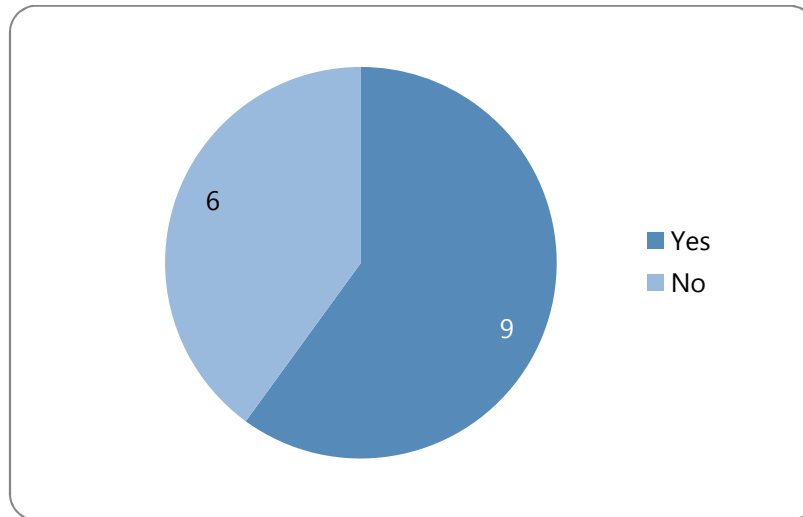


Fig. 10. Distribution of answers for Question 10: Are there any changes to be expected in your national monitoring programme in the near future?

In Sweden, harmonizing in the Baltic context was stressed.

In Estonia, more effective open sea monitoring, wider monitoring of alien species and more complete monitoring of Natura 2000 sites is planned. More attention will be paid to collecting data for reporting (e.g. Habitats Directive) requirements.

In Latvia, the National Monitoring Programme is revised every 4-5 years. The current Guidelines are in force till 2013.

In Finland, harmonisation of the coastal monitoring programme with the open sea monitoring is expected. On the other hand, a decrease of monitoring in terms of coverage of the monitoring network and monitoring frequencies is expected.

5 Conclusions on data availability

From the assessment of the compiled metadatabase and expert interviews, the following conclusions may be drawn with regard to the data availability for the MARMONI project needs:

- ❖ Although the quality of data in the sense of collection method and analysis is good, the sampling frequency is too low to provide appropriate basis for drawing scientifically sound conclusions.

- ❖ In general, the current data sets do not sufficiently cover international and national reporting needs.
- ❖ Harmonised data storage in all countries should be implemented.
- ❖ Open sea monitoring is lagging behind coastal monitoring, except for Finland.
- ❖ More extensive monitoring is needed on distribution and functions of habitats as well as the status of typical species.
- ❖ Data on phytoplankton of varying spatial and temporal scale seem to be available in the project areas. The methods of phytoplankton observations are well harmonised among the countries.
- ❖ Data on zooplankton are comparatively poor; therefore in future some monitoring activities have to be carried out for this group of marine organisms. The few existing datasets cover partly all project areas except the Hanö Bight. No data sets have been identified for the Estonian and Swedish project areas.
- ❖ Macrophytes are well covered concerning both, temporal and spatial scale. As different macrophyte indexes are being used in the countries, harmonisation is needed, which means also need for the harmonization of monitoring and data.
- ❖ Availability of angiosperm data is comparatively low. No essential datasets on angiosperms have been identified for Latvia and Finland.
- ❖ Zoobenthic community data seems to be available from all areas within the Baltic Sea, including historical time series.
- ❖ Data on commercial fish catches are regularly collected and available in all project countries and areas. However, they cover only the species most valuable for fishery, and thus the majority of fish species in the Baltic Sea region are excluded. Methodology seems to be well harmonised among the countries.
- ❖ Although only few marine mammal species can be found in the project states, the data sets are quite limited.
- ❖ The bird data sets are comparatively widely represented, but they are irregular. Many data categories that must be improved, e.g. the data from stopover sites during migration time and Baltic coast offshore winter data.
- ❖ The list of the identified datasets is not complete, and more datasets could be found in all countries and added to the metadata table.

6 Acknowledgements

We would like to thank the national experts in Estonia, Finland, Latvia and Sweden for their kind participation in the expert interviews and/or were involved in data collection and analysis.

7 References

Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008, establishing a framework of community action in the field of marine environmental policy (Marine Strategy Framework Directive). Official Journal of the European Union.

