Ecological coherence assessment of the marine protected areas network in the Baltic Sea

Draft version 18 April 2016

HELCOM
Baltic Marine Environment Protection Commission

This is the Ecological coherence assessment of the marine protected areas network in the Baltic Sea. It was approved for publishing by [*insert appropriate reference after approval*], and funded by the Nordic Council of Ministers (HELCOM ECONET project). The Swedish Agency for Marine and Water Management (HaV) is acknowledged for funding on the HELCOM MPA database, which enabled data collection for this assessment.

Published by:

Helsinki Commission
Katajanokanlaituri 6 B
FI-00160 Helsinki
Finland
http://www.helcom.fi

Authors

Janica Borg, Ulla Li Zweifel, Petra Kääriä, Iiris Kokkonen and Joni Kaitaranta

For bibliographic purposes this document should be cited as:
HELCOM 2016. Ecological coherence assessment of the marine protected areas network in the Baltic. Balt. Sea Environ. Proc. No. XX

Lay out: XX

Photo credits: XX

Number of pages: XX

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Executive summary

The Baltic Sea Action Plan sets out as one of its main goals to achieve 'a favourable status of Baltic Sea biodiversity'. Designation of Marine Protected Areas (MPAs) has been an instrument for protection in the Baltic Sea for more than 30 years and serves as an important measure to meet this commitment of the Contracting Parities to the Helsinki Convention. To reach an ecologically coherent network of MPAs, i.e. a network of protected sites that deliver more benefits than individual MPAs, has been on the agenda of HELCOM since the first joint Ministerial Meeting of the Helsinki and OSPAR Commissions in Germany 2003, when Member States of these two conventions and the European Commission agreed on a Joint Work Programme (JWP). To establish an ecologically coherent and effectively managed network of coastal and marine Baltic Sea protected areas is also the fundament of the HELCOM Recommendation on the system of coastal and marine Baltic Sea protected areas (HELCOM MPAs[1]) adopted in 2014 (HELCOM Recommendation 35-1).

This report presents the recent development of the HELCOM MPA network, assesses the ecological coherence of the network, and also follows up on other commitments made through HELCOM Recommendation 35-1. The assessment shows a continued positive development of HELCOM work on MPAs, but also room for improvement and need for implementation of made agreements.

Since the designation of the first HELCOM MPAs in 1994, there has been a substantial increase in the areal coverage of MPAs: in 2004 the protected marine area of the Baltic Sea was 3.9%, in 2010 it was 10.3%, and today, in 2016, it is 11.8%. Thus, the target of at least 10% coastal and marine areas being conserved, set by the UN Convention on Biological Diversity, was reached in the Baltic Sea already in 2010. Through Recommendation 35-1, HELCOM has furthermore agreed to reach the 10% target for each sub-basin, when scientifically justified. This target has been met in 11 out of 17 sub-basins, the exceptions being Eastern and Western Gotland Basin, Northern Baltic Proper, Åland Sea, Bothnian Sea and Bothnian Bay.

At this time, the initial steep increase in area of MPAs has slowed downed somewhat. However recently, 11 new Finnish sites were nominated as HELCOM MPAs, covering a total of 715 km^2 of marine area. 83% of this area is situated in the exclusive economic zone, which takes the network one step closer to the HELCOM target to include more off-shore areas under the MPA protection regime.

The assessment of ecological coherence considered four aspects; representativity, replication, adequacy and connectivity. Two of these aspects were evaluated to be at an acceptable level for supporting a coherent MPA network: the areal representation of different type of geographical features and broad scale habitats, and the replication of a set of indicative species and biotope complexes, as well the broad scale habitats. Adequacy however, which considers the quality of the network, and connectivity which measures how well the network supports migration and dispersal of species, indicates that the network is not yet ecologically coherent. Improving connectivity requires joint efforts from all HELCOM countries when planning and nominating new sites to the HELCOM MPA network, as connectivity cannot be improved on the level of single sites.

This report includes a first attempt at a quantitative integrated approach for assessing ecological coherence. The integrated approach indicates that it is highly unlikely that the network of HELCOM MPAs is ecologically coherent. It proved to be a straightforward and transparent method and is recommended to be used in future HELCOM MPA assessments alongside descriptive information on the status of the network. For the assessment of ecological coherence at large, further development is needed. Important basic information needed for appropriate analysis for example on the spatial distribution of species and biotopes is still missing as well as science based targets for assessment criteria such as replication.

The objectives of Recommendation 35-1 are at this time in most cases in progress but yet only partly accomplished. The goal to ensure that HELCOM MPAs provide specific protection to HELCOM Red Listed species, biotopes, biotope complexes and habitats, has for example not been reached since many threatened features are not protected in any of the HELCOM MPAs, at least not according to information reported by the Contracting Parties.

HELCOM Recommendation 35-1 also emphasizes the development and implementation of management plans for MPAs as well as to assess the effectiveness of management plans or other measures to ensure protection. One of the commitments is to develop and apply by 2015 management plans or measures for all existing HELCOM MPAs, and establish management plan or measures for every new MPA within five years after its designation. This agreement has not been met; currently only 67% of MPAs has management plans. Regarding assessment of effectiveness of the plans,

[1] Former BSPAs.

this has not yet taken place and joint guidelines still remain to be developed for how to carry out such evaluations. At present, monitoring within MPAs, a prerequisite for assessment of effectiveness, occurs in 64% of HELCOM MPAs.

1. Introduction

1.1. Purpose of assessing marine protected areas in the Baltic Sea

The purpose of assessing marine protected areas (MPAs) is to follow up on the development of the MPA network in the Baltic Sea, to identify where further development of the network is needed, and to evaluate commitments made in HELCOM with regard to MPAs. The overarching target is to achieve a coherent and effectively managed network of MPAs in the Baltic Sea, including not only the network of HELCOM MPAs but also other protection programmes such as Natura 2000 and Ramsar sites.

Additional specific targets include, as agreed through Recommendation 35-1 on the system of coastal and marine Baltic Sea protected areas (HELCOM MPAs[2]), for example to;

- protect at least 10% of the marine area of each Baltic Sea sub-basin, when scientifically justified,
- designate new sites as HELCOM MPAs where ecologically meaningful, especially in offshore areas beyond territorial waters,
- ensure that HELCOM MPAs provide specific protection to those species, habitats, biotopes and biotope complexes included in the HELCOM Red Lists,
- develop and apply by 2015 management plans or measures for all existing HELCOM MPAs, and establish management plan or measures for every new MPA within five years after its designation,
- assess the effectiveness of the management plans or measures of HELCOM MPAs by conducting monitoring, and where feasible scientific research programmes, which are directly connected to the conservation interests of HELCOM MPAs, including the placement of monitoring stations inside the MPAs,
- modernize the HELCOM MPAs database, taking into account and harmonizing with other similar databases.

This report includes an assessment of the ecological coherence of the HELCOM MPA network (chapter 3), a proposal for a new aggregation method for summarizing the outcome of the ecological coherence (chapter 4) and a follow-up of the commitments of HELCOM Recommendation 35-1 (chapter 5). The basis of the assessment are data, information and shapefiles reported to the HELCOM MPA database which was modernized and updated in 2015. The assessment methodology is based on the previous HELCOM assessment of ecological coherence (HELCOM 2010) and discussions within the HELCOM MPA Task Group and State and Conservation Working Group.

1.2. The concept of coastal and marine Baltic Sea protected areas (HELCOM MPAs[2])

The main goal of the coastal and marine Baltic Sea protected areas (HELCOM MPAs) is to protect valuable marine and coastal habitats in the Baltic Sea. This is done by designating suitable areas which have particular nature values as protected areas and by managing human activities within those areas (HELCOM 2003).

The first HELCOM MPAs were established in 1994, following the adoption of the 1992 Helsinki Convention, specifically its Article 15 on Nature conservation and biodiversity. Article 15 of the Helsinki Convention requires the Contracting Parties to take all appropriate measures to conserve natural habitats and biological diversity in the Baltic Sea. To further implement Article 15, HELCOM Recommendation 15/5 on the system of coastal and marine Baltic Sea protected areas was adopted in 1994. Furthermore, HELCOM agreed on guidelines and criteria for HELCOM MPAs as presented in Box 1 (HELCOM 1994). At a later stage, the Baltic Sea Action Plan (HELCOM 2007a) and HELCOM 2010 and 2013 Ministerial Meetings agreed on objectives for the network of protected areas, encouraging the Contracting Parties to nominate new areas (HELCOM 2007a). Recommendation 15/5 was reviewed and updated in 2014 and is now superseded by Recommendation 35/1 on the system of coastal and marine Baltic Sea protected areas (HELCOM MPAs). The new recommendation consolidates previous commitments and its main focus is on improving the management and ecological coherence of the network of MPAs in the Baltic Sea (HELCOM 2014).

Initially, 62 sites from all nine riparian states were nominated as HELCOM MPAs. Today the number of designated sites is 174. HELCOM MPAs cover both marine and coastal areas, including islands. The status of the HELCOM MPA network has been reviewed at several occasions (HELCOM 2006a, Al-Hamdani & Reker 2007, Andersson et al. 2007, HELCOM 2007b,

[2] Former BSPAs.

Piekäinen & Korpinen 2008, HELCOM 2009 and 2010), and this publication provides an overview of the status and ecological coherence of the network as reported in 2015.

BOX 1. HELCOM objectives and criteria for the HELCOM MPA network [a]

1. A HELCOM MPA should give particular protection to the species, natural habitats and nature types in order to conserve biological and genetic diversity.
2. It should protect ecological processes and ensure ecological function.
3. It should enable the natural habitat types and the habitats of the species to be maintained at, or where appropriate, restored to a favourable conservation status in their natural range.
4. The minimum marine size of a HELCOM MPA should preferably be 30 km^2 for marine/lagoon parts.
5. The system should be enlarged stepwise by additional areas, preferably purely marine areas.
6. The network should protect areas with:
   - threatened and/or declining species and habitats,
   - important species and habitats,
   - high natural biodiversity,
   - rare, unique, or representative geological or geomorphological structures or processes,
   - high sensitivity,
   - ecological significance:
     - a high proportion of habitats of migratory species,
     - important feeding, breeding, moulting, wintering or resting sites,
     - important nursery, juvenile or spawning areas,
     - a high natural biological productivity of the species or features being represented.

a) The objectives and criteria are based on the Joint HELCOM/ OSPAR Work Programme on Marine Protected Areas (Bremen 2003), HELCOM Recommendation 15/5 on the system of coastal and marine Baltic Sea protected areas and on the Minutes of the Eight Meeting of Nature Protection and Biodiversity Group (HELCOM HABITAT 8/2006).

2. Status of the network

Today there are 174 designated HELCOM MPAs (status in November 2015). They cover a total of 54 367 km^2, of which 90% (49 107 km^2) is marine area (Table 1). The marine area of all HELCOM MPAs equals 11.8% of the total surface area of the Baltic Sea (Figure 1). Denmark protects the largest marine area measured in square kilometres (10 411 km^2), while Germany protects the largest marine area measured as percentage of the total area of the nation (36%). Sweden protects the largest area in the exclusive economic zone (2 750 km^2).

The last overview of the HELCOM MPA network was carried out in 2013 (HELCOM 2013a). Since then Finland has nominated 11 new MPAs and the total number of sites has grown from 163 to 174. This increased the total area of HELCOM MPAs by 725 km^2.

Table 1. Total number, total area and marine fraction of HELCOM MPAs, total marine area per country and protected marine area of HELCOM MPAs in HELCOM Contracting Parties. The data is based on HELCOM MPA shapefiles from November 2015.

Country and number of HELCOM MPAs		Total area of HELCOM MPAs	Marine fraction of HELCOM MPAs		Total marine area per country			Size of protected marine area (km^2) and fraction (%) of the national territorial waters (TW), exclusive economic zone (EEZ) and total area					
		km^2	km^2	(%)	TW km^2	EEZ km^2	Total km^2	TW km^2	(%)	EEZ km^2	(%)	Total km^2	(%)
Denmark	66	11 181	10 411	(93%)	32 917	13 074	45 991	7 599	(23%)	1 091	(8%)	10 411	(23%)
Estonia	7	7 192	6 050	(84%)	25 139	11 830	36 970	5 954	(24%)	43	(0%)	6 050	(16%)
Finland	33	6 523	6 039	(93%)	53 176	28 660	81 836	3 066	(6%)	83	(0%)	6 039	(7%)
Germany	12	5 840	5 526	(95%)	10 852	4 505	15 357	2 202	(20%)	2 217	(49%)	5 526	(36%)
Latvia	7	4 364	4 364	(100%)	12 692	16 125	28 816	4 150	(33%)	214	(1%)	4 364	(15%)
Lithuania	6	1 393	1 005	(72%)	2 274	4 259	6 534	1 393	(61%)	0	(0%)	1 005	(15%)
Poland	9	8 052	7 361	(91%)	10 172	19 491	29 663	5 426	(53%)	888	(5%)	7 361	(25%)
Russia	6	1 435	977	(68%)	16 315	7 373	23 902	894	(6%)	0	(0%)	977	(4%)
Sweden	28	8 387	7 375	(88%)	83 013	65 272	148 284	3 599	(4%)	2 750	(4%)	7 375	(5%)
Total	**174**	**54 367**	**49 107**	**(90.3%)**	**246 550**	**170 589**	**417 352**	**34 283**	**(14%)**	**7 286**	**(4%)**	**49 107**	**(11.8%)**

The current overview numbers (Table 1) are calculated from shapefiles, while the numbers published in 2013 were based both on shapefiles and background data reported by the countries. During the last years the shapefiles have become more detailed, which directly affects the surface area calculated from them. Therefore the current numbers are not directly comparable with the ones published in 2013, which is why the 2013 values have been recalculated based on current shapefiles (adapted for the number of HELCOM MPAs in 2013, Annex 1). In 2013 the protected marine area of the Baltic Sea was reported as 11.7% (HELCOM 2013a), but according to calculations on the new shapefiles it was 11.6%. Today the corresponding number is 11.8% (Table 1).

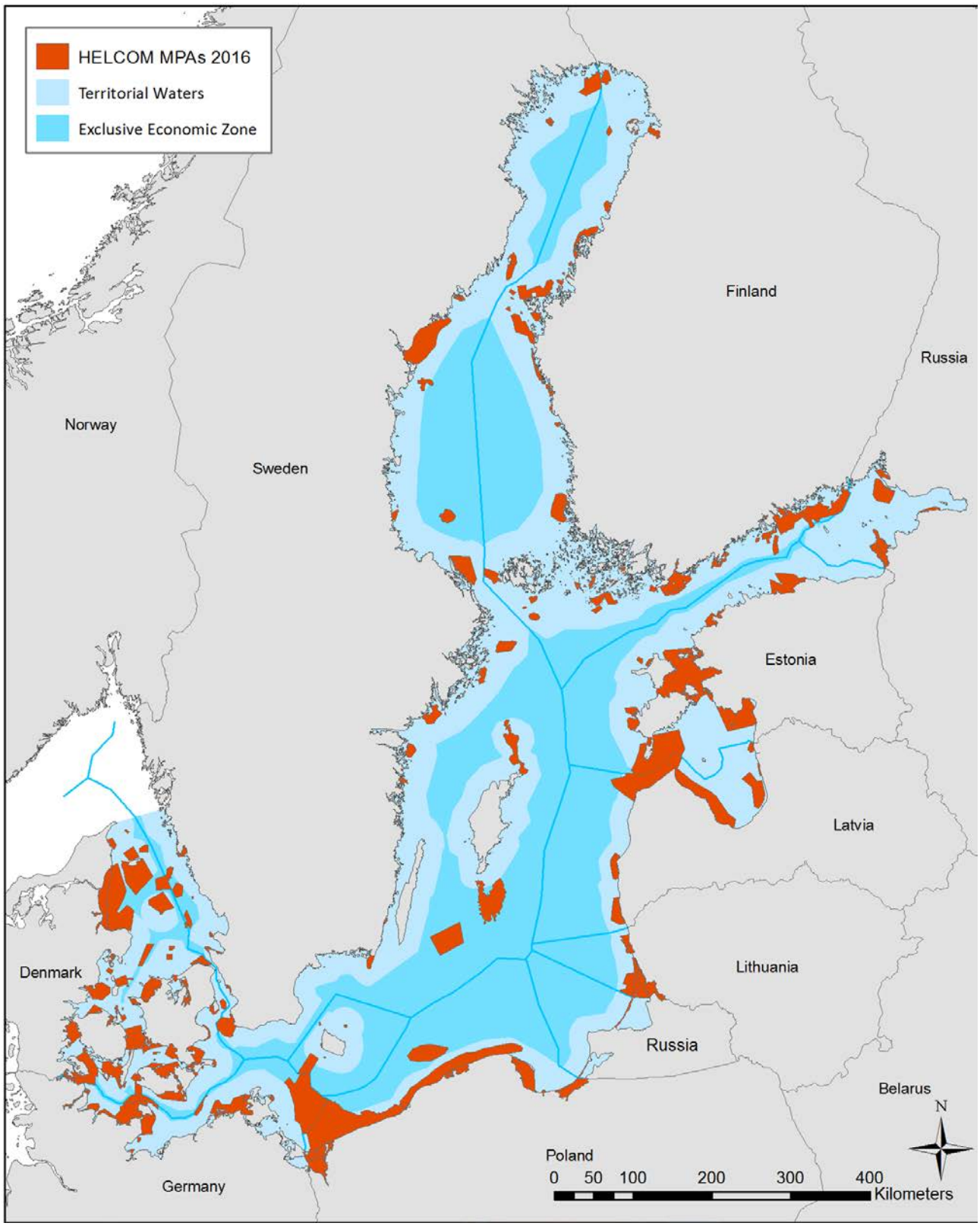

Figure 1. HELCOM MPAs in the Baltic Sea, as reported by the HELCOM countries (data extracted in November 2015).

2.1. The Natura 2000 network in the HELCOM area

The HELCOM MPA network overlaps with sites established under other frameworks, foremost the Natura 2000 network established under EU legislation (Figure 2). The Natura 2000 network aims to support the EU member states in achieving or maintaining favourable conservation status for European biodiversity features in both terrestrial and marine habitats It is based on the Birds Directive adopted in 1979 (Anonymous 1979, 2009) and the Habitats Directive adopted in 1992 (Anonymous 1992) and provides legal protection to the sites. Many Natura 2000 sites in the Baltic Sea area have also been designated as HELCOM MPAs, and some smaller sites have been merged together under one large HELCOM MPA. Overlapping Natura 2000 sites and HELCOM MPAs often have different shapes as the Natura 2000 sites may also include inland areas, while the HELCOM MPAs are restricted to the coastal zone and marine area. The Natura 2000 network protects certain natural habitats and species at EU level, whereas the HELCOM MPA network targets specific marine and coastal habitats and species of the Baltic Sea. In addition the HELCOM MPA network also includes Russian waters in the Baltic Sea, while the Natura 2000 network is restricted to marine areas under EU jurisdiction. Today the HELCOM MPA network covers 48 184 km^2 of the Baltic Sea, while the Natura 2000 sites cover 45 688 km^2. According to the recently published European report on protected area coverage the Baltic Sea has the highest protection of all European marine regions (EEA 2015, Technical Report No 17/2015).

OSPAR (Convention for the Protection of the marine Environment of the North-East Atlantic) is a regional seas convention for protecting and conserving the North-East Atlantic and its resources. HELCOM and OSPAR areas overlap in Kattegat, and protected sites in this area are protected by both regional seas conventions at the same time. A joint target and work programme for these two networks was agreed on at the HELCOM/OSPAR Bremen Ministerial Meeting in 2003.

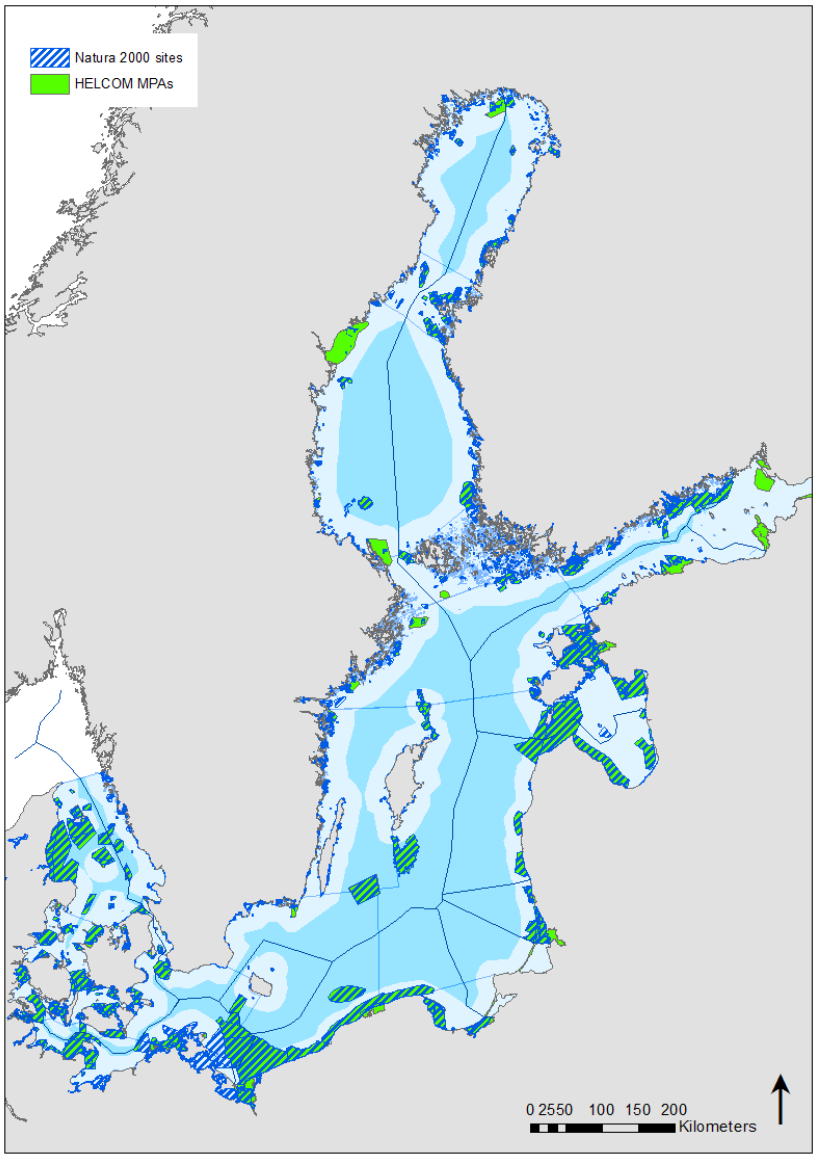

Figure 2. Overlap of the marine Natura 2000 sites and the HELCOM MPAs in the Baltic Sea.

3. Assessment of ecological coherence of the MPA network in the Baltic Sea

Ecological coherence describes how well a collection of MPAs provide protection to certain chosen features, such as species, habitats, landscapes and ecological processes, both individually and as a network. When well planned and managed as a network, a collection of sites can deliver more benefits than unconnected individual MPAs can provide on their own (IUCN-WCPA 2008, UNEP-WCMC 2008, and Catchpole 2012). Ecological coherence is assessed by using criteria which describe different characteristics of the network, such as how well certain features are represented within the MPAs, and how these protected sites are connected to each other.

This assessment was based on the same four main criteria as in the previous HELCOM assessment on ecological coherence of the MPA network (HELCOM 2010): representativity, replication, adequacy and connectivity. Each criterion was further divided into subcriteria, which were evaluated through spatial analysis (GIS) against set targets (Annex 2 and Table 2).

Table 2. Targets set for the subcriteria of the ecological coherence assessment.

Criteria and subcriteria	Target	Reasoning or source
I. Representativity		
1. Benthic marine landscapes	<20% coverage = inadequate protection 20-60% coverage = adequate protection of common habitats (>60% coverage = adequate protection of rare habitats[3])	Piekäinen & Korpinen 2008, HELCOM 2010
2. Geographical representation	≥10% shall be protected of the total Baltic Sea, each sub-basin as well as the coastal sea, outer coastal sea and open sea zones[4]	CBD 2010 (Aichi 11 target), HELCOM 2010
II. Replication		
1. Marker species and biotope complexes	A minimum of 3 replicates within the HELCOM MPA network	Piekäinen & Korpinen 2008, HELCOM 2010
2. Benthic marine landscapes	A minimum of 3 replicates within the HELCOM MPA network	Piekäinen & Korpinen 2008, HELCOM 2010
III. Adequacy		
1. Marine size of MPAs	80% of marine sites ≥ 30 km^2	Recommended size for HELCOM MPAs, and decision taken by HELCOM State and Conservation 3-2015
2. Terrestrial size of MPAs	80% of terrestrial sites ≥ 10 km^2	Recommended size for HELCOM MPAs, and decision taken by HELCOM State and Conservation 3-2015
IV. Connectivity		
1. Theoretical connectivity of benthic marine landscapes	50% of landscape patches have ≥20 connections at the given dispersal distance	HELCOM 2010, Wolters et al. 2015
2. Species-specific connectivity	50% of landscape patches representing habitats for the species have ≥20 connections at the given dispersal distance	HELCOM 2010, Wolters et al. 2015

This ecological coherence assessment was carried out in parallel for (1) the HELCOM MPA network, and (2) the combination of the HELCOM MPA network and the marine parts of the Natura 2000 network in the Baltic Sea. The HELCOM MPA network was assessed by all criteria and subcriteria, while the combined Baltic Sea network of HELCOM MPAs and marine Natura 2000 sites was assessed only by those criteria and subcriteria which were deemed applicable, as there were limitations due to fewer data available for the Natura 2000 sites (detailed information in Annex 3).

[3] The 60% target originates from the previous HELCOM assessment (HELCOM 2010) which was inspired by the European guidelines for application of the Habitats Directive in the marine environment (EC 2007).

[4] The target of minimum 10% coverage for geographical representativity is based on political decisions and not scientific studies which usually refer to much higher percentages (25-30%) for protection goals (IUCN-WCPA 2008, UNEP-WCMC 2008).

3.1. Representativity

Assessment of representativity considers in broad terms different types of areal coverage in order to determine whether the network covers enough different features (for example species or biotopes) or factors linked to them (for example suitable landscapes or areas for the species or biotopes). The basic assessment includes coverage of MPAs in the Baltic Sea and its sub-basins. In addition, representativity can be assessed for the coverage of conservation features such as species, biotopes and landscapes.

In this assessment representativity was evaluated by two subcriteria; (1) geographical representativity of MPAs (consisting of sub-basins and zonation categories of the Baltic Sea), and (2) benthic marine landscapes (Figures 3, 4, 5 and 6). The target for geographical representativity (1) was a minimum of 10% coverage of MPAs in the whole Baltic Sea, the sub-basins, the coastal sea, outer coastal sea and open sea zones. The target for benthic marine landscapes (2) was 20% coverage of the landscape within the MPA network (of the total landscape area in the Baltic Sea). For rare landscapes it is proposed to use a stricter target of 60% coverage. This target was used in the previous HELCOM assessment (HELCOM 2010) which was inspired by the European guidelines for application of the Habitats Directive in the marine environment (EC 2007). The marine landscapes cover the entire marine area and requiring a 60% MPA coverage for all of them is not realistic. In this assessment the measure of landscape scarcity was not included in the representativity analyses, but the stricter target is included in Figures 9 and 12 in order to compare benthic marine landscapes to this level. However, 20% remains the main target for representativity of benthic marine landscapes in this assessment (Table 2).

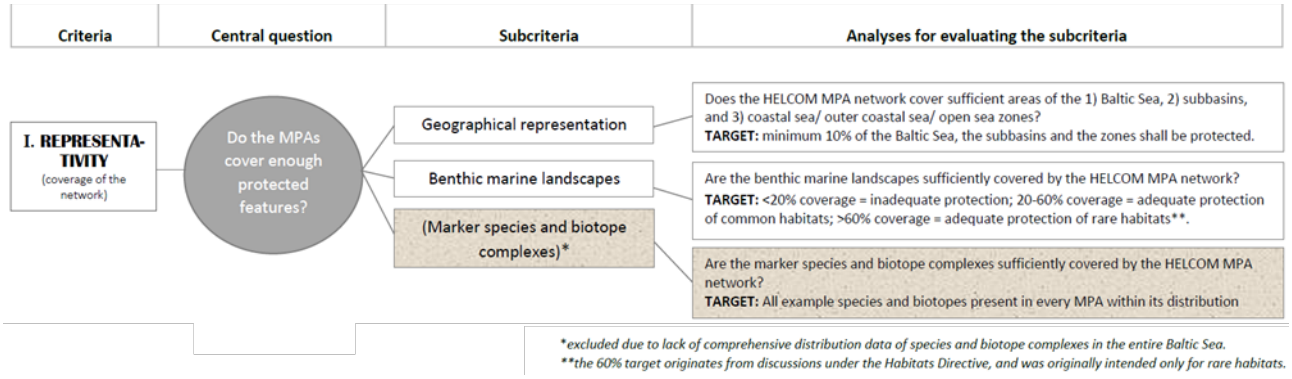

Figure 3. Overview of assessment design of the representativity criterion of the ecological coherence assessment. The third subcriterion for marker species and biotope complexes was not used in the current assessment due to lack of data.

In an ideal case, representativity of the Baltic Sea MPAs should also be assessed for species and biotopes complexes. However, the representativity assessment requires spatial data on distribution of species and biotope complexes in the entire Baltic Sea, both inside and outside the MPAs, and such data is currently not available (please see chapter 3.5.1 for further details).

3.1.1. Method and results of representativity assessment for the HELCOM MPA network

Representativity for both subcriteria was calculated as the percentage of the total area of the protected feature in the Baltic Sea occurring within the MPA network. The calculations were limited to the natural distribution range of the features. Data used for these analyses included shapefiles of the Baltic Sea sub-basins (Figure 4), coastal zones, benthic marine landscapes and the HELCOM MPAs (see Annex 4 for an overview table of all data). The coastal zonation was created for this analysis at fixed distances from the countries baselines ((1) coastal sea: <1 nm, (2) outer coastal sea: 1-12 nm, and (3) open sea: >12 nm) (Figure 5). The benthic marine landscape categories were derived from maps developed in the EuSeaMap project based on light, bottom substrate and salinity in the Baltic Sea (EUSeaMap 2015). For this assessment the original 60 categories were combined based on salinity values and bottom substrata into 30 categories (Table 3). Figure 6 depicts the distribution of these categories in the Baltic Sea and their relative size. In this assessment the benthic marine landscapes have been used as a proxy for diversity, and it should be noted that some of these landscapes include more biological features than others.

Figure 4. The 17 sub-basins of the Baltic Sea according to the HELCOM Monitoring and Assessment Strategy (HELCOM 2013d).

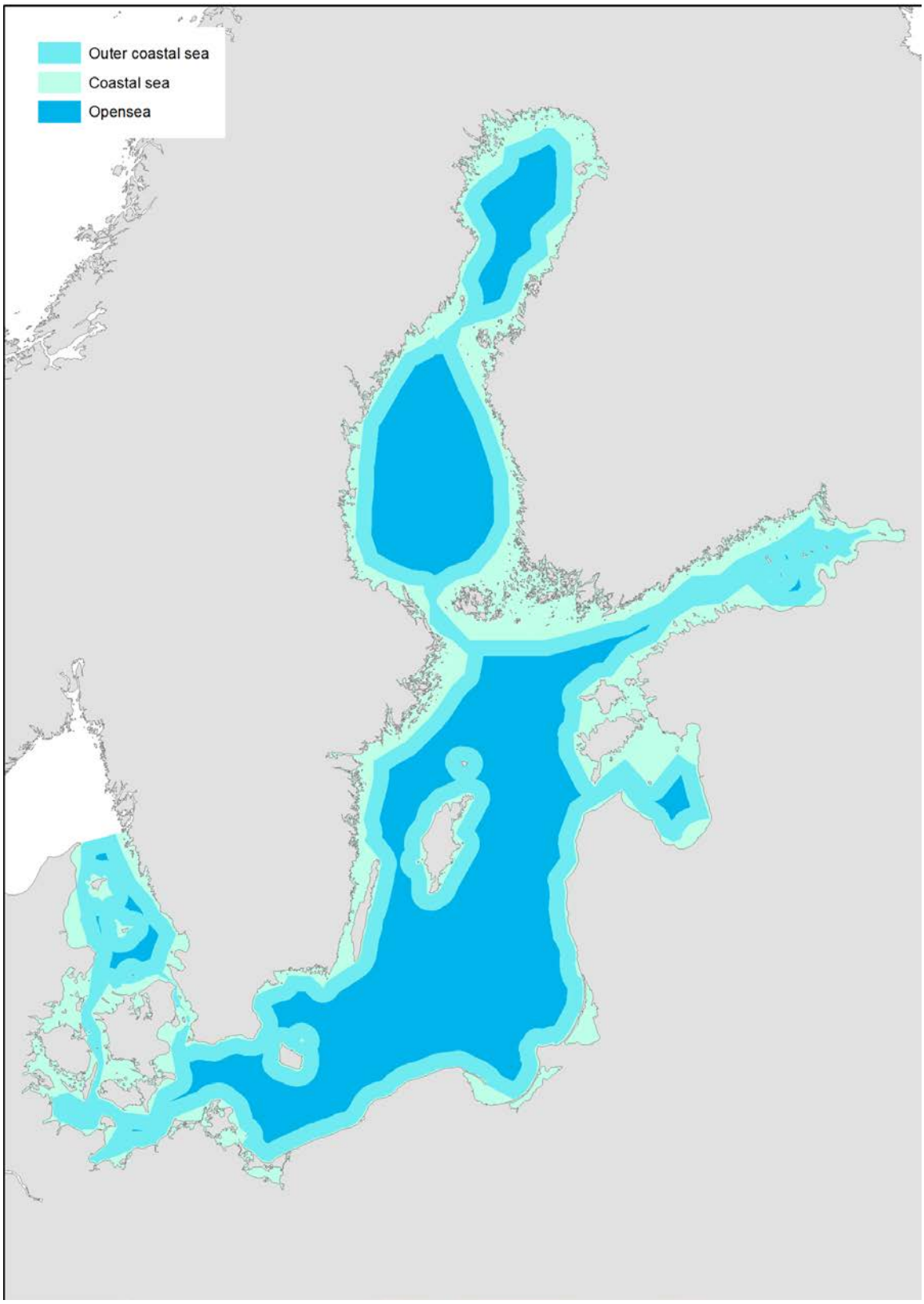

Figure 5. The coastal zones of the Baltic Sea: 1) coastal sea (light green): from the coastline to 1 nm beyond the baseline, 2) outer coastal sea (light blue): 1-12 nm beyond the baseline, and 3) open sea (blue): >12 nm beyond the baseline.

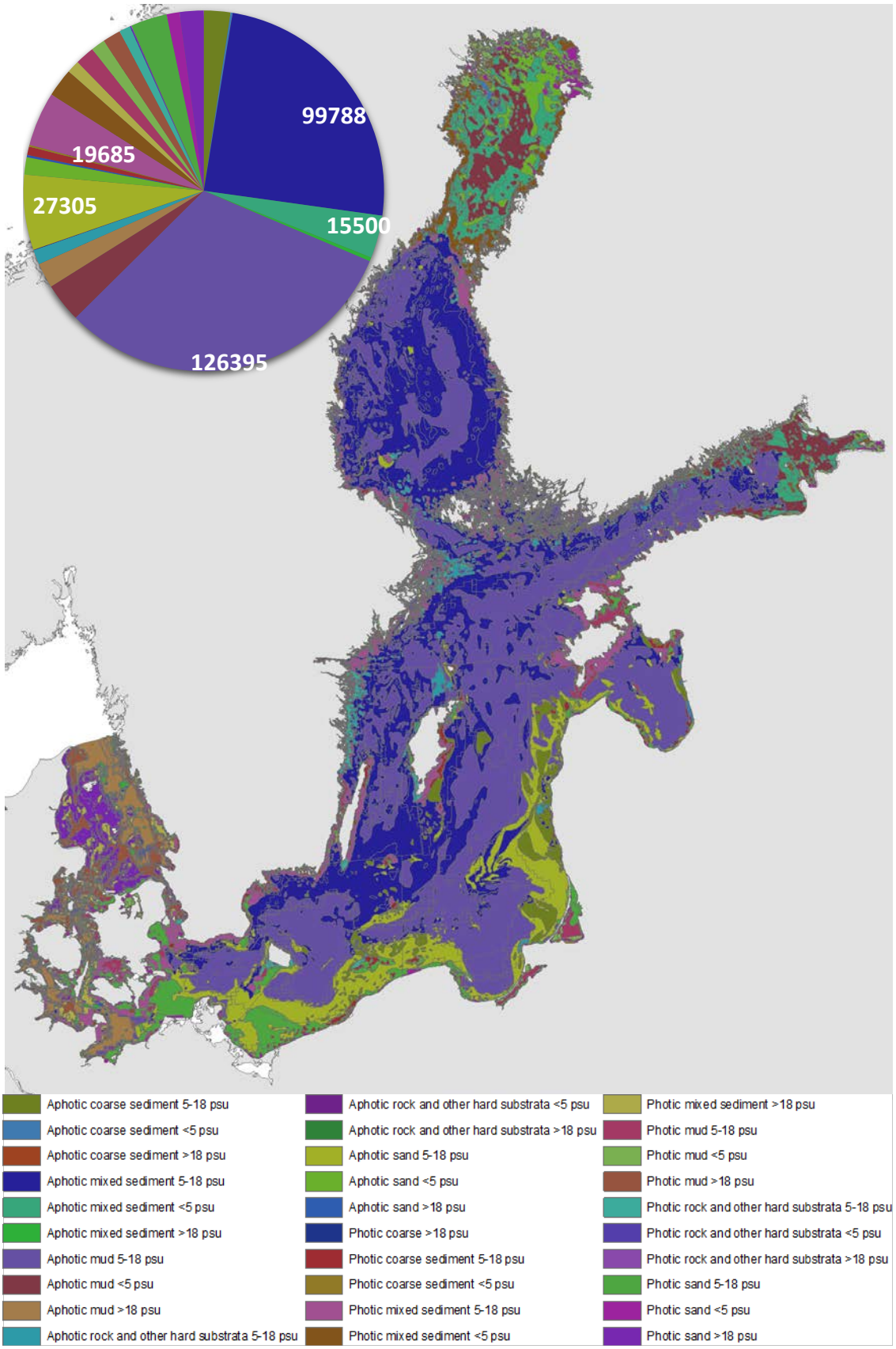

Figure 6. The benthic marine landscapes of the Baltic Sea. The 30 landscape categories were derived from maps developed by EUSeaMap project based on light, bottom substrate and salinity in the Baltic Sea. The pie chart shows the area of the different landscape types in square kilometres.

Table 3. Basis for categorization of benthic marine landscapes in this assessment. All possible combinations of the classes below produce the 30 benthic marine landscape categories used in this assessment (see Figure 6 for their distribution).

Light	Bottom substrate	Salinity
Photic	Sand	< 5
Aphotic	Rock and other hard substrata	5-18
	Mud	>18
	Mixed sediment	
	Coarse sediment	

The representativity target for the coverage of MPAs within the Baltic Sea, its sub-basins and the coastal zones (subcriteria 1) was a minimum 10% of the total area of each category. The target was reached for the Baltic Sea as a whole (12% coverage of MPAs) and for 11 of the 17 sub-basins (Figure 7). The target was also reached in two out of three zonation categories; coastal and outer coastal sea areas (Figure 8). The 20% protection target for landscapes (subcriteria 2) was reached for 18 of 30 landscape types (60%). The stricter target of 60% protection (intended for rare landscapes) was not reached by any landscape type (Figure 9). Please note that the areas of the different landscape varies between 14 and 126 395 km^2 (Figure 6).

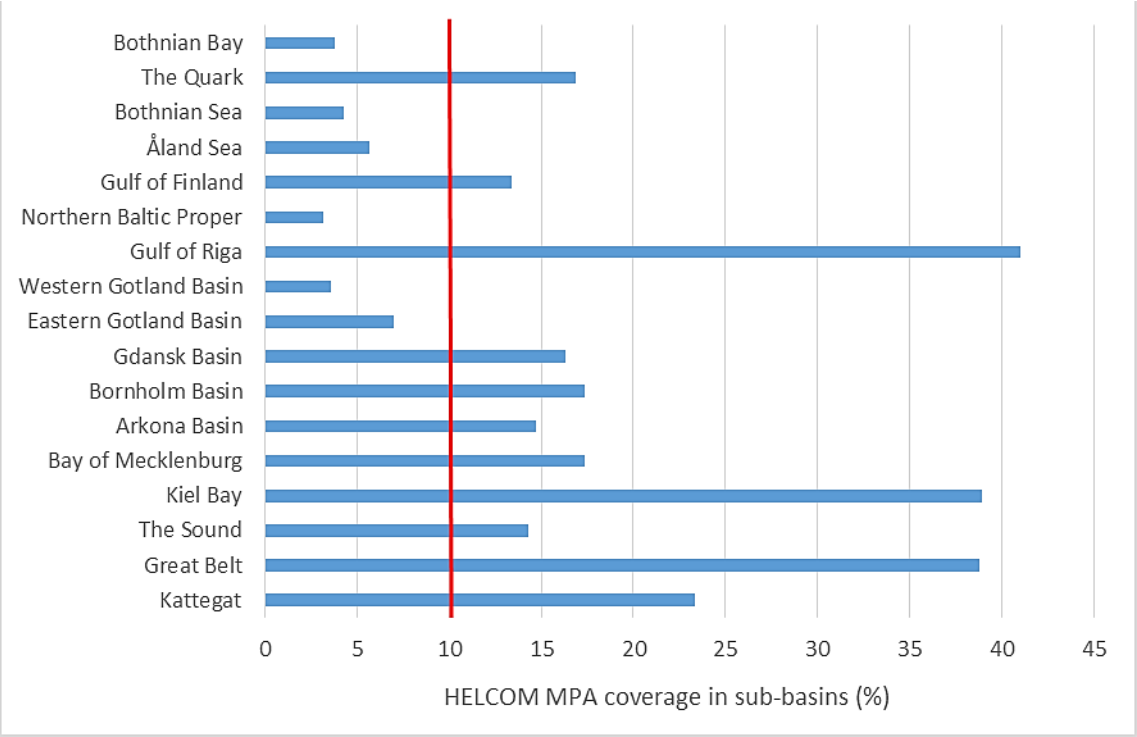

Figure 7. Coverage of HELCOM MPAs in each sub-basin of the Baltic Sea. In the whole Baltic Sea the HELCOM MPAs cover 12% of the marine area. The values were calculated as the area covered by HELCOM MPAs of the total area of the sub-basin, based on shapefiles of the MPAs provided by the HELCOM countries. The target (red line) is 10% coverage in each sub-basin.

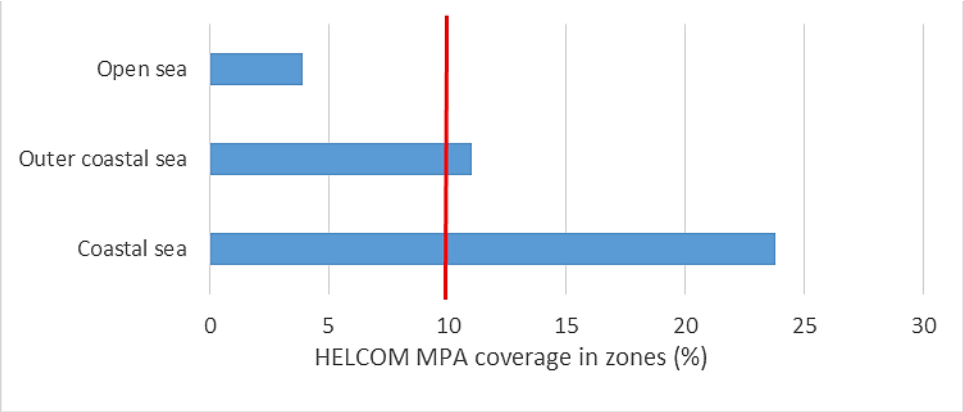

Figure 8. Coverage of HELCOM MPAs in the Baltic Sea zones. The zones are 1) coastal sea: from the coastline to 1 nm beyond the baseline, 2) outer coastal sea: 1-12 nm beyond the baseline, and 3) open sea: >12 nm beyond the baseline (see Figure 5). The values were calculated as the area covered by HELCOM MPAs of the total area of the zone, based on shapefiles of MPAs provided by the HELCOM countries. The target (red line) is 10% coverage in each zone.