UN Convention on Biological Diversity. <http://www.cbd.int/>

8 Annex 1. Summary on biodiversity related information in Estonia, Latvia, Finland and Sweden

ENGLISH TITLE	COUNTRY	COMMUNITIES/ SPECIES	VARIABLES	INSTITUTION
Biological Monitoring Data (phytoplankton)	Finland	Phytoplankton	Species name, units, amount of cell volume (biomass), carbon and plasma volume per litre of sample, number of individuals per litre, size, counting unit, shape (+ nutrients, hydrography, chlorophyll-a)	Finnish Environment Institute SYKE/ Marine Research Centre
Biological Monitoring Data (zooplankton)	Finland	Zooplankton	Species name, sex, stage, units, units per cubic meter, wet weight (+ nutrients, hydrography, chlorophyll-a)	Finnish Environment Institute SYKE/ Marine Research Centre
Biological Monitoring Data (zoobenthos)	Finland	Zoobenthos	Species name, units, abundance, wet weight, size (+ nutrients, hydrography, chlorophyll-a)	Finnish Environment Institute SYKE/ Marine Research Centre
Algabase - Alg@line database	Finland	Phytoplankton (semiquantitative)	Species name, abundance class (+ nutrients, hydrography, chlorophyll-a)	Finnish Environment Institute SYKE/ Marine Research Centre
Benthic fauna	Finland	Zoobenthos	Species name, number of individuals, amount of cell volume (biomass)	Finnish Environment Institute SYKE/ Marine Research Centre
Phytoplankton	Finland	Phytoplankton	Species name, number of individuals, amount of cell volume (biomass)	Finnish Environment Institute SYKE/ Freshwater Centre
Algal blooms	Finland	Phytoplankton	Species name, possible toxicity, metadata of samples	Finnish Environment Institute SYKE/ Freshwater Centre
Bottom fauna	Finland	All bottom fauna	Species name, water quality, seabed structure	Finnish Environment Institute SYKE/ Marine Research Centre
Aquatic macrophyte (coming)	Finland	All bottom macrophytes	Species name, water quality, seabed structure	Finnish Environment Institute SYKE/ Marine Research Centre

ENGLISH TITLE	COUNTRY	COMMUNITIES/ SPECIES	VARIABLES	INSTITUTION
soon)			ture	tute SYKE/ Marine Re- search Centre
Macrophyte transects along Vuosaari ship line	Finland	Annual, perennial, <i>Fucus</i> , red algae, brown algae	Coverage, height, depth, low growth limit	Alleco Ltd, Monivesi Ltd
Cladophora glomerata on navigation buoys along Vuosaari ship line	Finland	Annual, <i>Cladophora glomerata</i>	Height	Alleco Ltd, Monivesi Ltd
Fucus vesiculosus measurements on various sites on the GoF	Finland	Perennial, <i>Fucus vesiculosus</i>	Lower growth limit	Monivesi Ltd
Fucus vesiculosus measurements on Tvärminne archipelago	Finland	Perennial, <i>Fucus vesiculosus</i>	Lower growth limit	Monivesi Ltd
Commercial Marine Fishery	Finland	Commercial fish species (approximately 20 species)	Catch, catch per unit effort	Finnish Game and Fisheries Research Institute
Gill net monitoring in Baltic Sea reference areas, old data	Finland	Warm-water fish species (typically Percids and Cyprinids)	Catch, catch per unit effort, length distribution	Government of Åland
Gill net monitoring in Baltic Sea reference areas, new data	Finland	Warm-water fish species (typically Percids and Cyprinids)	Catch, catch per unit effort, length distribution	Finnish Game and Fisheries Research Institute
Monitoring of young flounder in Hanko and Åland	Finland	Flounder	Abundance and length distribution	Finnish Game and Fisheries Research Institute
Hunting in Finland -database (including seabirds and grey seal)	Finland	Seabirds (e.g. <i>Clangula hyemalis</i> , <i>Somateria mollissima</i> , <i>Anser anser</i>), grey seal	Number of target animals caught (by species and regions)	Finnish Game and Fisheries Research Institute
Counts of migrating and staging birds at the Hanko Bird Observatory	Finland	All bird species	Number, size category, length, weight, age, sex	Ornithological Society of Helsinki Region
Database of threatened species	Finland	Threatened species of waterfowl, gulls, auks, waders and birds of prey, threatened water plants	Number, age, size, condition of individuals	Finnish Environment Institute
Coastal database - Coastal fish monitoring	Sweden	Fish	Species, number of individuals per species, catch per unit	Swedish Board of Fisheries