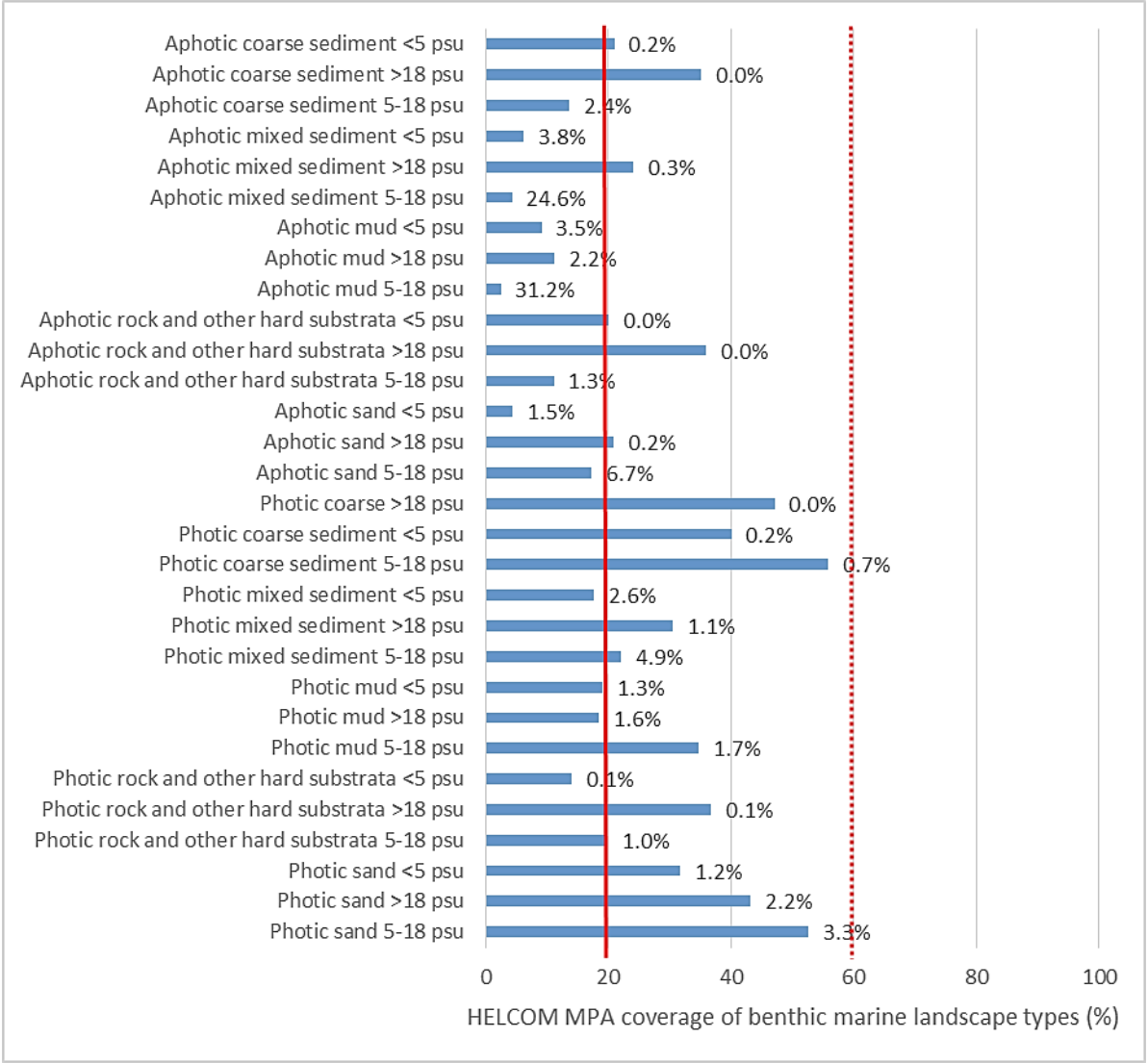

Figure 9. Coverage of benthic marine landscapes within the HELCOM MPA network. The values were calculated as the percentage protected by the HELCOM MPA network of the total landscape area, based on shapefiles of MPAs provided by the HELCOM countries. The percentage of the landscape in the Baltic Sea is given in brackets at the end of each bar (also see the pie chart in figure 6). The target is 20% coverage for protection of common landscapes (solid red line) and 60% coverage for protection of rare landscapes (dotted red line).

SUMMARY OF REPRESENTATIVITY RESULTS FOR THE HELCOM MPA NETWORK

The network of HELCOM MPAs meets some of the criteria set for representativity in this assessment. The minimum target of 10% is met for the Baltic Sea as a whole but not for all sub-basins or the open sea area (subcriteria 1). Representation is not met in the eastern and western Gotland basin, the norther Baltic Proper, the Åland Sea, the Bothnian Sea and the Bothnian Bay. The minimum target for protection of landscapes (20% coverage) is not met for 40% of the landscape types, which mainly includes aphotic landscapes occurring largely in the open sea area. The 60% protection target intended for rare landscapes is not met by any landscapes types (subcriteria 2).

3.1.2. Method and results of representativity assessment for the combined network of HELCOM MPAs and marine Natura 2000 sites

Representativity was also assessed for the combined network of HELCOM MPAs and marine Natura 2000 sites by both subcriteria (geographical representation and benthic marine landscapes, Figure 3). For this analysis a shapefile consisting of marine HELCOM MPAs and marine Natura 2000 areas in the Baltic Sea was constructed. The combined area of the Natura 2000 sites and HELCOM MPAs is 8127 km^2 larger than the HELCOM MPA network. Apart from this the method and data was identical with the assessment of the HELCOM MPA network (chapter 3.1.1).

The representativity target for the coverage of MPAs within the Baltic Sea, its sub-basins and the coastal zones (subcriteria 1) was a minimum 10% of the total area of each category. The target was reached for the Baltic Sea as a whole with13.5% coverage of the combined area of marine Natura 2000 sites and HELCOM MPAs, and for 11 of the 17 sub-basins (Figure 10). The target was also reached in two out of three zonation categories; coastal and outer coastal sea areas (Figure 11).

The 20% protection target for landscapes (subcriteria 2) was reached for 22 of 30 landscape types, i.e. 73%. The stricter target of 60% protection (intended for rare landscapes) was reached by nine landscape types. These are all scarce landscapes with a coverage less than 3.5% in the whole Baltic Sea (Figure 12). Almost all of the landscape *photic sand 5-18 psu* in the Baltic Sea is covered by marine Natura 2000 sites and HELCOM MPAs (99%). Please note that the areas of the different landscape varies between 14 and 126 395 km^2 (Figure 6).

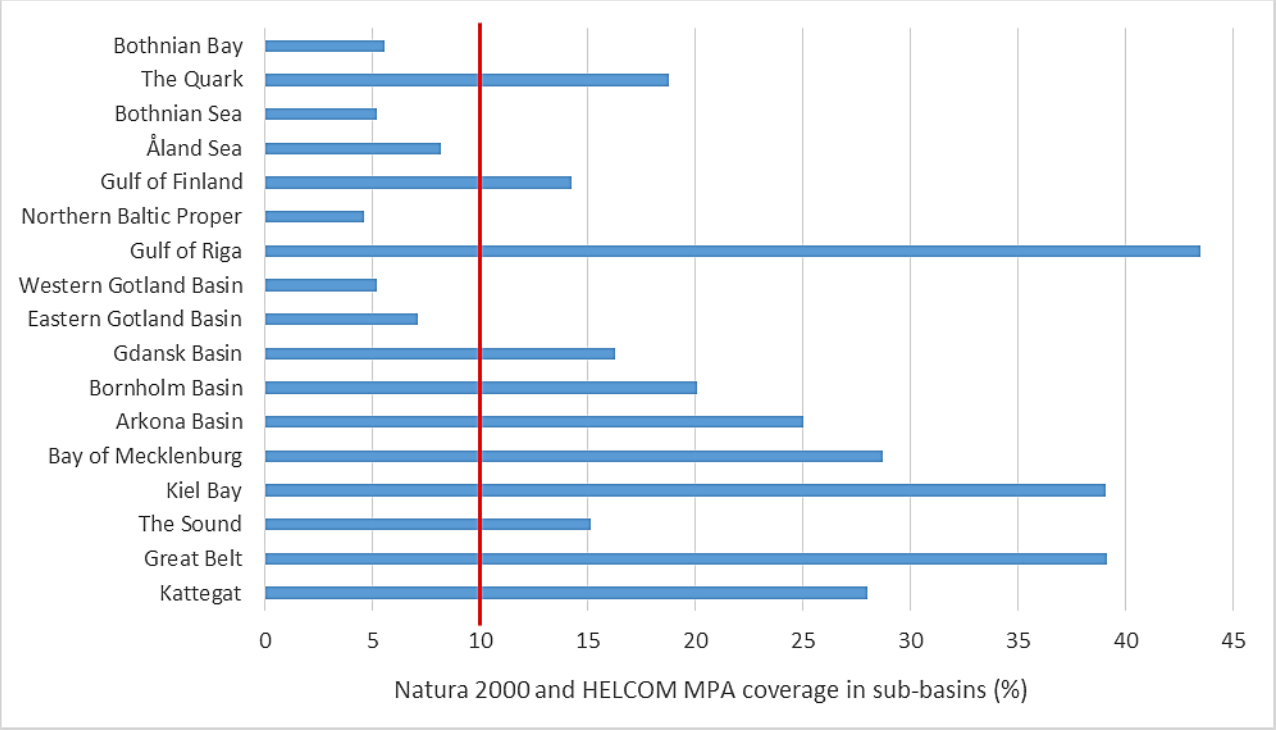

Figure 10. Coverage of marine Natura 2000 sites and HELCOM MPAs in each sub-basin of the Baltic Sea. In the whole Baltic Sea these MPAs cover 13.5% of the marine area. The values were calculated as the area covered by marine Natura 2000 sites and HELCOM MPAs of the total area of the sub-basin, based on shapefiles of the HELCOM MPAs provided by the HELCOM countries and shapefiles of the Natura 2000 sites downloaded from the EEA Data & Map service. The target (red line) is 10% coverage in each sub-basin.

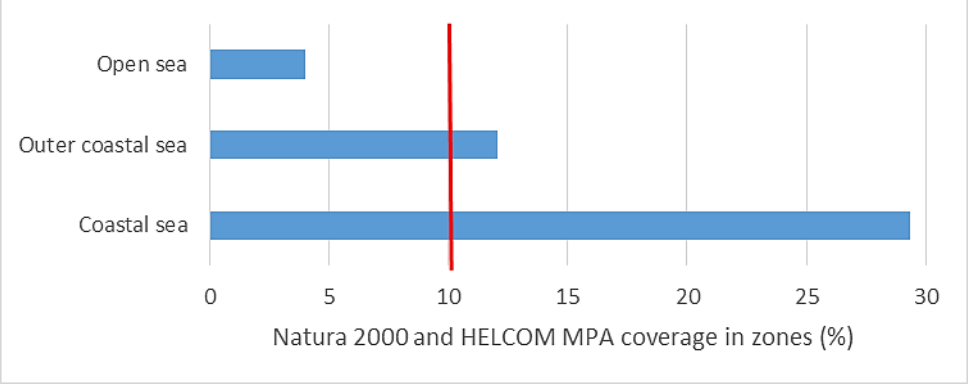

Figure 11. Coverage of marine Natura 2000 sites and HELCOM MPAs in the Baltic Sea zones. The zones are 1) coastal sea: from the coastline to 1 nm beyond the baseline, 2) outer coastal sea: 1-12 nm beyond the baseline, and 3) open sea: >12 nm beyond the baseline (see Figure 5). The values were calculated as the area covered by marine Natura 2000 sites and HELCOM MPAs of the total area of the zone, based on shapefiles of HELCOM MPAs provided by the HELCOM countries and shapefiles of the Natura 2000 sites downloaded from the EEA Data & Map service. The target (red line) is 10% coverage in each zone.

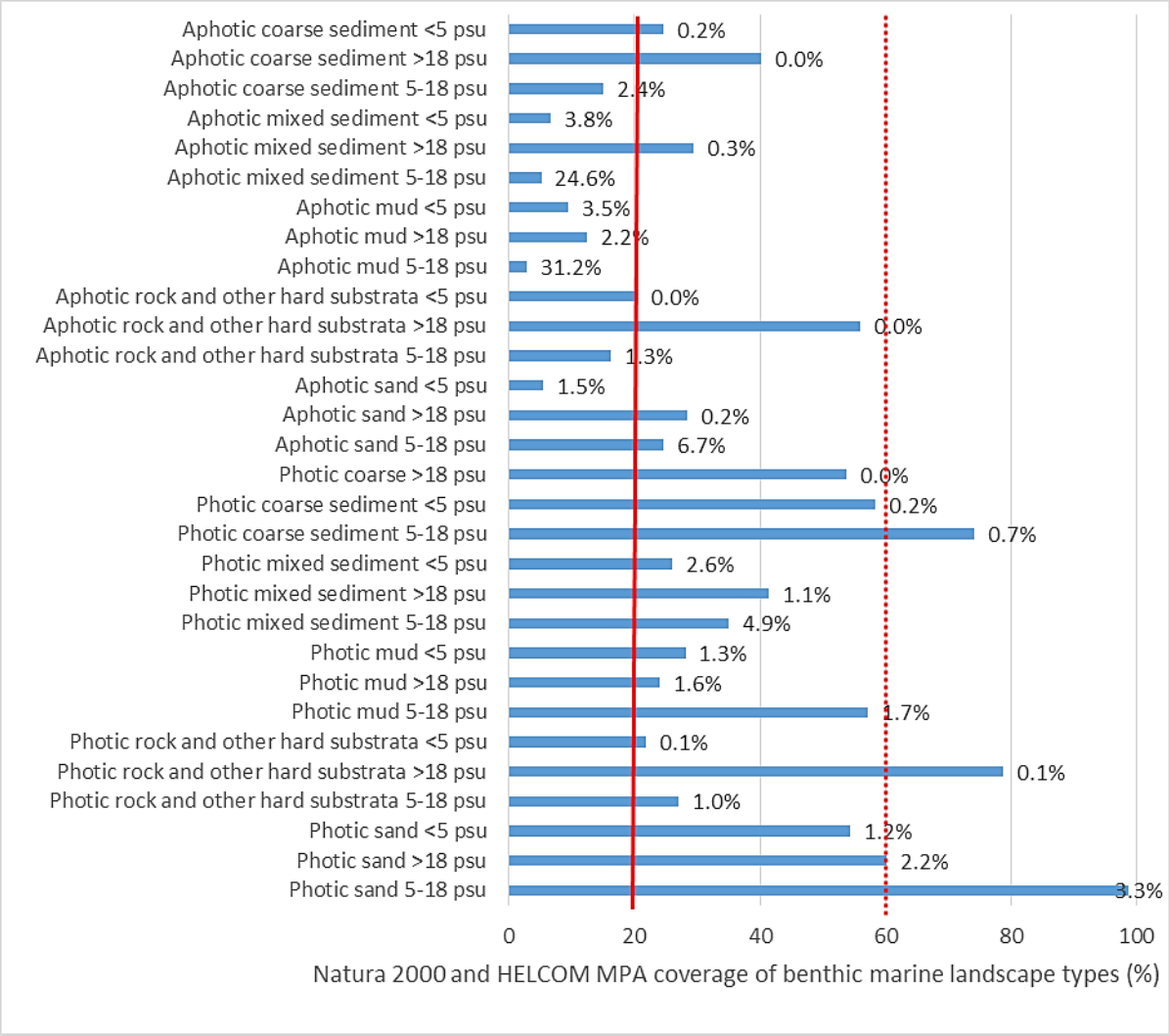

Figure 12. Coverage of benthic marine landscapes within the combined area of the marine Natura 2000 sites and HELCOM MPA network. The values were calculated as the area covered by the combined network of the total area of the landscape type within the Baltic Sea, based on shapefiles of MPAs provided by the HELCOM countries and shapefiles of the Natura 2000 sites downloaded from the EEA Data & Map service. The total area of the landscape in the Baltic Sea is given as a separate percentage at the end of each bar (also see the pie chart in figure 6). The target is 20% coverage for protection of common landscapes (solid red line) and 60% coverage for protection of rare landscapes (dotted red line).

SUMMARY OF REPRESENTATIVITY RESULTS FOR THE COMBINED MARINE NATURA 2000 SITES AND HELCOM MPA NETWORK IN THE BALTIC SEA

The combined network of marine Natura 2000 sites and HELCOM MPAs gives better protection than the HELCOM MPA network alone, but the difference for the geographical distribution is small. The minimum target of 10% coverage is met for the Baltic Sea as a whole but not for all sub-basins or the open sea area (subcriteria 1). The minimum target for protection of landscapes (20% coverage) is not met for 23% of the landscape types (mainly aphotic landscapes occurring largely in the open sea area), compared to 40% when analysing the HELCOM MPA network alone (subcriteria 2). However, the protection of certain landscape types, such as *photic sand 5-18 psu*, improves remarkably when the Natura 2000 network and the HELCOM MPAs are evaluated together, and nine landscape types reach the stricter 60% protection target. The HELCOM MPA network covers 53% of this landscape while the combined network covers 99% of the landscape. This is mainly explained by the fragmented distribution and coastal location of the Natura 2000 network, as the *photic sand 5-18 psu* is a typical coastal landscape.

3.2. Replication

Assessment of replication considers the number of replicas of a conservation feature in the assessment area, for example certain species, and aims to ensure that the provided protection is not depending on only one site in the network.

In this assessment replication was assessed by two subcriteria; (1) marker species and biotope complexes and (2) benthic marine landscapes (Figure 13). The target was set at a theoretical minimum of three replicas, based on the previous HELCOM assessment (HELCOM 2010 and references therein). The replication number equals the total number of occurrences minus one, which means that in total four occurrences are needed to reach the target of three replications. It should be noted that the chosen target is static and does not work equally well for all species and biotope complexes. In an ideal situation the target would be adjusted for each species, biotope complex and landscape based on scientific background information and on how rare or common they are.

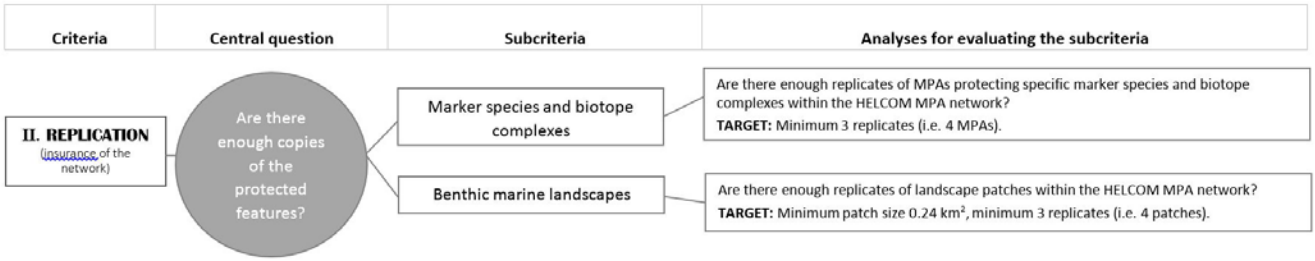

Figure 13. Overview of assessment design of replication criterion of the ecological coherence assessment.

3.2.1. Method and results of replication assessment for the HELCOM MPA network

Replication values for marker species and biotope complexes were calculated as the number of HELCOM MPAs where the protected feature occurred, and calculations were limited to the natural distribution range of the features. Replication values for benthic marine landscapes were calculated as the total number of landscape patches within the HELCOM MPA network. Data used for these analyses included shapefiles of species distribution (reported per sub-basin), biotope complexes distribution (reported on a 100x100 km grid), benthic marine landscapes and the MPAs, as well as data on presence of species and biotope complexes reported in the HELCOM MPA database (Annex 4). The benthic marine landscape classes were derived from maps developed in EuSeaMap, which were further developed by combining the existing categories to create the 30 categories as described in Table 3 and Figure 6 (EUSeaMap 2015).

Twelve marker species and eleven marker biotope complexes were chosen based on the species and biotope complexes used in the previous assessment (HELCOM 2010) and discussion by the HELCOM MPA Task Group and State and Conservation 3-2015 (STATE & CONSERVATION 3-2015) (Tables 4 and 5). The list of marker species used in the previous assessment was modified to ensure that all parts of the Baltic Sea were covered by the natural distributions of at least some of the chosen species. To achieve this, functionally similar species were paired together to form a marker species pair with a distribution covering the whole Baltic Sea. This was done for four bird species and two mammal species in order to form three species pairs.

The list of marker biotope complexes used in the previous assessment was expanded to include all marine biotope complexes of Annex I of the Habitat Directive which have been included in the MPA database (Table 5). One biotope complex ('macrophytes') was removed as the HELCOM MPA database no longer contains data on this biotope.

Table 4. Twelve marker species or species pairs used in the assessment.

Species group	Species/ Species pair	English name of species or species pair	Distribution
Macrophytes	*Chara* spp.	Stoneworts	Whole Baltic Sea (HELCOM 2012).
Fish	*Anguilla anguilla*	European eel	Whole Baltic Sea, except the Bothnian Bay and the Quark (where the occurrence is temporary) (HELCOM 2012, 2013c).
Fish	*Lampetra fluviatilis*	River lamprey	Whole Baltic Sea, except the Belt Seas (where the occurrence is temporary) (HELCOM 2012, 2013c).
Fish	*Salmo salar*	Atlantic salmon	Whole Baltic Sea (HELCOM 2012, 2013c).

Birds	*Gavia arctica &Gavia stellata*	Black-throated diver & Red-throated diver	Combined wintering distribution of these species covers the whole Baltic Sea (HELCOM 2013c, BirdLife International 2015).[5]
Birds	*Mergus serrator & Mergus merganser*	Red breasted merganser & Goosander	Combined distribution of these species covers the whole Baltic Sea (HELCOM 2012).
Birds	*Sternula albifrons*	Little tern	Whole Baltic Sea (HELCOM 2012, 2013c).
Birds	*Tadorna tadorna*	Common Shelduck	Whole Baltic Sea (HELCOM 2012, 2013c).
Birds	*Somateria mollissima*	Common Eider	Whole Baltic Sea (combined wintering and breeding) (HELCOM 2012, 2013c, BirdLife International 2015).
Mammals	*Halichoerus grypus*	Grey seal	Whole Baltic Sea, except the Belt Seas (HELCOM 2012).
Mammals	*Phoca vitulina & Phoca hispida botnica*	Harbour seal & Ringed seal	Combined distribution of these species covers the whole Baltic Sea (HELCOM 2013c).
Mammals	*Phocoena phocoena*	Harbour porpoise	Southern and western Baltic Sea (i.e. Western Gotland basin, Bornholm basin, Arkona Basin, Bay of Mecklenburg basin, Kiel Bay, the Belts, the Sound and Kattegat) (HELCOM 2013c).

Table 5. Eleven marker biotope complexes used in the assessment.

Biotope complex code	Biotope complex name	Distribution
1110	Sandbanks which are slightly covered by sea water all the time	Whole Baltic Sea (HELCOM 2013c).
1130	Estuaries	Whole Baltic Sea (HELCOM 2013c).
1140	Mudflats and sandflats not covered by seawater at low tide	Whole Baltic Sea (HELCOM 2013c).
1150	Coastal lagoons	Whole Baltic Sea (HELCOM 2013c).
1160	Large shallow inlets and bays	Whole Baltic Sea (HELCOM 2013c).
1170	Reefs	Whole Baltic Sea (HELCOM 2013c).
1180	Submarine structures made by leaking gases	Kattegat (HELCOM 2013c).
1610	Baltic esker islands with sandy, rocky and shingle beach vegetation and sublittoral vegetation	Bothnian Bay, Quark, Bothnian Sea, Åland Sea, Archipelago Sea, Gulf of Finland, Northern Baltic Proper, Western Gotland Basin (HELCOM 2013c).
1620	Boreal Baltic islets and small islands	Bothnian Bay, Quark, Bothnian Sea, Åland Sea, Archipelago Sea, Gulf of Finland, Northern Baltic Proper, Western Gotland Basin, Bornholm basin (HELCOM 2013c).
1650	Boreal Baltic narrow inlets	Bothnian Bay, Bothnian Sea, Archipelago Sea, Gulf of Finland, Northern Baltic Proper, Western Gotland Basin (HELCOM 2013c).
8330	Submerged or partially submerged sea caves	No distribution data available.

The replication target set for marker species and biotope complexes (subcriteria 1) as well as the landscapes (subcriteria 2) within the HELCOM MPA network was a minimum of 3 replications. The target was reached for all marker species (Figure 14) and landscape types (Figure 16), and for 9 of 11 (82%) marker biotope complexes (Figure 15).