ENGLISH TITLE	COUNTRY	COMMUNITIES/SPECIES	VARIABLES	INSTITUTION
			effort, for some species also sex, length and weight.	
The Swedish Species Information Centre	Sweden	Fish, macrophytes, birds, marine invertebrates	Observations	ArtDatabanken
SHARK - SMHI (SE)	Sweden	Macrozoobenthos (invertebrates), bacterioplankton, phytoplankton, seals	Counts. Biomass for macrozoobenthos, secchi depth, chlorophyll a, primary production in water column, sedimentation rates	SMHI
MarTrans and Grunda - SMHI (SE)	Sweden	Phytobenthic transects, inventories of shallow bays, macrophytes, zoobenthos, vascular plants	Species, cover	SMHI
Swedish county maps	Sweden		Polygons with coordinates	Collaborative effort from all County boards
Global biodiversity information facility - Sweden	Global	Macrozoobenthos, fish etc. Information concerning objects from museums or species observations	Species observations, samples	GBIF-Sweden
The Swedish Portal for Environmental Reporting	Sweden	Macrophytes, zoobenthos, birds	Species, estimated cover. Predicted distribution maps	SEPA
HELCOM-ASCOBANS Harbour porpoise database	Baltic-Sea wide	Harbour porpoise	Sightings, bycatches and strandings	HELCOM-ASCOBANS
Round goby inventories, coastal database	Sweden	Focused on the immigratory round goby, but abundances of all fish species are noted	Species, length, weight	Swedish board of fisheries
Swedish water-bird census	Sweden	Waterbirds (divers, grebes, ducks, geese, swans, coot, cormorant and heron)	Number of the different species per counting units	Biological Institute, Department of Biodiversity, University of Lund
Measurements of chlorophyll A in territorial waters of Latvia	Latvia		Chlorophyll concentration - mg/ml	Latvian Institute of Aquatic Ecology
Analysis of hard bottom fauna and	Latvia	Hard bottom fauna, macro-	Genus/species composition; abundance -	Latvian Institute of Aquatic

ENGLISH TITLE	COUNTRY	COMMUNITIES/SPECIES	VARIABLES	INSTITUTION
macrophytes in territorial waters of Latvia		phytes	individuals/m ² ; biomass - g/m ²	Ecology
Analysis of soft bottom fauna community in territorial waters of Latvia	Latvia	Soft bottom fauna	Genus/species composition; abundance - individuals/m ² ; biomass - g/m ³	Latvian Institute of Aquatic Ecology
Analysis of phytoplankton community in territorial waters of Latvia	Latvia	<i>Nostocophyceae, Diatomophyceae, Dinophyceae, Cryptophyceae, Chrysophyceae, Haptophyceae, Chlorophyceae, Prasinophyceae, Euglenophyceae, Ebrriidea, Litostomatea</i>	Species composition, abundance, biomass	Latvian Institute of Aquatic Ecology
Analysis of mesozooplankton community in territorial waters of Latvia	Latvia	<i>Copepoda, Cladocera, Rotifera (Rotatoria), Varia</i> - planktonic stages of benthic species	Genus/species composition; abundance - individuals/m ³ ; biomass - mg/m ³ ; seven (nauplii, I-V copepodite stage, adults - male or female) development stages for <i>Copepoda</i>	Latvian Institute of Aquatic Ecology
Data of coastal fish inventories	Latvia	Coastal fish	Species, number, length, weight, for some individuals - sex, development stage	Institute of Food Safety, Animal Health and Environment "BIOR"
Detailed fishery statistics	Latvia	Coastal fish	Total weight for each species	Institute of Food Safety, Animal Health and Environment "BIOR"
Scientific record of demersal trawling in the Gulf of Riga	Latvia	Benthic fish	Species, number, total weight of species	Institute of Food Safety, Animal Health and Environment "BIOR"
Mid winter waterfowl counts	Latvia	<i>Gavia sp, Podiceps, cristatus, Clangula hyemalis, Mergus merganser, Mergus serrator, Anas platyrhynchos</i>	Species, number, location (sex, age optional)	Institute of Biology
Baltic Seabirds Transect Surveys/European Seabirds At Sea database	Denmark, Sweden, Germany, Poland, Lithuania,	<i>Gavia sp, Podiceps, cristatus, Podiceps grisegena, Podiceps auritus, Melanitta nigra, Mel-</i>	Density	DHI Water-Environment-Health