[5] Expert opinion.

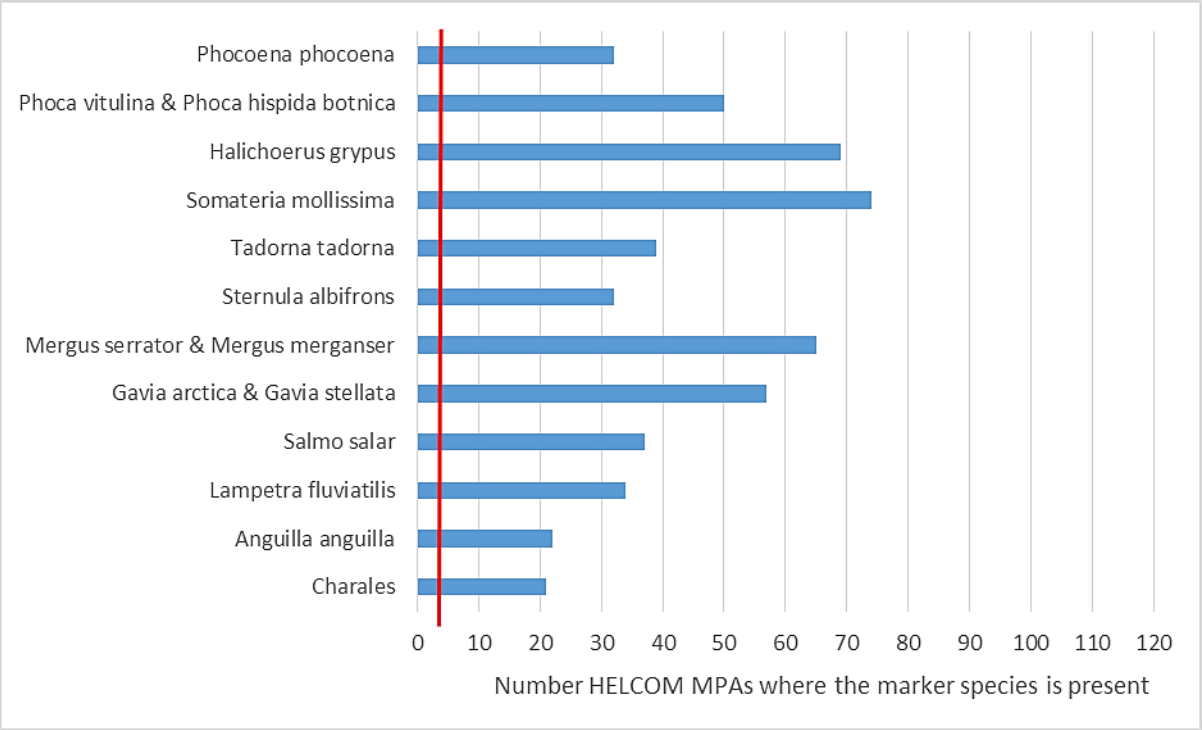

Figure 14. Replication of marker species within the HELCOM MPA network. The values were calculated as the number of HELCOM MPAs where the species is present, within its natural distribution range, based on data reported in the HELCOM MPA database and shapefiles on species distribution form the HELCOM Species Information Sheets (HELCOM 2013e). The target of at least three replicates is reached when the species is present in at least four HELCOM MPAs (red line).

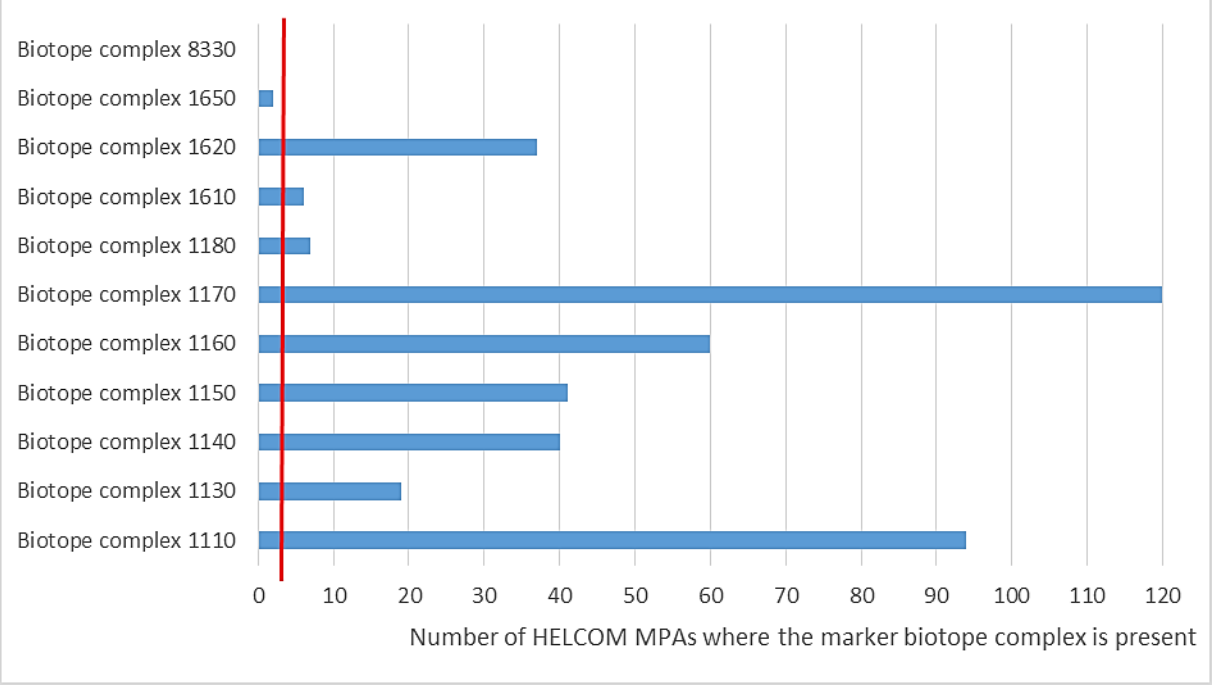

Figure 15. Replication of marker biotope complexes within the MPA network. The values were calculated as the number of MPAs where the biotope complex occurs within its natural distribution range, based on data reported to the HELCOM MPA database and shapefiles on biotope complex distribution form the HELCOM Biotope Complex Information Sheets (HELCOM 2013f). The target of at least three replicates is reached when the biotope complex occurs in a minimum of four MPAs (red line).

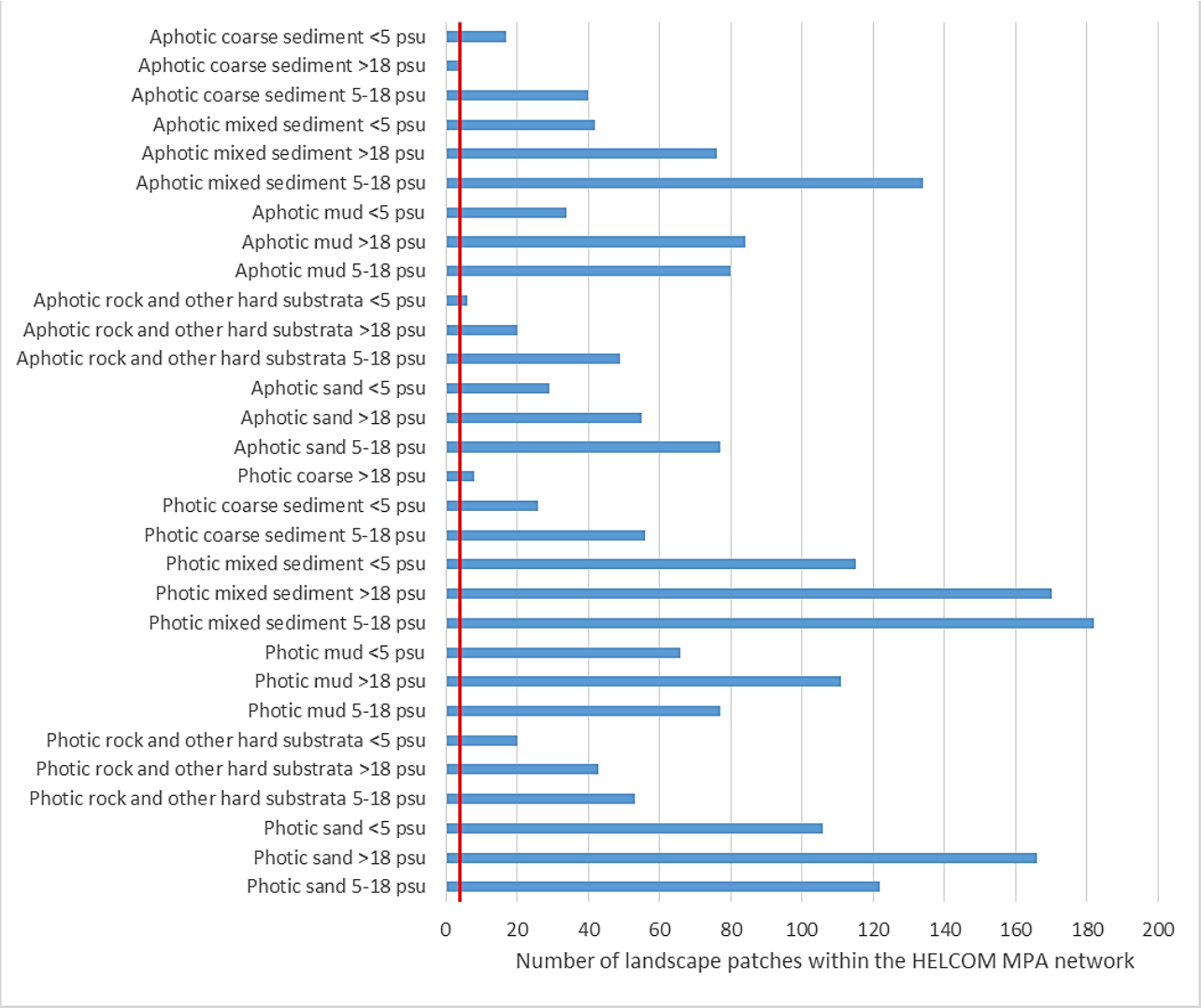

Figure 16. Replication of landscape types within the HELCOM MPA network. The values were calculated as the total number of landscape patches within the HELCOM MPA network, based on the shapefile of landscapes (Figure 6) and shapefiles of MPAs. The target of at least three replicates is reached when the landscape type occurs in a minimum of four MPAs (red line).

SUMMARY OF REPLICATION RESULTS FOR HELCOM MPA NETWORK

The network of HELCOM MPAs meets almost all of the criteria set for replication in this assessment. Only two biotope complexes (1650 Boreal Baltic narrow inlets and 8830 Submerged or partially submerged sea caves) did not reach the target of 3 replications.

3.2.2. Method and results of replication assessment for the combined network of HELCOM MPAs and marine Natura 2000 sites

Replication was also assessed for the combined network of HELCOM MPAs and marine Natura 2000 sites, but only by the second subcriteria: benthic marine landscapes (Figure 13) since data for subcriteria 1 (marker species and biotope complexes) was not readily available for the Natura 2000 sites. For this analysis a shapefile consisting of marine HELCOM MPAs and marine Natura 2000 areas in the Baltic Sea was constructed. The combined area of the Natura 2000 sites and HELCOM MPAs is 8127 km^2 larger than the HELCOM MPA network. Apart from this the method and data was identical with the assessment of the HELCOM MPA network alone (chapter 3.1.2).

The replication target set for the landscapes (subcriteria 2) within the combined network of marine Natura 2000 sites and HELCOM MPAs was a minimum of 3 replicas of each landscape type, and it was reached for all landscape types (Figure 17).

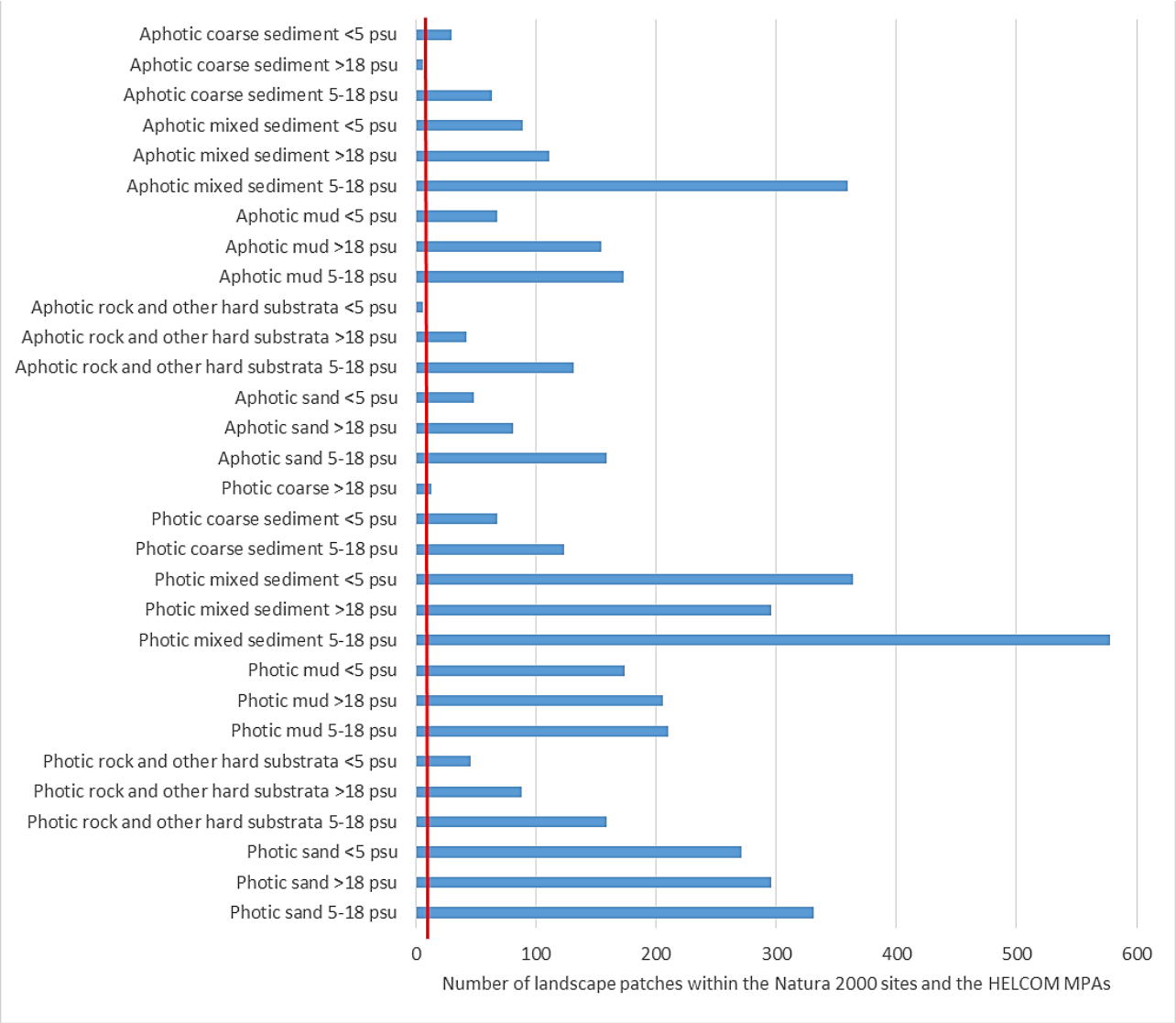

Figure 17. Replication of landscape types within the marine Natura 2000 sites and HELCOM MPA network. The values were calculated as total number of landscape patches within the combined area of the marine Natura 2000 sites and the HELCOM MPA network, based on the shapefile of landscapes (Figure 6), shapefiles of MPAs provided by the HELCOM countries and shapefiles of the Natura 2000 sites downloaded from the EEA Data & Map service. The target of at least three replicates is reached when the landscape type occurs in a minimum of four MPAs (red line).

SUMMARY OF REPLICATION RESULTS FOR THE COMBINED MARINE NATURA 2000 SITES AND HELCOM MPA NETWORK IN THE BALTIC SEA

The combined network of marine Natura 2000 sites and HELCOM MPAs ensures better replication of the landscapes types than the HELCOM MPA network alone.

3.3. Adequacy

Adequacy is a concept which describes quality aspects of single MPAs. While the other three main criteria used in this assessment evaluate the MPAs as a network, adequacy focuses on evaluating whether the single MPAs are sufficient as building blocks for the network. Adequacy has commonly been assessed based on the size, shape or location of the MPAs, but also based on the pressures affecting the MPAs and the IUCN protection categories assigned to the MPAs (HELCOM 2010, Wolters et al. 2015, CBD 2008). According to the CBD adequacy definition MPA networks should include a core system of no-take areas, a larger system of multiple-use MPAs as well as areas of sustainable use (CBD, 2008).

In this assessment the evaluation of adequacy was restricted to one subcriterion where clear targets could be set: MPA size (Figure 18). The targets were based on the recommended size of 30 km^2 (3000 ha) for marine areas and 10km^2 (1000 ha) for terrestrial areas of HELCOM MPAs (HELCOM 2003). This target was defined to apply when 80% of the MPAs have reached the recommended size, thus also acknowledging that smaller MPAs may be relevant components of the network (Table 2).

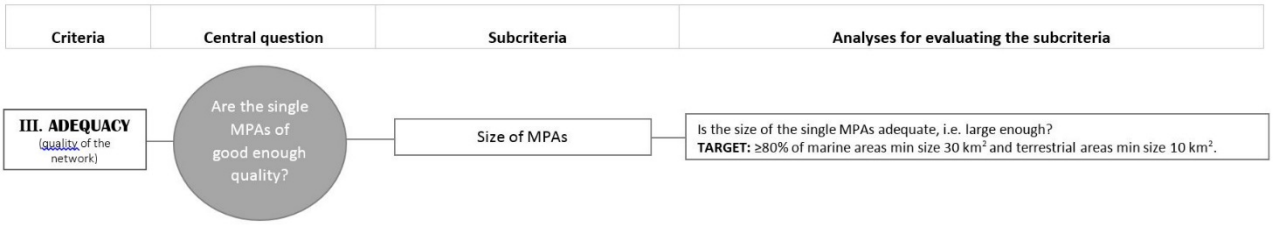

Figure 18. Overview of assessment design of adequacy criterion of the ecological coherence assessment.

In addition to the one subcriterion data on pressures and IUCN protection categories were analysed as supporting information. No targets have been set within HELCOM for either pressures or IUCN categories of the MPAs, and therefore the results of these analyses were used purely to provide descriptive information on the MPAs. Pressures were analysed based on spatial distribution of fishing activities and ship traffic. Fishing activities was represented by total hours of fishing intensity (Vessel Monitoring System (VMS) data on fishing effort, all gear types) within C-square cell during 2013, and ship traffic (all ship types) during 2014 in 500 m grid based on HELCOM Automatic Identification System (AIS) within the MPAs. The IUCN protection categories were analysed as the percentage of MPAs which are protected as strictly protected areas (reflecting the CBD definition), which correspond to the ICUN categories I-II.

3.3.1. Method and results of adequacy assessment for the HELCOM MPA network

Size of marine and terrestrial areas of each MPA were calculated from MPA shapefiles submitted by the HELCOM countries. Neither marine nor terrestrial areas reached the 80% target, as only 68% of marine parts of MPAs were at least 30 km^2, and only 40% of terrestrial parts of the MPAs were at least 10 km^2 (Figure 19). It can be noted that a majority of MPAs are sized between 100-1000 km^2 (Figure 20).

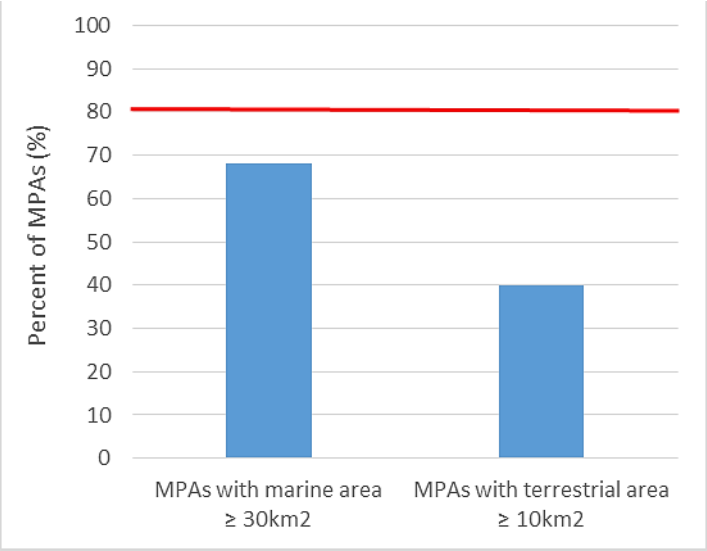

Figure 19. Percent of MPAs reaching the given size (30 km^2 for marine areas and 10km^2 for terrestrial areas of MPAs). The values were calculated based on shapefiles of MPAs provided by the HELCOM countries. The target is reached when 80% of the MPAs reach the recommended size (red line).

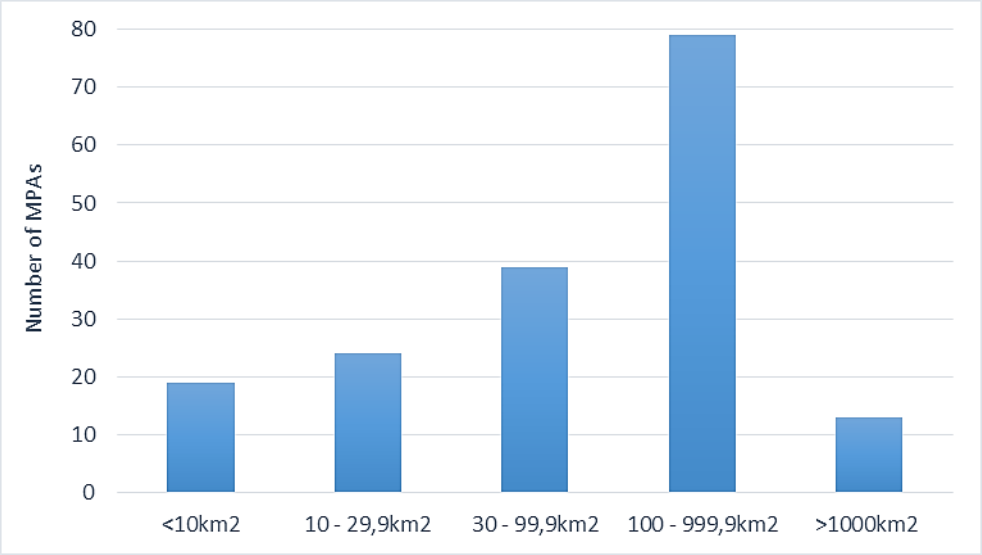

Figure 20. Distribution of MPAs into size classes according to their marine area size. The values were calculated based on shapefiles of MPAs provided by the HELCOM countries.