ENGLISH TITLE	COUNTRY	COMMUNITIES/SPECIES	VARIABLES	INSTITUTION
	Latvia, Estonia	<i>anitta fusca</i> , <i>Clangula hyemalis</i> , <i>Mergus serrator</i> , <i>Larus minutus</i> , <i>Alca torda</i> , <i>Cephus grylle</i>		
Baltic MPA Bird database	Latvia	<i>Gavia arctica</i> , <i>Gavia stellata</i> , <i>Melanitta nigra</i> , <i>Melanitta fusca</i> , <i>Clangula hyemalis</i> , <i>larus minutus</i> , <i>Alca torda</i> , <i>Cephus grylle</i>	Species, number, distance belt	Latvian Ornithological Society
Counts of moulting Goldeneyes	Latvia	<i>Bucephala clangula</i>	Number, location	Institute of Biology
Counts from ship in 1998	Latvia	<i>Gavia spp</i> , <i>Clangula hyemalis</i> , <i>Melanitta fusca</i> , <i>Larus argentatus</i> , <i>Larus canus</i>	Species, number	Latvian Ornithological Society
Counts from ship in 2000	Latvia	<i>Gavia spp</i> , <i>Clangula hyemalis</i> , <i>Melanitta fusca</i> , <i>Larus argentatus</i> , <i>Larus canus</i>	Species, number, distance belt	Institute of Biology
Birds counts on the Latvian sea-coasts	Latvia	All waterbirds and shore birds observed	Species, number, (sex, age - optional)	
Beached birds surveys	Latvia	All waterbirds and shore birds	Species, status, presence of oil on plumage, presence of oil on coast	
Protected species in coastal and dune areas of Kurzeme	Latvia	All bird species observed	Species, number, breeding status, sex, age	"REMM" Ltd.
Inventories of marine benthic habitats and species in marine protected areas	Estonia	Zoobenthos, macrophytes, vascular plant communities	Species composition, coverage, abundance, biomass, distribution; sediment composition	University of Tartu, Estonian Marine Institute
Coastal sea benthic communities monitoring	Estonia	Zoobenthos, macrophytes, vascular plant communities	Species composition, coverage, abundance, biomass, distribution; sediment composition	University of Tartu, Estonian Marine Institute
Coastal sea surveillance monitoring according to WFD requirements, benthic communities	Estonia	Zoobenthos, macrophytes, vascular plant communities	Species composition, coverage, abundance, biomass, distribution; sediment composition	University of Tartu, Estonian Marine Institute
Coastal sea sur-	Estonia	Phytoplankton	Species composition,	University of

ENGLISH TITLE	COUNTRY	COMMUNITIES/SPECIES	VARIABLES	INSTITUTION
veillance monitoring, plankton communities		communities	abundance, biomass; chlorophyll-a	Tartu, Estonian Marine Institute
Offshore monitoring of plankton	Estonia	Phytoplankton communities	Species composition, abundance, biomass; chlorophyll-a	University of Tartu, Estonian Marine Institute
Ferrybox	Estonia	Phytoplankton communities	Species composition, abundance, biomass; chlorophyll-a	University of Tartu, Estonian Marine Institute
Operational monitoring program	Estonia	Phytoplankton communities	Species composition, abundance, biomass; chlorophyll-a	University of Tartu, Estonian Marine Institute
Operational monitoring program	Estonia	Zoobenthic communities	Species composition, coverage, abundance, biomass, distribution; sediment composition	University of Tartu, Estonian Marine Institute
Marine protected areas and Inventories of open sea area marine benthic habitats	Estonia	Zoobenthic communities	Species composition, coverage, abundance, biomass, distribution; sediment composition	University of Tartu, Estonian Marine Institute
Marine protected areas and Inventories of open sea area marine benthic habitats	Estonia	Fish	Species composition, abundance, weight, length, sex, distribution	University of Tartu, Estonian Marine Institute
Inventories of marine benthic habitats and species in marine protected areas	Estonia	Fish	Species composition, abundance, weight, length, sex, distribution	University of Tartu, Estonian Marine Institute
Coastal sea fish monitoring	Estonia	Fish	Species composition, abundance, weight, length, sex, distribution	University of Tartu, Estonian Marine Institute
National data collection program, fishery	Estonia	Fish	Species composition, abundance, weight, length, sex, distribution	University of Tartu, Estonian Marine Institute
Fishframe data collection program	Estonia	Fish, commercial species (cod, Baltic herring, flatfish etc.)	Species composition, length, weight, sex, abundance, distribution	University of Tartu, Estonian Marine Institute
Estonian Nature Information System	Estonia	Birds, mammals, plants	Location description, coordinates, habitat description, habitat impact description, species composition, protection status, monitoring status etc.	Estonian Environment Information Centre

ENGLISH TITLE	COUNTRY	COMMUNITIES/SPECIES	VARIABLES	INSTITUTION
Estonian Nature Observations Database	Estonia	All species groups	Location description, coordinates, habitat description, protection status, observation means etc.	Estonian Environment Information Centre
Biological community	International, Denmark	2117 species of all kind	Abundance and biomass	International Council for the Exploration of the Sea
Contaminants and biological effects	International, Denmark	99 species of all kind	Number, size category, length, weight, distribution	International Council for the Exploration of the Sea
Fish predation (stomach content)	International, Denmark	846	Number, size category, length, weight, distribution	International Council for the Exploration of the Sea
Fish trawl survey	International, Denmark	455	Number, size category, length, weight, distribution	International Council for the Exploration of the Sea

LIFE+ Nature & Biodiversity project **“Innovative approaches for marine biodiversity monitoring and assessment of conservation status of nature values in the Baltic Sea”** (Project acronym - MARMONI).

Please visit the project website: <http://marmoni.balticseaportal.net/>

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