Supporting analyses of pressures and protection level of the HELCOM MPAs

Supporting analyses related to fishing, which was carried out by ICES, showed that intensive fishing activities are occurring in some HELCOM MPAs, especially in the southern and western Baltic Sea (Figure 21). In total 51 348 hours of fishing took place within 111 HELCOM MPAs in 2013, half of this (51%) by bottom contacting gear and a bit less than half (46%) by midwater trawls. Only a small part of fishing (3%) was done by longlines and only in 8 MPAs (ICES 2015 and Annex 7).

Pressures caused by ship traffic, such as input of litter and contaminants, disturbance of species and introduction or spread of non-indigenous species occur within many HELCOM MPAs, and in some areas major ship lines go through or very close to an MPA (Figure 22).

In total 41 (24%) of all 174 HELCOM MPAs are protected under at least one of the IUCN categories for strict protection (Ia Strict Nature Reserve, Ib Wilderness Area and II National Park) (Figure 23 and Table 6). This lies within the range of 10-30% strict protection which was recommended by the Fifth World Parks Congress (2003) for each habitat type. This recommendation is however based on areal coverage, which is not possible to analyse with the current data, as

information on areal coverage of the different categories is lacking. The most common IUCN category assigned to an MPA (or a part of it) is category IV Habitat/Species Management Area.

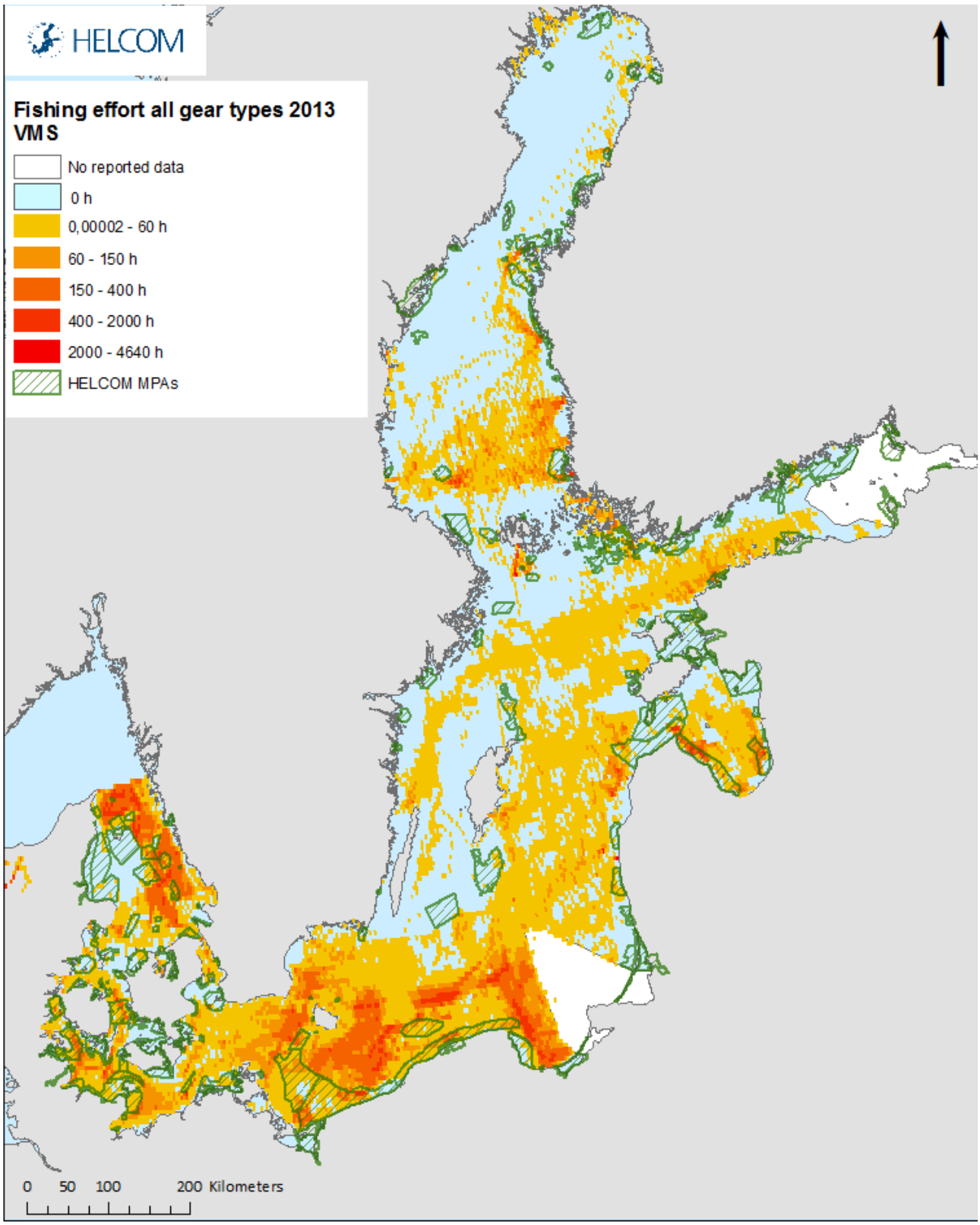

Figure 21. HELCOM MPAs and spatial distribution of total hours of fishing effort (Vessel Monitoring System data on fishing effort, all gear types) within C-square cells during the year 2013 (ICES 2015) in the Baltic Sea (excluding Skagerrak). Please note that currently no data is available for the white areas on the map.

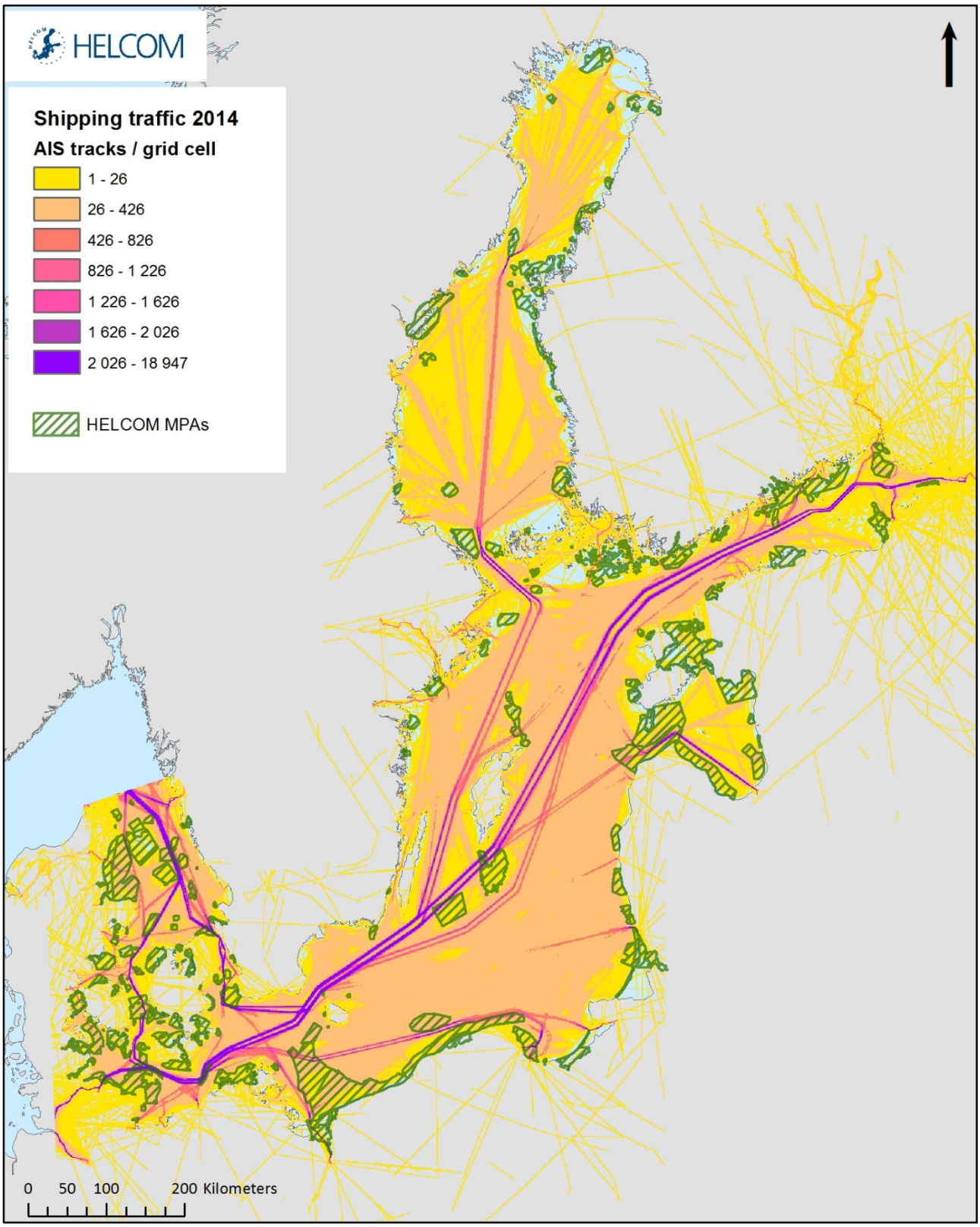

Figure 22. HELCOM MPAs and ship traffic (all ship types) during 2014 reported on a 500 m grid based on HELCOM Automatic Identification System.

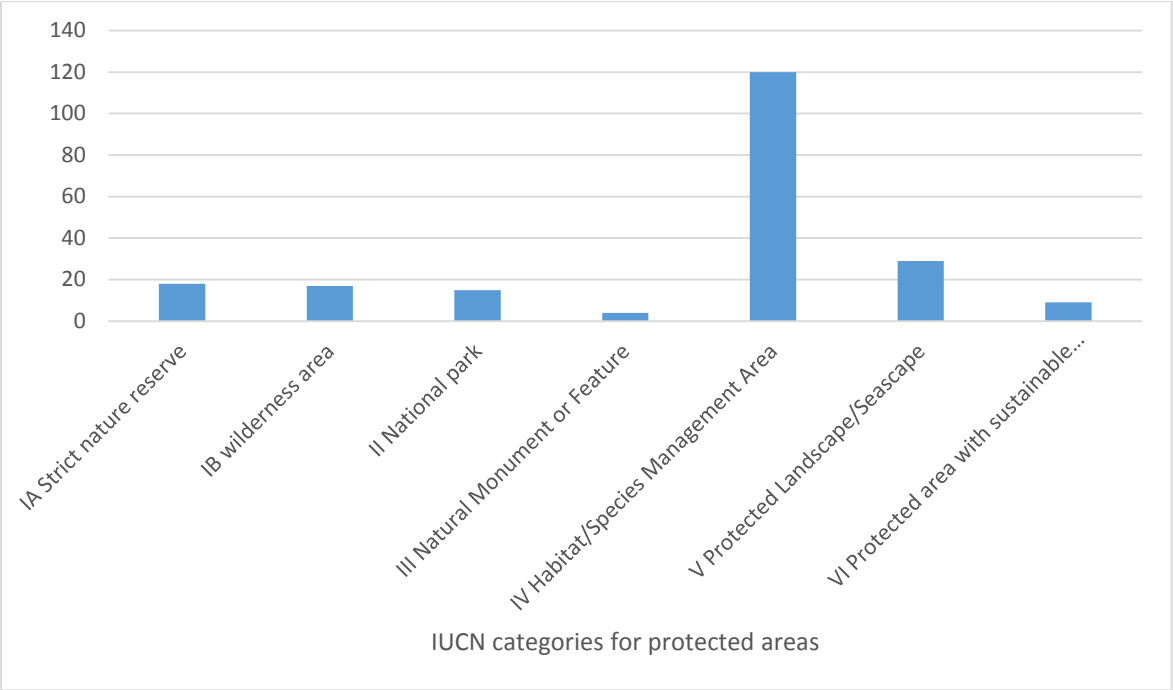

Figure 23. Number of HELCOM MPAs assigned to the different IUCN categories. The IUCN category is provided for 118 of all 174 (68%) HELCOM MPAs, and in many cases one MPA has been assigned several IUCN categories. In total 41 HELCOM MPAs have been assigned to one or several of the strict protection IUCN categories (Ia-II).

Table 6. Categorization and definitions of protected areas according to IUCN.

Code	Name	Definition
Ia	Strict Nature Reserve	Category Ia are strictly protected areas set aside to protect biodiversity and also possibly geological/geomorphical features, where human visitation, use and impacts are strictly controlled and limited to ensure protection of the conservation values. Such protected areas can serve as indispensable reference areas for scientific research and monitoring.
Ib	Wilderness Area	Category Ib protected areas are usually large unmodified or slightly modified areas, retaining their natural character and influence without permanent or significant human habitation, which are protected and managed so as to preserve their natural condition.
II	National Park	Category II protected areas are large natural or near natural areas set aside to protect large-scale ecological processes, along with the complement of species and ecosystems characteristic of the area, which also provide a foundation for environmentally and culturally compatible, spiritual, scientific, educational, recreational, and visitor opportunities.
III	Natural Monument or Feature	Category III protected areas are set aside to protect a specific natural monument, which can be a landform, sea mount, submarine cavern, geological feature such as a cave or even a living feature such as an ancient grove. They are generally quite small protected areas and often have high visitor value.
IV	Habitat/Species Management Area	Category IV protected areas aim to protect particular species or habitats and management reflects this priority. Many Category IV protected areas will need regular, active interventions to address the requirements of particular species or to maintain habitats, but this is not a requirement of the category.
V	Protected Landscape/Seascape	A protected area where the interaction of people and nature over time has produced an area of distinct charcter with significant, ecological, biological, cultural and scenic value: and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values.
VI	Protected area with sustainable use of natural resources	Category VI protected areas conserve ecosystems and habitats together with associated cultural values and traditional natural resource management systems. They are generally large, with most of the area in a natural condition, where a proportion is under sustainable natural resource management and where low-level non-industrial use of natural resources compatible with nature conservation is seen as one of the main aims of the area.

SUMMARY OF ADEQUACY RESULTS FOR HELCOM MPA NETWORK

The network of HELCOM MPAs does not meet the criteria set for adequacy in this assessment.

The supporting information reveals that fishing and shipping occurs in many HELCOM MPAs, but further analyses are needed to see if this contradicts with the with the protection targets of the individual HELCOM MPAs. The number of HELCOM MPAs protected under the stricter IUCN protection categories seems to be sufficient, but to verify this result analyses should be done based on areal coverage instead of number of MPAs.

3.3.2. Method and results of adequacy assessment for the combined network of HELCOM MPAs and marine Natura 2000 sites

This analysis was not carried out for the Natura 2000 sites as there is no minimum size recommendations for these sites. In general Natura 2000 sites tend to be smaller than HELCOM MPAs.

3.4. Connectivity

Connectivity of MPAs has been called the 'glue of the network', and it measures whether a group of MPAs function as a network. Connectivity aims to ensure that species' migrations and dispersal at different life stages is supported by the MPA network.

Connectivity was assessed by two subcriteria; (1) theoretical connectivity and (2) species-specific connectivity (Figure 24). The target for both subcriteria was that 50% of landscape patches would have ≥20 connections.

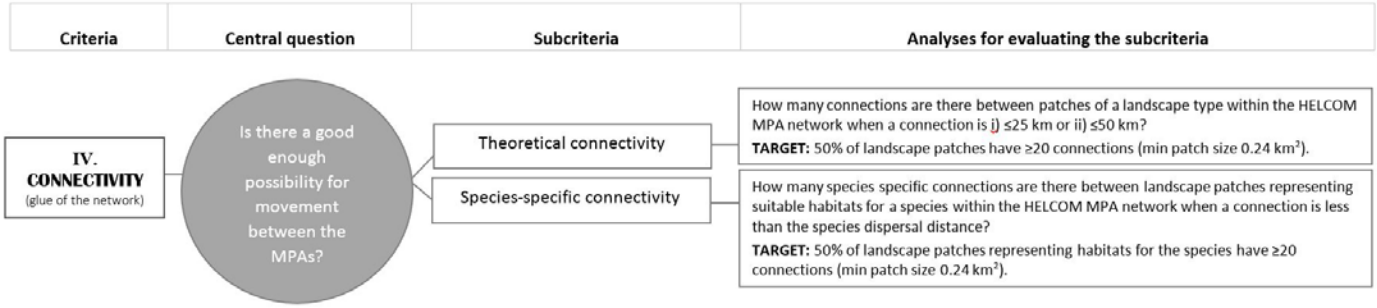

Figure 24. Overview of assessment design of connectivity criterion of the ecological coherence assessment.

3.4.1. Method and results of connectivity assessment for the HELCOM MPA network

Connectivity for both subcriteria was calculated as the number of connections within the given dispersal distance between specific landscape patches in the MPAs. Calculations were limited to the natural distribution range of the features. Data used for the analyses included shapefiles on benthic marine landscapes and the MPAs, (see Annex 4 for an overview table of all data). The benthic marine landscape categories are described in chapter 3.1.

Theoretical connectivity (subcriteria 1) for (i) 25 km and (ii) 50 km dispersal distance was analysed for five landscape types chosen to represent different landscapes in the Baltic Sea. The landscape types were chosen to correspond to the ones used in the previous HELCOM ecological coherence assessment (HELCOM 2010): photic mud <5 psu, photic sand 5-18 psu, aphotic rock and other hard substrata <5 psu, aphotic sand 5-18 psu, and aphotic mixed substrate >18 psu. The patches of each landscape type (min size 0.24 km^2) were buffered with half the dispersal distance, and the number of buffers touching or overlapping equalled the number of connections. The target for theoretical connectivity was set at 50% of the landscape patches having ≥20 connections at the given dispersal distance ((i) 25 and (ii) 50 km).

Species-specific connectivity (subcriteria 2) was analysed based on landscape types representing five species with differing dispersal strategies and distances (Table 7). The same five species were used in the previous HELCOM ecological coherence assessment (HELCOM 2010). The analysis was carried out as for subcriteria 1, this time choosing several landscape types into each analysis to cover all probable habitats occupied by the species, as reported in literature. The target for species-specific connectivity was that 50% of the landscape patches representing habitats for the species should have ≥20 connections at the species-specific dispersal distance.

Table 7. Species used in the analysis of species-specific connectivity.

Species	Substrate	Salinity	Photic depth	Dispersal distance	Notes and references
Macoma baltica	Sand and mud[1]	> 5 psu	Non-photic and photic	100 km^2	Tolerates salinity of 4 psu[3]. Distribution whole Baltic Sea, except the Bothnian Bay.
Psetta maxima spawning and nursery grounds	Bedrock, hard bottom complex and sand[4]	> 5 psu	Photic	25 km[5]	Spawning and nursery grounds are not found north from the Finnish south coast.
Furcellaria lumbricalis	Bedrock, hard bottom complex and sand	> 5 psu	Photic	25 km[6]	Distribution whole Baltic Sea, except the Bothnian Bay.
Idotea baltica	Bedrock, hard bottom complex and sand	> 5 psu	Photic	25 km[7]	Distribution whole Baltic Sea, except the Bothnian Bay.

Fucus vesiculosus	Bedrock, hard bottom complex and sand	> 5 psu	Photic	1 km[8]	Distribution whole Baltic Sea, except the Bothnian Bay.

[1]MarLIN, [2]larval settling time 1-6 months, Marlin, [3]Laine & Seppänen 2001, [4]Iglesias et al. 2003, Sparrevohn & Sottrup 2003, Stankus 2006,
[5] based on genetical studies, Florin & Höglund 2006, [6]Fletcher & Callow 1992, Norton 1992,
[7]based on measurements by Alexander & Chen 1990, [8]according to Gaylord et al. 2002: a fraction of algal propagules can drift distances of several kilometres.

The theoretical connectivity (1) target for 50% of the landscape patches having ≥20 connections was not reached for the 25 km dispersal distance, nor for the 50 km dispersal distance (Figure 25). The species-specific connectivity (2) target for 50% of the landscape patches having ≥20 connections was reached for the dispersal distance of *Macoma baltica, Psetta maxima, Furcellaria lumbricalis and Idotea baltica*, but not for *Fucus vesiculosus* (Figure 26). This is explained by the very short dispersal distance of *F. vesiculosus* (only 1 km). The results correlate with the dispersal distance of the species; *Macoma baltica* with the longest dispersal distance (100 km) has the highest connectivity value (96% of species-specific habitat patches with a minimum of 20 connections).

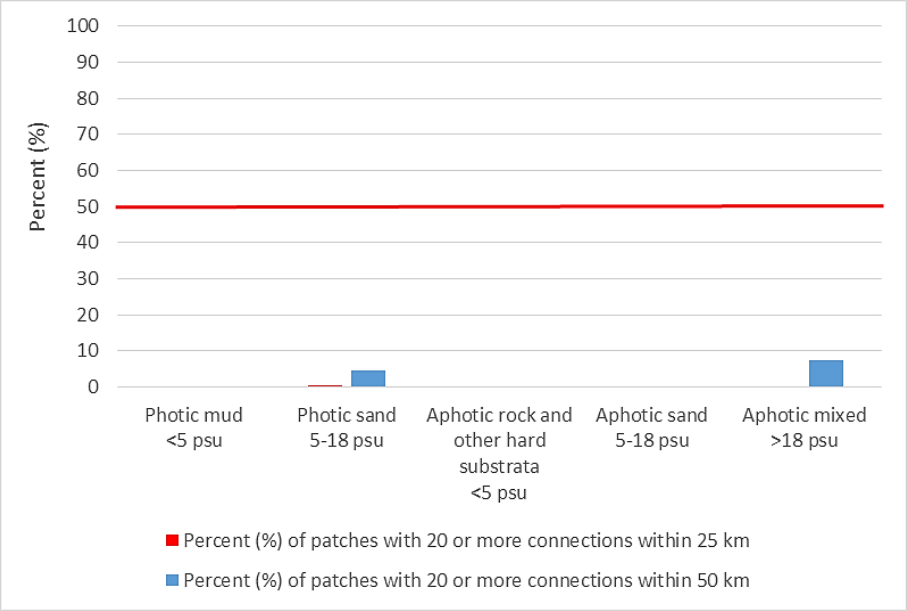

Figure 25. Theoretical connectivity of landscape patches within the HELCOM MPA network. The values were calculated as the number of connections between landscape patches of the same type within the HELCOM MPAs for five landscape types, based on the shapefile of landscapes (Figure 5) and shapefiles of MPAs provided by the HELCOM countries. The target of at least 50% of all patches having 20 or more connections lies outside of the range of this figure.

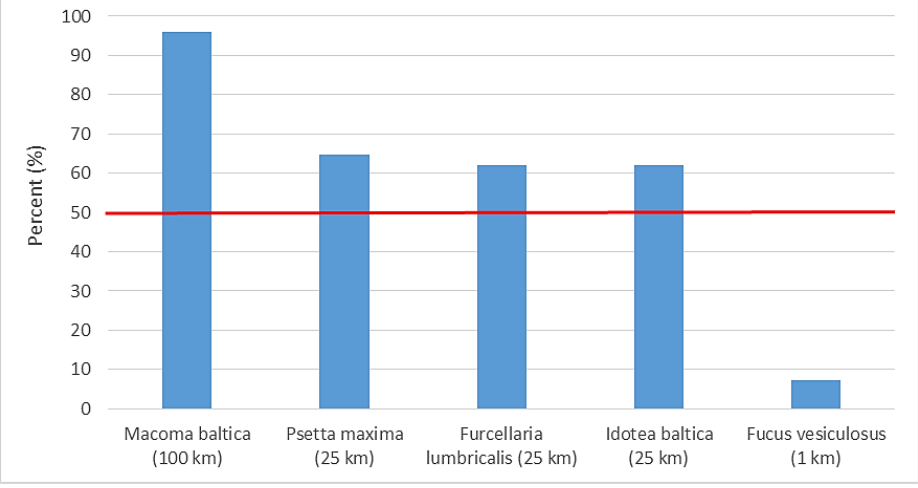

Figure 26. Species-specific connectivity of landscape patches representing habitats for five species within the MPA network. The chart shows the percentage of patches with 20 or more connections. The values were calculated as the number of connections between landscape patches chosen for a species within the HELCOM MPAs for five species, based on the shapefile of landscapes (Figure 5) and shapefiles of MPAs provided by the HELCOM countries. The target is reached when 50% of the patches have at least 20 connections (red line).

SUMMARY OF CONNECTIVITY RESULTS FOR HELCOM MPA NETWORK

The network of HELCOM MPAs meets the criteria set for species-specific connectivity in this assessment in four of five cases (subcriteria 2), but in none for theoretical connectivity (subcriteria 1). The minimum target of 20 connections for at least 50% of the landscape patches representing habitats for a chosen species is met for all species in the analysis except *Fucus vesiculosus* (subcriteria 2). This is explained by the very short dispersal distance of *F. vesiculosus* (only 1 km).

3.4.2. Method and results of connectivity for the combined network of HELCOM MPAs and marine Natura 2000 sites

Connectivity was also assessed for the combined network of HELCOM MPAs and marine Natura 2000 sites by both subcriteria (theoretical and species-specific connectivity) (Figure 24). For this analysis a shapefile consisting of marine HELCOM MPAs and marine Natura 2000 areas in the Baltic Sea was constructed. The combined area of the Natura 2000 sites and HELCOM MPAs is 8127 km^2 larger than the HELCOM MPA network. Apart from this the method and data was identical with the assessment of the HELCOM MPA network (chapter 3.4.1).

The same targets were used; 50% of the landscape patches should have ≥20 connections at the given dispersal distance, which for theoretical connectivity was (i) 25 and (ii) 50 km, and for species-specific connectivity followed the species-specific dispersal distance.

The theoretical connectivity target for 50% of the landscape patches having ≥20 connections was not reached for the 25 km dispersal distance, nor for the 50 km dispersal distance (Figure 27) for the combined area of the marine Natura 2000 sites and the HELCOM MPA network. The values are however higher than for just the HELCOM MPA network. The species-specific connectivity target for 50% of the landscape patches having ≥20 connections was reached for the dispersal distance of *Macoma baltica, Psetta maxima, Furcellaria lumbricalis and Idorea baltica*, but not for *Fucus vesiculosus* (Figure 28). This is explained by the very short dispersal distance of *F. vesiculosus* (only 1 km). Also in this analysis the results correlate with the dispersal distance of the species; *Macoma baltica* with the longest dispersal distance (100 km) has the highest connectivity value (95% of species-specific habitat patches with a minimum of 20 connections). Interestingly, the overall results for this analysis are slightly lower than for the HELCOM MPA network alone, despite the increased area. This is most likely due to the analysis design, where increasing the area enables several smaller patches to combine into one large one, losing the connections between the smaller patches. The analysis design would benefit from defining a specific size range for the patches.

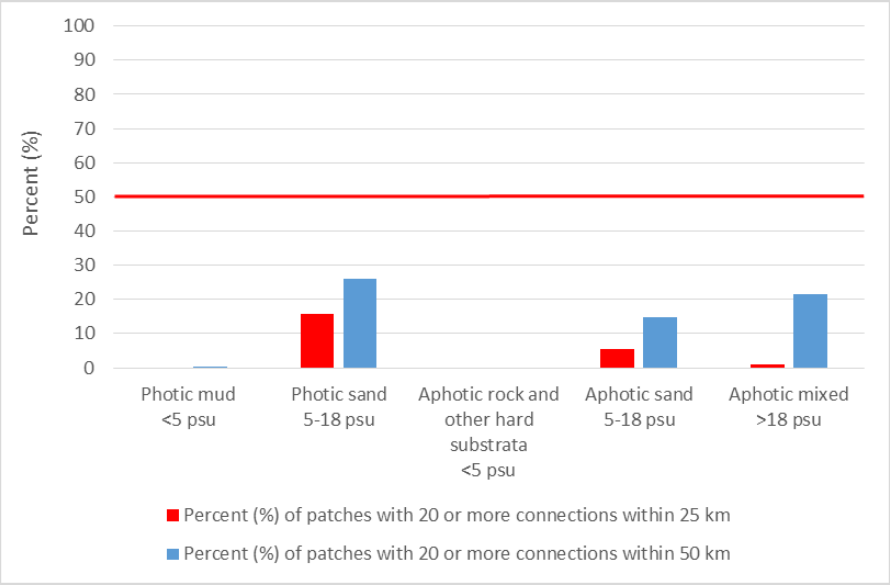

Figure 27. Theoretical connectivity of landscape patches within the marine Natura 2000 sites and HELCOM MPA network. The values were calculated as the number of connections between landscape patches of the same type within the combined area of marine Natura 2000 sites and HELCOM MPAs for five landscape types, based on the shapefile of landscapes (Figure 6), shapefiles of MPAs provided by the HELCOM countries and shapefiles of the Natura 2000 sites downloaded from the EEA Data & Map service. The target of at least 50% of all patches having 20 or more connections lies outside of the range of this figure.

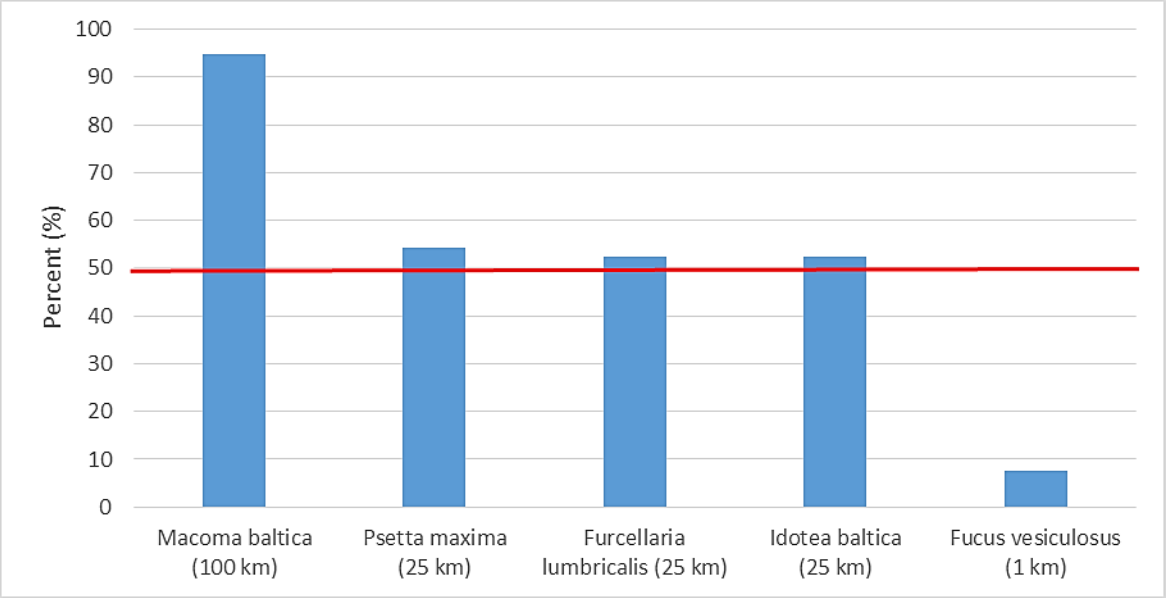

Figure 28. Species-specific connectivity of landscape patches representing habitats for five species within the marine Natura 2000 sites and HELCOM MPA network. The chart shows the percentage of patches with 20 or more connections. The values were calculated as the number of connections between landscape patches chosen for a species within the combined area of marine Natura 2000 sites and HELCOM MPAs for five species, based on the shapefile of landscapes (Figure 6), shapefiles of MPAs provided by the HELCOM countries and shapefiles of the Natura 2000 sites downloaded from the EEA Data & Map service. The target is reached when 50% of the patches have at least 20 connections (red line).

SUMMARY OF CONNECTIVITY RESULTS FOR THE COMBINED MARINE NATURA 2000 SITES AND HELCOM MPA NETWORK IN THE BALTIC SEA

The combined area of the marine Natura 2000 sites and the HELCOM MPA network meets the criteria set for species-specific connectivity in this assessment in four of five cases (subcriteria 2), but in none for theoretical connectivity (subcriteria 1). The minimum target of 20 connections for at least 50% of the landscape patches representing habitats for a chosen species is met for all species in the analysis except *Fucus vesiculosus* (subcriteria 2). This is explained by the very short dispersal distance of *F. vesiculosus* (only 1 km).

3.5. Conclusions of the ecological coherence assessment

HELCOM has agreed that in order to conclude that the MPA network is ecologically coherent all main criteria need to meet the set targets. As only the replication criterion meets its target fully the Baltic Sea MPA network is not yet ecologically coherent (however, see chapter 4 for a test on a quantitative integrated approach of ecological coherence).

The targets set for the **representativity** criterion were partly met in this assessment. At 12% areal MPA coverage of the Baltic Sea, the representativity of HELCOM MPAs in Baltic Sea exceeds the target by 2 percentage points. Improved protection is needed in the open sea and for most of the aphotic landscapes (commonly found in the open sea), as well as in the Bothnian Bay, Bothnian Sea, Åland Sea, Northern Baltic Proper, western and eastern Gotland Basins. The results described in chapter 3.1 revealed that 40% of the landscapes (mainly aphotic landscapes) are in need of improved protection. However, the open sea aphotic zone also includes areas which are suffering from severe and long-term oxygen depletion, and are therefore not meaningful to be designated as HELCOM MPAs.

The targets set for the **replication** criterion were all met in this assessment, as all subcriteria showed at least three replicates of each feature within the HELCOM MPA network. It should be noted that the chosen target is static and rather low, and does not work equally well for all species and biotope complexes. In an ideal situation the target would be adjusted for each species, biotope complex and landscape based on scientific background information.

The targets set for the **adequacy** criterion were not met in this assessment. The MPA network fell 12 percentage points short from the 80% target set for the marine areas (68% reached).

The targets set for the **connectivity** criterion were partly met in this assessment. Theoretical connectivity (subcriteria 1) showed a very low number of connections for all landscape types, but regarding species-specific connectivity (subcriteria 2) the target was met for all chosen species expect *Fucus vesiculosus*. This correlates directly to the dispersal distances of the chosen species, where *F. vesiculosus* has the shortest dispersion distance of 1 km in comparison to the other species (25-100 km).

The area of the combined network of marine Natura 2000 sites and HELCOM MPAs is 8127 km^2 larger than the HELCOM MPA network alone, and analysing these networks together reveals improved representativity, replication and connectivity. This is a result of the larger size of the network along with the typical coastal location of the Natura 2000 sites. For example the typical coastal landscape *photic sand in 5-18 psu*, which covers 3,5% of all landscapes in the Baltic Sea, doubles its representativity value when the Natura 2000 network is combined to the HELCOM MPA network. The fourth criteria, adequacy, was not analysed for this combined network. While the marine Natura 2000 sites and the HELCOM MPA networks have a large overlap in the Baltic Sea they target slightly different features in their protection; the Natura 2000 sites protect certain habitats and species at a European level, while the HELCOM MPAs aim to protect habitats, species and processes specific for the Baltic Sea. Together these protected areas cover a larger area and ensure better protection to the habitats and species in that area.

The results of the current ecological coherence assessment do not differ distinctively from the previous assessment (HELCOM 2010). The main difference can be seen in replication of species, where the previous assessment concluded that some of the assessed species, namely *Fucus serratus, Zostera marina, Alosa fallax, Anguilla anguilla* and *Gadus morhua*, are in need of enhanced replication. Of these species only *Anguilla anguilla* was included in the current assessment, and this assessment indicates a better connectivity for this species than the previous HELCOM assessment.

3.5.1. Current data gaps and proposal for improvements to the assessment

The main shortcomings of the assessment are related to lack of relevant data for the desired analyses, and partial lack of scientifically based targets and methodology.

Improving data availability

The main data gap for this assessment was the lack of adequate information on the distribution of species and biotope complexes, which lead to exclusion of this subcriterion from the assessment of representativity. For a more appropriate assessment of representativity information on the spatial distribution is needed on these features both inside and outside the MPAs throughout the Baltic Sea. Currently only presence-data based on point wise observations is available. The previous assessment (HELCOM 2010) used the presence data as proxy for distribution in the representativity assessment, but this in fact is a repetition of the replication assessment. In addition to improving the data availability it is important to focus the data collection on the right type of data (for example by continuously updating the data in the HELCOM MPA database).

Setting science-based targets for the subcriteria

Setting targets for the subcriteria analyses is a central question as it determines the outcome of the ecological coherence assessment. The targets should be set with the prevailing environmental conditions in mind (for example accounting for species abundance when setting the targets for adequate replication values per species) and revised to fit the scale of the used data (for example the scale of maps). For the next ecological coherence assessment all subcriteria targets should be reviewed, keeping in mind the scale of new and possibly more detailed maps. Especially the representativity assessment of benthic marine landscapes could be improved by accounting for their relative abundance in the Baltic Sea, in order to distinguish the rare landscapes from common ones. This would enable more precise targets to be set, for example 60% coverage for rare habitats and 20% coverage for common habitats. The replication assessment would benefit from targets set according to each marker species and biotope complex, instead of the currently used fixed target.

Scrutinizing the methods for the analyses

The approach to evaluate connectivity in this assessment is rudimentary, and the results of species-specific connectivity clearly correspond to the different dispersal distances of the species. An appropriate analysis would for example be based on direction and strength of major Baltic Sea currents and information on stepping stone habitats which facilitate species dispersal from one suitable habitat patch to another. Some of the required data and methods for a more elaborate analysis are however lacking at this time.

If data is available, replication could be analysed also within the MPAs, as currently it is only analysed between the MPAs. In addition the reliability of the method for assessing adequacy would be improved by using more than one subcriterion.

4. Testing a new model for aggregating the results of subcriteria evaluations of the ecological coherence assessment into a single outcome

Ecological coherence assessments previously carried out in HELCOM (HABITAT 2006, Piekäinen & Korpinen 2007, HELCOM 2010) have not attempted to aggregate numerical results of the subcriteria analyses into one single outcome of ecological coherence. Instead, most assessments have focused on describing how far the MPA network currently is from reaching ecological coherence. Here a method is tested for aggregating the results using weighted averaging for the subcriteria and by using the one-out-all-out principle for the main criteria, while accounting for uncertainty of the data, target and method. A set of five integration tables were used to carry out the aggregation according to the steps described below (Tables 9-13) (Wolters et al. 2015), based on the following criteria:

Subcriteria — A ratio of the result of the subcriteria analysis and its target is calculated. Uncertainty in the data, target and method is defined, and averaged for each subcriteria. A weighted average is then calculated for each subcriteria (average uncertainty × subcriteria ratio). This is repeated for all subcriteria.

Main criteria — An average of all subcriteria under one main criterion is calculated separately for all four main criteria. The likelihood of reaching the target is given for each criterion, based on the weighted average of the subcriteria.

Whole assessment — Finally, the assessment of ecological coherence is based on the one-out-all-out principle, where the criterion with the lowest score (or likelihood) determines the final assessment result.

4.1. Integration tables of the results of subcriteria evaluations for the HELCOM MPAs

The outcome of the subcriteria evaluations were compared against their specific targets and aggregated using integration tables (adapted from Table 7 in Wolters et al. 2015).

Step-wise approach:

1. The subcriteria evaluated in chapters 3.1 - 3.4 aimed to assess how far the current state of the MPA network is from the set target, and to give this distance a value, the ratio of the subcriteria evaluation result and its target was attained (result divided by target) as a first step (Tables 9-12). A ceiling value of 2 was applied for this ratio in order to restrict disproportionally high values of subcriteria which highly exceed their set targets.

2. In the second step uncertainty of the data, target and method of the analysis were estimated as low, moderate or high, and translated into numerical values (1, 0.75 and 0.5, respectively), and averaged to calculate a value for mean uncertainty for each subcriteria. In the third step, the ratio and mean of uncertainties were used to calculate a weighted average for each subcriteria (subcriteria ratio x mean uncertainty). The rationale for choice of uncertainty values are presented in Annex 5.

3. Finally, the score for the main criteria was attained by calculating a simple average of all subcriteria weighted averages. Based on these scores the likelihood (very unlikely, unlikely, likely and very likely) that ecological coherence is reached was given for each main criterion (Table 8).

Table 8. Likelihood that target is currently achieved.

Likelihood target being achieved	Score of main criteria
VERY UNLIKELY	<0.5
UNLIKELY	0.5 - <1
LIKELY	1 - 1.5
VERY LIKELY	>1.5

Table 9. Integration table of subcriteria of the representativity criterion in the ecological coherence assessment. For explanation on the table calculations please see beginning of chapter 4.1. The background colours indicate the different subcriteria of representativity (light blue = geographical representation in Baltic Sea sub-basins, lilac = geographical representation in Baltic Sea zones, light brown = representation of benthic marine landscape types).

Subcriteria of representativity	**Subcriteria result**	**Subcriteria target**	**Subcriteria ratio** (=result/target)	**Uncertainty in data**[6]	**Uncertainty in target**[8]	**Uncertainty in method**[8]	**Average uncertainty**	**Weighted average of subcriteria** (=subcriteria ratio x mean uncertainty)
Representativity of MPAs in Kattegat	23.4	10.0	2.0	1.0	1.0	1.0	1.0	2.00
Representativity of MPAs in Great Belt	38.8	10.0	2.0	1.0	1.0	1.0	1.0	2.00
Representativity of MPAs in The Sound	14.3	10.0	1.4	1.0	1.0	1.0	1.0	1.43
Representativity of MPAs in Kiel Bay	38.9	10.0	2.0	1.0	1.0	1.0	1.0	2.00
Representativity of MPAs in Bay of Mecklenburg	17.4	10.0	1.7	1.0	1.0	1.0	1.0	1.74
Representativity of MPAs in Arkona Basin	14.7	10.0	1.5	1.0	1.0	1.0	1.0	1.47
Representativity of MPAs in Bornholm Basin	17.4	10.0	1.7	1.0	1.0	1.0	1.0	1.74
Representativity of MPAs in Gdansk Basin	16.3	10.0	1.6	1.0	1.0	1.0	1.0	1.63
Representativity of MPAs in Eastern Gotland Basin	7.0	10.0	0.7	1.0	1.0	1.0	1.0	0.70
Representativity of MPAs in Western Gotland Basin	3.6	10.0	0.4	1.0	1.0	1.0	1.0	0.36
Representativity of MPAs in Gulf of Riga	41.0	10.0	2.0	1.0	1.0	1.0	1.0	2.00
Representativity of MPAs in Northern Baltic Proper	3.2	10.0	0.3	1.0	1.0	1.0	1.0	0.32
Representativity of MPAs in Gulf of Finland	13.4	10.0	1.3	1.0	1.0	1.0	1.0	1.34
Representativity of MPAs in Åland Sea	5.6	10.0	0.6	1.0	1.0	1.0	1.0	0.56
Representativity of MPAs in Bothnian Sea	4.3	10.0	0.4	1.0	1.0	1.0	1.0	0.43
Representativity of MPAs in The Quark	16.8	10.0	1.7	1.0	1.0	1.0	1.0	1.68
Representativity of MPAs in Bothnian Bay	3.8	10.0	0.4	1.0	1.0	1.0	1.0	0.38
Representativity of MPAs in coastal sea	23.8	10.0	2.0	1.0	1.0	1.0	1.0	2.00
Representativity of MPAs in outer coastal sea	11.0	10.0	1.1	1.0	1.0	1.0	1.0	1.10
Representativity of MPAs in open sea	3.9	10.0	0.4	1.0	1.0	1.0	1.0	0.39
Representativity of photic sand 5-18 psu	52.7	20.0	2.0	0.75	0.75	1.0	0.8	1.67
Representativity of photic sand >18 psu	43.2	20.0	2.0	0.75	0.75	1.0	0.8	1.67
Representativity of photic sand <5 psu	31.8	20.0	1.6	0.75	0.75	1.0	0.8	1.32
Representativity of photic rock and other hard substrata 5-18 psu	19.9	20.0	1.0	0.75	0.75	1.0	0.8	0.83
Representativity of photic rock and other hard substrata >18 psu	36.8	20.0	1.8	0.75	0.75	1.0	0.8	1.53
Representativity of photic rock and other hard substrata <5 psu	14.0	20.0	0.7	0.75	0.75	1.0	0.8	0.58
Representativity of photic mud 5-18 psu	34.8	20.0	1.7	0.75	0.75	1.0	0.8	1.45
Representativity of photic mud >18 psu	18.4	20.0	0.9	0.75	0.75	1.0	0.8	0.77
Representativity of photic mud <5 psu	19.1	20.0	1.0	0.75	0.75	1.0	0.8	0.80
Representativity of photic mixed sediment 5-18 psu	22.1	20.0	1.1	0.75	0.75	1.0	0.8	0.92

[6] See annex 5.

Representativity of photic mixed sediment >18 psu	30.5	20.0	1.5	0.75	0.75	1.0	0.8	1.27
Representativity of photic mixed sediment <5 psu	17.7	20.0	0.9	0.75	0.75	1.0	0.8	0.74
Representativity of photic coarse sediment 5-18 psu	55.9	20.0	2.0	0.75	0.75	1.0	0.8	1.67
Representativity of photic coarse sediment <5 psu	40.1	20.0	2.0	0.75	0.75	1.0	0.8	1.67
Representativity of photic coarse >18 psu	47.1	20.0	2.0	0.75	0.75	1.0	0.8	1.67
Representativity of aphotic sand 5-18 psu	17.3	20.0	0.9	0.75	0.75	1.0	0.8	0.72
Representativity of aphotic sand >18 psu	20.9	20.0	1.0	0.75	0.75	1.0	0.8	0.87
Representativity of aphotic sand <5 psu	4.4	20.0	0.2	0.75	0.75	1.0	0.8	0.18
Representativity of aphotic rock and other hard substrata 5-18 psu	11.1	20.0	0.6	0.75	0.75	1.0	0.8	0.46
Representativity of aphotic rock and other hard substrata >18 psu	36.0	20.0	1.8	0.75	0.75	1.0	0.8	1.50
Representativity of aphotic rock and other hard substrata <5 psu	20.1	20.0	1.0	0.75	0.75	1.0	0.8	0.84
Representativity of aphotic mud 5-18 psu	2.5	20.0	0.1	0.75	0.75	1.0	0.8	0.10
Representativity of aphotic mud >18 psu	11.2	20.0	0.6	0.75	0.75	1.0	0.8	0.47
Representativity of aphotic mud <5 psu	9.1	20.0	0.5	0.75	0.75	1.0	0.8	0.38
Representativity of aphotic mixed sediment 5-18 psu	4.4	20.0	0.2	0.75	0.75	1.0	0.8	0.18
Representativity of aphotic mixed sediment >18 psu	24.0	20.0	1.2	0.75	0.75	1.0	0.8	1.00
Representativity of aphotic mixed sediment <5 psu	6.2	20.0	0.3	0.75	0.75	1.0	0.8	0.26
Representativity of aphotic coarse sediment 5-18 psu	13.7	20.0	0.7	0.75	0.75	1.0	0.8	0.57
Representativity of aphotic coarse sediment >18 psu	35.1	20.0	1.8	0.75	0.75	1.0	0.8	1.46
Representativity of aphotic coarse sediment <5 psu	21.0	20.0	1.0	0.75	0.75	1.0	0.8	0.87
Representativity main criterion score								**1.1**
Likelihood								**LIKELY**

Table 10. Integration table of subcriteria of the replication criterion in the ecological coherence assessment. For explanation on the table calculations please see beginning of chapter 4.1. The background colours indicate the different subcriteria of replication (yellow = replication of marker species, green = replication of marker biotope complexes, light brown = replication of benthic marine landscape types).

Subcriteria of replication	**Subcriteria result**	**Subcriteria target**	**Subcriteria ratio** (=result/target)	**Uncertainty in data**[8]	**Uncertainty in target**[8]	**Uncertainty in method**[8]	**Average uncertainty**	**Weighted average of subcriteria** (=subcriteria ratio x mean uncertainty)
Replication of Charales	21	4	2.0	1	0.5	0.75	0.8	1.50
Replication of Anguilla anguilla	22	4	2.0	1	0.5	0.75	0.8	1.50
Replication of Lampetra fluviatilis	34	4	2.0	1	0.5	0.75	0.8	1.50
Replication of Salmo salar	37	4	2.0	1	0.5	0.75	0.8	1.50
Replication of Gavia arctica & Gavia stellata	57	4	2.0	1	0.5	0.75	0.8	1.50
Replication of Mergus serrator & Mergus merganser	65	4	2.0	1	0.5	0.75	0.8	1.50
Replication of Sternula albifrons	32	4	2.0	1	0.5	0.75	0.8	1.50
Replication of Tadorna tadorna	39	4	2.0	1	0.5	0.75	0.8	1.50
Replication of Somateria mollissima	74	4	2.0	1	0.5	0.75	0.8	1.50
Replication of Halichoerus grypus	69	4	2.0	1	0.5	0.75	0.8	1.50
Replication of Phoca vitulina & Phoca hispida botnica	50	4	2.0	1	0.5	0.75	0.8	1.50
Replication of Phocoena phocoena	32	4	2.0	1	0.5	0.75	0.8	1.50
Replication of biotope complex 1110	94	4	2.0	1	0.5	0.75	0.8	1.50
Replication of biotope complex 1130	19	4	2.0	1	0.5	0.75	0.8	1.50
Replication of biotope complex 1140	40	4	2.0	1	0.5	0.75	0.8	1.50
Replication of biotope complex 1150	41	4	2.0	1	0.5	0.75	0.8	1.50
Replication of biotope complex 1160	60	4	2.0	1	0.5	0.75	0.8	1.50
Replication of biotope complex 1170	120	4	2.0	1	0.5	0.75	0.8	1.50
Replication of biotope complex 1180	7	4	1.8	1	0.5	0.75	0.8	1.31
Replication of biotope complex 1610	6	4	1.5	1	0.5	0.75	0.8	1.13
Replication of biotope complex 1620	37	4	2.0	1	0.5	0.75	0.8	1.50
Replication of biotope complex 1650	2	4	0.5	1	0.5	0.75	0.8	0.38
Replication of biotope complex 8330	0	4	0.0	1	0.5	0.75	0.8	0.00
Replication of photic sand 5-18 psu	122	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of photic sand >18 psu	166	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of photic sand <5 psu	106	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of photic rock and other hard substrata 5-18 psu	53	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of photic rock and other hard substrata >18 psu	43	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of photic rock and other hard substrata <5 psu	20	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of photic mud 5-18 psu	77	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of photic mud >18 psu	111	4	2.0	0.75	0.5	0.5	0.6	1.17

Replication of photic mud <5 psu	66	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of photic mixed sediment 5-18 psu	182	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of photic mixed sediment >18 psu	170	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of photic mixed sediment <5 psu	115	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of photic coarse sediment 5-18 psu	56	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of photic coarse sediment <5 psu	26	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of photic coarse >18 psu	8	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of aphotic sand 5-18 psu	77	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of aphotic sand >18 psu	55	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of aphotic sand <5 psu	29	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of aphotic rock and other hard substrata 5-18 psu	49	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of aphotic rock and other hard substrata >18 psu	20	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of aphotic rock and other hard substrata <5 psu	6	4	1.5	0.75	0.5	0.5	0.6	0.88
Replication of aphotic mud 5-18 psu	80	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of aphotic mud >18 psu	84	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of aphotic mud <5 psu	34	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of aphotic mixed sediment 5-18 psu	134	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of aphotic mixed sediment >18 psu	76	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of aphotic mixed sediment <5 psu	42	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of aphotic coarse sediment 5-18 psu	40	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication of aphotic coarse sediment >18 psu	4	4	1.0	0.75	0.5	0.5	0.6	0.58
Replication of aphotic coarse sediment <5 psu	17	4	2.0	0.75	0.5	0.5	0.6	1.17
Replication main criterion score **Likelihood**								**1.2** **LIKELY**

Table 11. Integration table of subcriteria of the adequacy criterion in the ecological coherence assessment. For explanation on the table calculations please see beginning of chapter 4.1. The background colour indicate the subcriteria MPA size (peach).

Subcriteria of adequacy	**Subcriteria result**	**Subcriteria target**	**Subcriteria ratio** (=result/target)	**Uncertainty in data**[8]	**Uncertainty in target**[8]	**Uncertainty in method**[8]	**Average uncertainty**	**Weighted average of subcriteria** (=subcriteria ratio x mean uncertainty)
Adequacy of MPAs with marine size of minimum 30km^2	68	80	0.9	1	0.75	1	0.92	0.78
Adequacy of MPAs with terrestrial size of minimum 10km^2	40	80	0.5	1	0.75	0.5	0.75	0.38
Adequacy main criterion score **Likelihood**								**0.6** **UNLIKELY**

Table 12. Integration table of subcriteria of the connectivity criterion in the ecological coherence assessment. For explanation on the table calculations please see beginning of chapter 4.1. The background colours indicate the different subcriteria of connectivity (light brown = theoretical connectivity based on benthic marine landscape types, brown = species-specific connectivity based on benthic marine landscape types representing suitable habitats for the chosen species).

Subcriteria of connectivity	**Subcriteria result**	**Subcriteria target**	**Subcriteria ratio** (=result/target)	**Uncertainty in data**[8]	**Uncertainty in target**[8]	**Uncertainty in method**[8]	**Average uncertainty**	**Weighted average of subcriteria** (=subcriteria ratio x mean uncertainty)
Connectivity within 25 km for photic mud <5 psu	0	50	0.0	0.75	0.5	0.5	0.58	0.00
Connectivity within 25 km for photic sand 5-18 psu	0.5	50	0.0	0.75	0.5	0.5	0.58	0.01
Connectivity within 25 km for aphotic rock and other hard substrata <5 psu	0	50	0.0	0.75	0.5	0.5	0.58	0.00
Connectivity within 25 km for aphotic sand 5-18 psu	0	50	0.0	0.75	0.5	0.5	0.58	0.00
Connectivity within 25 km for aphotic mixed >18 psu	0	50	0.0	0.75	0.5	0.5	0.58	0.00
Connectivity within 50 km for photic mud <5 psu	0.0	50	0.0	0.75	0.5	0.5	0.58	0.00
Connectivity within 50 km for photic sand 5-18 psu	4.5	50	0.1	0.75	0.5	0.5	0.58	0.05
Connectivity within 50 km for aphotic rock and other hard substrata <5 psu	0.0	50	0.0	0.75	0.5	0.5	0.58	0.00
Connectivity within 50 km for aphotic sand 5-18 psu	0.0	50	0.0	0.75	0.5	0.5	0.58	0.00
Connectivity within 50 km for aphotic mixed >18 psu	7.5	50	0.1	0.75	0.5	0.5	0.58	0.09
Connectivity for Macoma baltica	95.9	50	1.9	0.75	0.75	0.5	0.67	1.28
Connectivity for Psetta maxima	64.6	50	1.3	0.75	0.75	0.5	0.67	0.86
Connectivity for Furcellaria lumbricalis	62.1	50	1.2	0.75	0.75	0.5	0.67	0.83
Connectivity for Idotea baltica	62.1	50	1.2	0.75	0.75	0.5	0.67	0.83
Connectivity for Fucus vesiculosus	7.2	50	0.1	0.75	0.75	0.5	0.67	0.10
Average uncertainty and average criterion Likelihood:								**0.3 VERY UNLIKELY**

4.2. Final outcome of ecological coherence for the HELCOM MPA network using the integration tables for aggregating the subcriteria results

The final step of assessing the likelihood that the HELCOM MPA network has reached ecological coherence is done by the one-out-all-out principle between the four main criteria i.e. the criterion with the lowest score (by likelihood) determines the final assessment outcome. Based on the aggregated results of this assessment it is very unlikely that the HELCOM MPA network is ecologically coherent (Table 13). While representativity and replication were evaluated to be likely to have reached ecological coherence, adequacy and connectivity were unlikely respective very unlikely to be sufficient to fulfill the conservation goals of the HELCOM MPA network (Table 13).

Using integration tables for a calculative approach on the main outcome of the ecological coherence assessment is a straightforward and transparent method. In addition it accounts for uncertainties in the data, target and method, and can therefore be used despite different accuracy of the available background data. The integration tables are also easy to reproduce in order to create a long term view of the development of the ecological coherence of the MPA network. The current integration tables are a first attempt at applying this method for aggregating the final outcome of the ecological coherence assessment of HELCOM MPAs, and it is proposed to be applied in future ecological coherence assessments. However, some details of the subcriteria evaluations will inevitably be lost in the aggregation done by the integration tables, and the integration tables will also in the future be accompanied by a descriptive outcome of the subcriteria evaluations, as in chapter 3 in this report. Future assessments should focus developing the targets for the subcriteria analyses, as these have the largest influence when interpreting the results, both for the descriptive and the aggregated outcome.

Table 13. Scores of main criteria and final aggregated outcome of the ecological coherence assessment.

Main criterion	Score	Likelihood	Ecological coherence of the HELCOM MPA network
REPRESENTATIVITY	1.1	LIKELY	***Very unlikely that ecological coherence is reached.***
REPLICATION	1.2	LIKELY	
ADEQUACY	0.6	UNLIKELY	
CONNECTIVITY	0.3	VERY UNLIKELY	

5. Recommendation 35/1 on coastal and marine Baltic Sea protected areas (HELCOM MPAs[9])

HELCOM Recommendation 35/1 'System of coastal and marine Baltic Sea protected areas (HELCOM MPAs[7])' was adopted on 1 April 2014 superseding HELCOM Recommendation 15/5. It recommends that the Governments of the Contracting Parties to the Helsinki Convention take all appropriate measures to step up efforts to establish an ecologically coherent and effectively managed network of coastal and marine Baltic Sea protected areas (HELCOM MPAs) and to improve the protection effectiveness of existing HELCOM MPAs.

The Recommendation also lists more detailed objectives which the Contracting Parties are recommended to achieve or carry out, labelled as paragraphs a-r. The Recommendation is followed up through the paragraphs that have specific targets or time limits for achievement by use of specific evaluation criteria. This chapter presents the current level of accomplishment of the commitments expressed in these paragraphs. In addition, the progress of objectives in a set of paragraphs without defined targets are also included in this chapter. The evaluation criteria as well as additional guiding paragraphs from the Recommendation that are not included in the assessment of accomplishment are included in Annex 6.

5.1. Current status of implementation

5.1.1. Accomplishment of Recommendation 35-1

Reach the target set by the HELCOM 2010 Moscow Ministerial Declaration that at least 10% of the marine area in all sub-basins of the Baltic Sea including the EEZ areas beyond territorial waters is covered by MPAs where scientifically justified (paragraph a).

This objective overlaps with a sub-criterion used to assess representativity as part of the analysis of ecological coherence of the MPA network. As shown in chapter 3.1.1, the 10% target is met in some sub-basins as well as on the Baltic Sea level as a whole (Table 14 and Figure 7). However, since the target is not met in all sub-basins, the objective expressed in this paragraph is assessed as "partly accomplished" (Table 16). This conclusion is furthermore supported if the coverage of MPAs in the EEZ is considered: currently MPAs are covering 5% of the EEZ (Table 14).

It should however be noted that paragraph a) includes the clause that the target of 10% areal coverage should be reached "where scientifically justified". Thus, further consideration is needed to evaluation whether the 10% target is scientifically justified in Eastern and Western Gotland Basin as well as the Northern Baltic Proper, Åland Sea, Bothnian Sea and Bothnian Bay.

Table 14. Percentage of HELCOM MPAs in HELCOM sub-basins – the basis for assessing level of accomplishment of paragraph a) of Recommendation 35-1.

Sub-basin	HELCOM MPA network coverage per sub-basin (%)	HELCOM MPA network coverage in the EEZ (% of tot EEZ per sub-basin)
Kattegat	23	20
Great Belt	39	5
The Sound	14	0.3
Kiel Bay	39	32
Bay of Mecklenburg	17	14
Arkona Basin	15	17
Bornholm Basin	17	13
Gdansk Basin	16	0

[7] Former BSPAs.

Eastern Gotland Basin	7	2
Western Gotland Basin	4	5
Gulf of Riga	41	100
Northern Baltic Proper	3	0
Gulf of Finland	13	2
Åland Sea	6	0
Bothnian Sea	4	0.7
The Quark	17	0
Bothnian Bay	4	0.1
Total area	**12**	**4.7**

Designate new sites as HELCOM MPAs where ecologically meaningful especially in offshore area beyond territorial waters (paragraph b).

Since the adoption of recommendation 35-1 in 2014, only Finland has designated 11 new sites which increases the total area of HELCOM MPAs in the Baltic Sea by 725 km^2. Moreover, the new Finnish sites are located in or partly in the EEZ, increasing the EEZ area covered by HELCOM MPAs by 82km^2. However, the offshore area and the landscape types typically encountered in this and other areas are still in need of improved protection, as the assessment of the representativity criterion shows (Figures 8 and 9). Therefore this objective should be seen as an ongoing process.

Ensure that HELCOM MPAs inter alia provide specific protection to those species, habitats, biotopes and biotope complexes included in the HELCOM Red Lists, as agreed in the HELCOM 2013 Copenhagen Ministerial Declaration, by considering these in the site selection procedure (paragraph c).

This objective is assessed as accomplished when the network of HELCOM MPAs provides protection to all threatened species, biotopes and biotope complexes according to the HELCOM Red Lists published in 2013 (HELCOM 2013b, c). The assessment of accomplishment for this objective is based on the data reported by the Contacting Parties to the HELCOM MPA database on whether the species, biotope or biotope complex justifies the sites designation as an MPA, and more specifically on the information regarding the presence of threatened species, biotopes and biotope complexes in at least one MPA and information on whether a threatened species, biotope or biotope complex is protected in at least one MPA (i.e. justifies for the site's establishment as an MPA). According to data reported in the HELCOM MPA database, this objective is currently assessed as partly accomplished (Figure 29). It is accomplished for the threatened biotope complexes, as each one of them is reported to be protected in at least one HELCOM MPA. This objective has however not been reached for the threatened species and biotopes, as only 36% of all threatened species, and 12% of threatened biotopes are protected within at least one MPA. The biotopes follow the HELCOM HUB classification and are in general very poorly reported in the HELCOM MPA database, which partly explains this low result.

According to the data some threatened species are protected in many MPAs, for example bird species, such as the common eider, black-throated diver and velvet scoter, and the harbor porpoise. Threatened species which are protected in only one or a few MPAs include birds, in addition to macrophytes, fish and lamprey species and invertebrates (Table 15). In general threatened species are the reason for establishing many HELCOM MPAs.

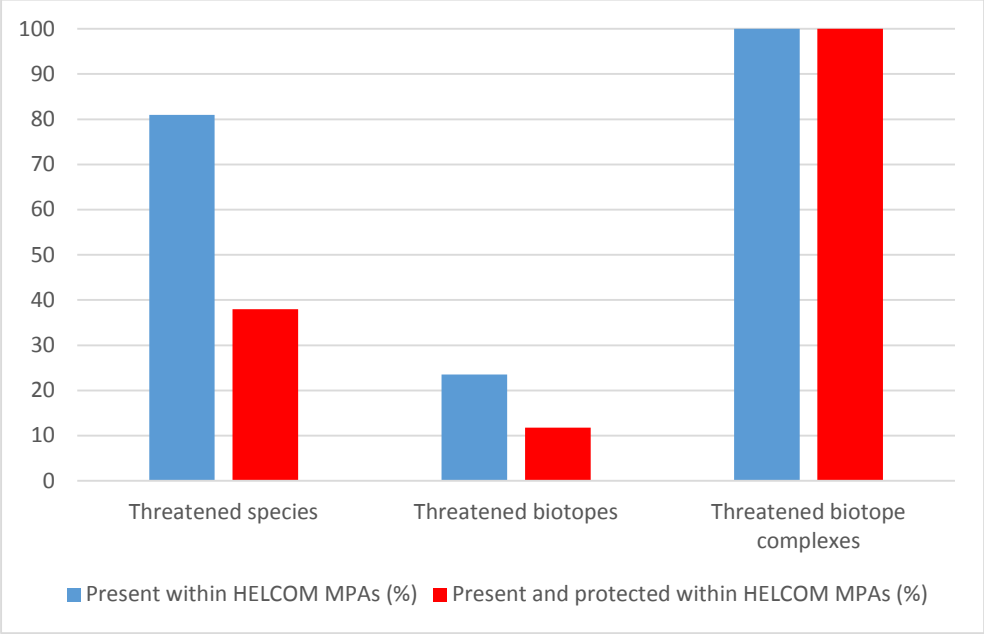

Figure 29. The percentage (%) of threatened species, biotopes and biotope complexes present (blue) or present and protected (red) in at least one MPA as reported in the HELCOM MPA database. Present and protected means that the HELCOM MPA is established to protect this feature in particular. The threatened categories include regionally extinct (RE), critically endangered (CR), endangered (EN) or vulnerable (VU). The HELCOM Red Lists (HELCOM 2013b, c) include total of 69 threatened species, 17 threatened biotopes and 8 threatened biotope complexes.

Table 15. Threatened species according to HELCOM Red List 2013 (HELCOM 2013 c) protected in HELCOM MPAs.

Species group	Scientific name	English name	Protected in no. MPAs	Countries
Fish and lamprey	*Anguilla anguilla*	European eel	1	Sweden
Birds	*Cepphus grylle arcticus (wintering)*	Black guillemot	1	Germany
Macrophytes	*Hippuris tetraphylla*		1	Sweden
Birds	*Rissa tridactyla (breeding)*	Black-legged kittiwake	1	Sweden
Fish and lamprey	*Salmo salar*	Salmon	1	Russia
Invertebrates	*Scrobicularia plana*		1	Denmark
Macrophytes	*Alisma wahlenbergii*		2	Sweden, Russia
Invertebrates	*Macoma calcarea*		2	Denmark
Birds	*Larus fuscus fuscus (breeding)*		3	Sweden, Germany
Macrophytes	*Zostera noltii*		3	Denmark
Birds	*Arenaria interpres (breeding)*	Ruddy turnstone	4	Sweden
Birds	*Hydroprogne caspia (breeding)*	Caspian tern	4	Sweden, Denmark, Poland
Fish and lamprey	*Salmo trutta*	Trout	4	Russia, Sweden
Birds	*Podiceps grisegena (wintering)*	Red-necked grebe	5	Poland, Russia, Germany
Birds	*Polysticta stelleri (wintering)*	Steller´s eider	5	Finland
Fish and lamprey	*Petromyzon marinus*	Sea lamprey	6	Poland, Denmark, Russia
Mammals	*Phoca hispida botnica*	Baltic ringed seal	7	Sweden, Finland, Russia
Birds	*Anser fabalis fabalis (wintering)*	Taiga Bean goose	10	Poland, Russia, Denmark
Birds	*Clangula hyemalis (wintering)*	Long-tailed duck	11	Finland, Latvia, Denmark, Poland, Germany, Sweden
Birds	*Aythya marila (breeding)*	Greater scaup	12	Poland, Denmark, Russia, Germany

Birds	*Calidris alpina schinzii (breeding)*	Southern dunlin	14	Finland, Denmark, Sweden, Poland
Birds	*Melanitta nigra (wintering)*	Common scoter	14	Latvia, Denmark, Poland, Sweden, Germany
Birds	*Mergus serrator (wintering)*	Red-breasted merganser	14	Germany, Denmark, Latvia, Sweden, Poland
Birds	*Philomachus pugnax(breeding)*	Ruff	14	Sweden, Finland
Birds	*Melanitta fusca (breeding)*	Velvel scoter	18	Finland, Latvia, Denmark, Sweden, Germany, Poland
Birds	*Gavia stellata (wintering)*	Red-throated diver	20	Finland, Russia, Poland, Latvia Sweden
Mammals	*Phocoena phocoena*	Harbour porpoise Western Baltic subpopulation	20	Denmark, Sweden, Germany
Birds	*Gavia arctica (wintering)*	Black-throated diver	22	Sweden, Finland, Latvia, Germany, Poland, Russia
Birds	*Somateria mollissima (breeding)*	Common eider	25	Finland, Germany, Denmark, Sweden

Ensure when selecting new areas that the network of HELCOM MPAs is ecologically coherent and takes into account connectivity between sites including for example migration routes, species mobility and areas of special ecological significance such as spawning areas (paragraph d).

According to the assessment presented in chapter 3 of this report the HELCOM MPA network in the Baltic Sea is not yet ecologically coherent. However, 2 of the 4 main criteria (representativity and replication; see Table 13) are likely to have reached ecological coherence, and the objective is thereby assessed as partly accomplished.

Develop and apply by 2015 management plans or measures for all existing HELCOM MPAs (paragraph h1).

Paragraph h1) of the Recommendation is related to the development of management plans for the MPAs. The objective is that all existing MPAs should have implemented management plans or measures by 2015. Information provided to the HELCOM MPA database shows that this objective has not been met. On a regional level the percentage of MPAs with management plans is the same as in 2014, i.e. 67%, and thus the target has only been partly accomplished.

Assess the effectiveness of the management plans or measures of HELCOM MPAs by conducting monitoring, and where feasible scientific research programmes, which are directly connected to the conservation interests of HELCOM MPAs, including the placement of monitoring stations inside the MPAs (paragraph k).

Currently HELCOM has no joint approach on how to assess the effectiveness of management plans or measures and the objective is thus not accomplished. However, monitoring, which is required to assess effectiveness of MPAs, takes places in 64% of MPAs as reported in the MPA database.

Modernize the HELCOM MPAs database as agreed in the HELCOM 2013 Copenhagen Ministerial Declaration, taking into account and harmonizing with other similar databases (paragraph p).

This objective is accomplished, as the new HELCOM MPA database (mpas.helcom.fi) was published in October 2015. It contains a map interface, new reporting features on pressures and regulated human activities within the MPAs, and is harmonized with the OSPAR MPA database and Natura 2000 standard data forms where feasible. Data, information and shapefiles reported to the database form the basis for the assessment of ecological coherence and accomplishment of Recommendation 35/1.

Update the management plans when necessary and in accordance with other legal requirements with a maximum of 12 years intervals (paragraph i).

The total number of management plans reported in the HELCOM MPA database by January 2016 is 216, and 140 of them are implemented. Seven of the implemented management plans have not been updated in the last 12 years (i.e. after 2004). Therefore, this target has not been accomplished. Management plans still need to be developed or finalized for several HELCOM MPAs and those seven management plans that are older than 12 years need to be updated.

Establish management plan or measures for every new MPA within five years after its designation (paragraph h2).

Recommendation 35-1 was adopted in 2014 and thus this target will be assessed in 2019.

5.1.2 Summary on Recommendation 35-1 follow-up

In conclusion, out of the seven paragraphs with agreed targets and time limits of the Recommendation 35-1, one has been accomplished, five have partly been accomplished, and one objective has not been accomplished (Table 16). In addition, one paragraph of Recommendation 35/1 cannot yet be assessed since its target year is set in the future.

Table 16. Evaluation of the follow-up of HELCOM Recommendation 35/1.

Paragraphs from Recommendation 35-1	Evaluation	Evaluation criteria supporting assessment	Additional info to justify accomplishment
a) reach the target set by the HELCOM 2010 Moscow Ministerial Declaration that at least 10% of the marine area in all sub-basins of the Baltic Sea including the EEZ areas beyond territorial waters is covered by MPAs where scientifically justified.	**Partly accomplished**	10% of the marine area is covered by MPAs in some sub-basins, including the EEZ areas beyond territorial waters (presented per sub-basin)	In 11 of 17 sub-basins MPAs cover at least 10% of the surface. The EEZ is sufficiently covered in some sub-basins (Table 14).
b) designate new sites as HELCOM MPAs where ecologically meaningful especially in offshore area beyond territorial waters	**Partly accomplished**	The nr and/or % of MPAs areas is increasing, and nr and/or % of MPAs in EEZ is increasing.	Only Finland has designated 11 new sites which increases the total area of HELCOM MPAs in the Baltic by 725km^2. Finland has designated 3 new sites in or partly in the EEZ, which increases the EEZ area covered by MPAs by 82km^2
c) ensure that HELCOM MPAs inter alia provide specific protection to those species, habitats, biotopes and biotope complexes included in the HELCOM Red Lists, as agreed in the HELCOM 2013 Copenhagen Ministerial Declaration, by considering these in the site selection procedure	**Partly accomplished**	1)The HELCOM network of MPAs provides protection to some HELCOM threatened species 2) The HELCOM network of MPAs provides protection to some HELCOM threatened biotopes/habitats (both to be met)	All threatened biotope complexes are protected within at least one MPA, whereas only 36% of all threatened species, and 12% of threatened biotopes are protected within an MPA.
d) ensure when selecting new areas, that the network of HELCOM MPAs is ecologically coherent and takes into account connectivity between sites including for example migration routes, species mobility and areas of special ecological significance such as spawning areas	**Partly accomplished**	Some criteria considered in the evaluation are reflecting ecological coherence	According to the assessment presented in chapter 3 the MPA network in the Baltic Sea s is not ecologically coherent.
h1) develop and apply by 2015 management plans or measures for all existing HELCOM MPAs,	**Partly accomplished**	At least 67% of HELCOM MPAs designated by 2014 have management plans or measures	
h2) and establish management plan or measures for every new MPA within five years after its designation,	**Not assessed**		Not assessed - will be assessed in 2019 (5 years after adoption of Rec35-1)
i) update the management plans when necessary and in accordance with other legal requirements with a maximum of 12 years intervals	**Not accomplished**		Management plans still need to be developed or finalized for several HELCOM MPAs. Seven management plans are older than 12 years and need to be updated.
k) assess the effectiveness of the management plans or measures of HELCOM MPAs by conducting monitoring, and where feasible scientific research programmes, which are directly connected to the conservation interests of HELCOM MPAs, including the placement of monitoring stations inside the MPAs	**Not accomplished**	Assessment management effectiveness not started.	Not accomplished - currently there is no joint approach on how to assess the effectiveness of management plans/measures. However, 64% of MPAs with management plans also have monitoring in place as reported to the MPA database.
p) modernize the HELCOM MPAs database as agreed in the HELCOM 2013 Copenhagen Ministerial Declaration, taking into account and harmonizing with other similar databases;	**Accomplished**	New database published on-line in October 205	http://mpas.helcom.fi/apex/f?p=103:1

5.1.3. Progress of additional commitments

In addition to the paragraphs with defined targets and time limits, Recommendation 35-1 includes a set of paragraphs which only address some Contracting Parties, or which are expressed as encouragement rather than commitments.

Encourage Contracting Parties which are also EU Member States to designate when feasible all appropriate Natura 2000 sites as HELCOM MPAs, and to consider all Natura 2000 sites as well as other marine protected areas when evaluating the network of marine protected areas (paragraph f).

Today 63% of the marine Natura 2000 area in the Baltic Sea are also designated into the HELCOM MPA network, and this has not changed since 2013.

In addition, there are six HELCOM MPAs within the EU borders which have not been designated as Natura 2000 sites (one in Finland, Denmark, Lithuania and Sweden, and two in Germany).

The second objective of the paragraph, "to consider all Natura 2000 sites as well as other marine protected areas when evaluating the network of marine protected areas", has been achieved with the current assessment of ecological coherence (chapter 3), which also considers the Natura 2000 sites.

Encourage Contracting Parties which are also OSPAR Contracting Parties to designate, when appropriate, OSPAR MPAs as HELCOM MPAs in order to harmonize the networks where the conventions' geographical scope overlap (paragraph g).

The geographical scope of the OSPAR and HELCOM regional sea conventions overlap in Kattegat, and there are 22 OSPAR MPAs in the Kattegat. All OSPAR MPAs in Kattegat are also HELCOM MPAs and has been so since 2005 or 2009. In addition there are seven HELCOM MPAs in the Kattegat which are not designated as OSPAR MPAs.

Apply the newest IUCN categorisation system when describing the HELCOM MPAs in order to allow for global comparisons of regional networks (paragraph n).

According to data reported in the HELCOM MPA database an IUCN category (Table 6) is provided for 118 of all 174 (68%) HELCOM MPAs. The most common IUCN category for the HELCOM MPAs is IV Habitat/Species Management Area (Figure 23 and Table 6 in chapter 3). In many cases one MPA has been assigned several IUCN categories, as the IUCN categories can be assigned to smaller areas inside the MPA.

6. Next steps for improving the network and assessments of HELCOM MPAs

From the perspective of a marine region, this reports shows an impressive system of marine protected areas in the Baltic Sea region, far exceeding the areal coverage of MPAs at the European and global level[8]. However, the ambition set by HELCOM for the MPA network is high and the commitments made by Contracting Parties have been only partly met to date. In addition, lack of information and consolidated methodology hampers the assessment of the ecological coherence of the network as well as the effectiveness of its management. Some proposed steps of improvement requires implementation by countries, while others are best achieved through joint efforts.

Measures by countries

Designate new sites as HELCOM MPAs where scientifically meaningful, especially in offshore area beyond territorial waters

The increase in areal coverage of HELCOM MPAs has slowed down in recent years. Although the target of 10% areal coverage has been met for the Baltic Sea as whole the current report shows that the target has not been met in all sub-basin, and also not in waters beyond territorial waters (chapter 3.1 and 5.1). While designation of new MPAs is a national matter, such decisions can be supported by joint analyses to agree on the need to improve protection in sub-basins and zones which do not yet reach the 10% target. As recognized in Recommendation 35-1 the relevance of spatial protection differs between areas depending on the characteristics of the respective sub-basin, for example in the offshore areas of the Baltic Sea that are subject to oxygen depletion, the designation of MPAs may not be meaningful from point of protecting important or rare features.

Improve the protection of threatened species, biotopes and biotope complexes within the MPAs

Surprisingly few threatened species and biotopes have been reported as being having protection in the MPAs, although the role of MPAs in protecting such species and biotopes is highlighted in Recommendation 35-1 (chapter 5.1). This evaluation is based on reporting by countries to the HELCOM MPA database. Thus, if countries have not reported consistently in this regard, the protection of threatened species may be underestimated. The results indicate the need to scrutinize the purpose of the MPAs as regards protection of threatened species but also the reporting to the HELCOM MPA database.

Develop management plans for MPAs still lacking them

Development of management plans for existing MPAs was laid down in the Baltic Sea Action Plan with and initial deadline by 2010, being extended for existing MPAs to 2015 in HELCOM Recommendation 35-1. Currently this is met for 67% of the MPAs (chapter 5.1). In addition, the agreement to update the management plans with a maximum of 12 years intervals has been exceeded for seven MPAs.

Increase monitoring and information on monitoring in MPAs

Currently, monitoring is taking place in 64% of HELCOM MPAs as reported to the HELCOM MPA database. Monitoring in MPAs is a prerequisite to evaluate the effectiveness of MPAs and their management (see also below). The frequency of monitoring has however not been reported to the database and it is therefore difficult to estimate whether the monitoring is sufficient to analyse temporal changes in the MPAs where monitoring exists.

Ensure complete reporting to the HELOCM MPA database

This assessment is to a large extent based on the reporting by countries to the HELCOM MPA database. If there reporting is not complete it means that the conclusions made are incorrect. This refers to reporting on protected species, biotopes and biotope complexes (see above) as well as other features such as pressures within the MPA, management plan status and regulated activities within the MPA.

[8] The total area of MPAs in the North-east Atlantic Ocean, Mediterranean Sea and Black Sea was estimated at 4.2, 9.5 and 5.9% respective in 2015 (EEA 2015, Technical Report No 17/2015), and 2.1% of the global oceans in 2016 (www.mpatlas.org).

Encourage Contracting Parties which are also EU Member States to designate when feasible all appropriate Natura 2000 sites as HELCOM MPAs

There are still 37% of marine Natura 2000 sites which are not designated to the HELCOM MPA network. In order to improve the HELCOM MPA network, Contracting Parties are encouraged to designate these areas as HELCOM MPAs, when feasible.

Joint measures

Maximize the chance of enhancing the ecological coherence when designating new MPAs

One of key outcomes of the assessment is the lack of ecological coherence of the MPA network, and in particular the aspect of connectivity that reflects the possibilities of species to migrate and disperse within and between MPAs. To achieve better connectivity, countries need to cooperate in the designation of the MPAs to ensure that the network as a whole will meet the desired features such as connectivity. The use of site selection tools to identify areas suitable for new MPAs have been used previously in HELCOM (HELCOM 2010) and are proposed to be explored again.

Further develop the assessment methodology for the next ecological coherence assessment, including the targets set for the sub-criteria

As detailed in chapter 3.5.1 several improvements can be made for the next ecological coherence assessment. These include improving data availability, setting science-based targets for all subcriteria and scrutinizing the methods for some of the analyses. The integration table provides a calculative approach for aggregating the results of the subcriteria analyses, and is encouraged to be used along with the descriptive approach.

Include all Baltic Sea MPAs in the next assessment

In the next assessment all MPAs established in the Baltic Sea, such as national protected areas, Ramsar sites and Important Bird Areas should preferentially be included in addition to HELCOM MPAs and the marine Natura 2000 sites. The prerequisite for such assessment is that the appropriate data for the analysis is available for all protected area networks in the Baltic Sea.

Develop an approach and carry out an assessment of management effectiveness for HELCOM MPAs

While management plans is a required component in the process of designating MPAs and being regularly followed-up in HELCOM, an assessment of the effectiveness of such plans or other measures applied in the MPAs has not yet been carried out. A first step is to develop a common HELCOM approach to assess management effectiveness.

Update HELCOM guidelines

HELCOM Recommendation 35-1 recommends Contracting Parties to 'update, when necessary, HELCOM MPA related guidelines and guiding documents in order to keep them in line with new knowledge and compatible with other international criteria, such as MSFD requirements, in particular those concerning spatial protection measures'. The latest HELCOM MPA guidelines are from 2006 (BSEP 105, Planning and management of Baltic Sea Protected Areas: guidelines and tools). It is thus timely to review and tentatively revise the existing guidelines.

Improve spatial data on the distribution of species and biotopes

Lack of data has hampered the assessment of ecological coherence, this included data on the distribution of species and biotope complexes which would have improved analysis of for example representativity.

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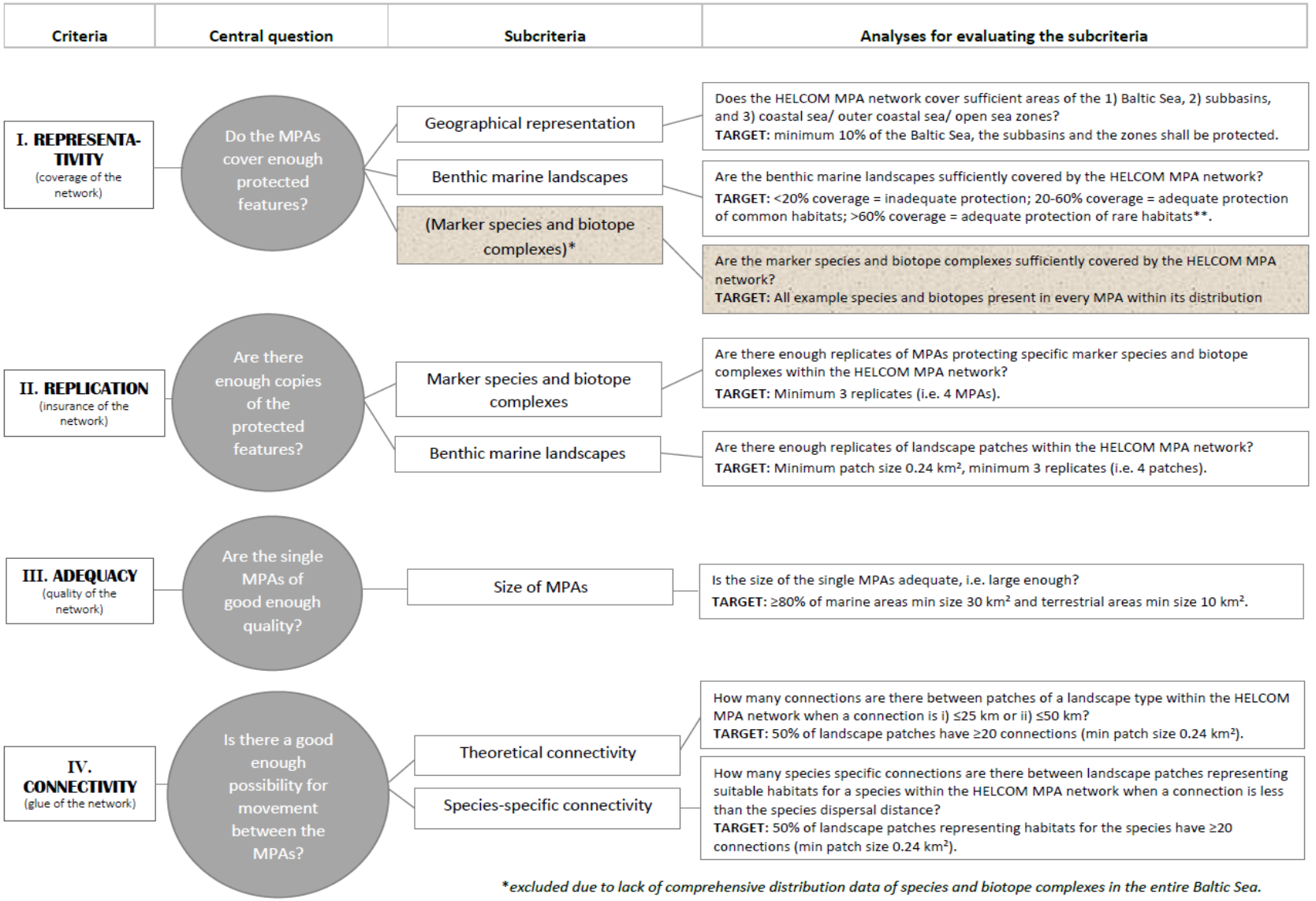
Annex 1. Total number, total area and marine fraction of HELCOM MPAs, total marine area per country and protected marine area of HELCOM MPAs in HELCOM Contacting Parties. The data is based on HELCOM MPA shapefiles from 2013.

Country and number of HELCOM MPAs		Total area of HELCOM MPAs	Marine fraction of HELCOM MPAs		Total marine area per country			Protected marine area as area (km²) and fraction (%) of the national territorial waters (TW), exclusive economic zone (EEZ) and total area					
		km²	km²	(%)	TW km²	EEZ km²	Total km²	TW km²	(%)	EEZ km²	(%)	Total km²	(%)
Denmark	66	11 181	10 411	(93%)	32 917	13 074	45 991	7 599	(23%)	1 091	(8%)	10 411	(23%)
Estonia	7	7 192	6 050	(84%)	25 139	11 830	36 970	5 954	(24%)	43	(0%)	6 050	(17%)
Finland	22	5 798	5 553	(96%)	53 176	28 660	81 836	2 423	(5%)	0	(0%)	5 553	(7%)
Germany	12	5 840	5 526	(95%)	10 852	4 505	15 357	2 202	(20%)	2 217	(49%)	5 526	(36%)
Latvia	7	4 364	4 364	(100%)	12 692	16 125	28 816	4 150	(33%)	214	(1%)	4 364	(15%)
Lithuania	6	1 393	1 005	(72%)	2 274	4 259	6 534	1 393	(61%)	0	(0%)	1 005	(15%)
Poland	9	8 052	7 361	(91%)	10 172	19 491	29 663	5 426	(53%)	888	(5%)	7 361	(25%)
Russia	6	1 435	977	(68%)	16 315	7 373	23 902	894	(6%)	0	(0%)	977	(4%)
Sweden	28	8 387	7 375	(88%)	83 013	65 272	148 284	3 599	(4%)	2 750	(4%)	7 375	(5%)
Total	**163**	**53 642**	**48 621**	**(91%)**	**246 550**	**170 589**	**417 352**	**33 640**	**(13.6%)**	**7203**	**(4.2%)**	**48 621**	**(11.6%)**

Annex 2. Overview of assessment design of the entire ecological coherence assessment



**excluded due to lack of comprehensive distribution data of species and biotope complexes in the entire Baltic Sea.*
***the 60% target originates from discussions under the Habitats Directive, and was originally intended only for rare habitats.*

Annex 3. Overview of ecological coherence assessment carried out for (1) the HELCOM MPA network and (2) the combination of the HELCOM MPA network and the marine parts of the Natura 2000 network in the Baltic Sea.

Criteria and subcriteria	(1) HELCOM MPA network	(2) combination of HELCOM MPA network and marine parts of the Baltic Sea Natura 2000 network
I. Representativity	**x**	**x**
1) Geographical representation	x	x
2) Benthic marine landscapes	x	x
II. Replication	**x**	**x**
1) Marker species and biotope complexes	x	-
2) Benthic marine landscapes	x	x
III. Adequacy	**x**	**-**
1) Marine size of MPAs	x	-
2) Terrestrial size of MPAs	x	-
IV. Connectivity	**x**	**x**
1) Theoretical connectivity of benthic marine landscapes	x	x
2) Species-specific connectivity	x	x

Annex 4. Overview table of all data used for the ecological coherence assessment

Data layer	Source and year of last update	Representativity of landscape	Representativity, geographical	Replication of marker species	Replication of marker biotope complexes	Replication of landscapes	Adequacy of MPA size	Connectivity, theoretical	Connectivity, species-specific
Shapefile of HELCOM MPAs	HELCOM Data & Map service (2015).	x	x	x	x	x	x	x	x
Shapefile of HELCOM MPAs and marine Natura 2000 sites	HELCOM Data & Map service (2015) and the EEA data bank.	x	x			x		x	x
Shapefile of marine benthic landscape maps	EUSeaMap2 (2015) Interim draft Baltic Sea Broad-Scale Predictive Habitat Map.[9]	x				x		x	x
Shapefile of Baltic Sea sub-basins	HELCOM Data & Map service (2013). "HELCOM Sub-basins" Based on HELCOM Monitoring and Assessment Strategy (2013).		x						
Shapefile of coastal zones	Created for this assessment based on "HELCOM Sub-basins with coastal WFD divisions (2013)".		x						
Shapefiles of species distribution (per sub-basin)	HELCOM Species Information Sheets (2013)			x					
Shapefiles of biotope complexes distribution (100x100 km grid)	HELCOM Biotope complexes Information Sheets (2013)				x				
Species data reported per MPA.	HELCOM MPA database (2015).			x					
Biotope complexes data reported per MPA.	HELCOM MPA database (2015).				x				
Shapefile of spatial distribution of fisheries within the Baltic Sea during 2013 (VMS)	HELCOM Data & Map service (2015)						x		

[9] To cover the whole Baltic Sea, the shapefile was amended with EuSeaMap2 North & Celtic Seas habitat map (including Kattegat). This dataset was supplemented with salinity dataset from EUSeaMap project and reclassified to match the classes used in Baltic habitat map.

Shapefile of spatial distribution of shipping traffic within the Baltic Sea during 2014 (AIS)	Unpublished, will be made available in HELCOM Data & Map service in 2016						x		

Annex 5. Fishing effort (hours) for longlines, midwater trawl, and mobile bottom-contacting gears in 2013 within HELCOM MPAs, based on VMS data (ICES 2015).

MPA	Longlines	Midwater trawl	Mobile bottom-contacting gear
Adler Grund og Rønne Banke	442	1	48
Æbelø og havet syd for og Nærå		2	13
Akmensrags		5	5
Ålborg Bugt, østlige del		30	4
Anholt og havet nord for		10	1,005
Bakkebrædt og Bakkeground			3
Bogskar		14	
Bornholm: Davids Banke	114	21	16
Bornholm: Ertholmene		1	
Centrale Storebælt og Vresen		23	2,033
Eckernförder Bucht mit Flachgründen, Südküste der Eckernförder Bucht und vorgelagerte Flachgründe		26	223
Falsterbo Peninsula with Måkläppen		261	97
Fehmarnbelt		25	995
Femern Bælt			57
Finngrundet–Östra Banken		48	2
Fladen			69
Flensborg Fjord, Bredgrund og farvandet omkring Als		67	3,123
Fyns Hoved, Lillegrund og Lillestrand			
Gilleleje Flak og Tragten		67	141
Hangon itäinen selkä		28	
Havet mellem Romsø og Hindsholm samt Romsø		1	
Havet og kysten mellem Hundested og Rørvig			4
Havet omkring Nordre Rønner		7	407
Herthas Flak			114
Hesselø med omliggende stenrev		3	2
High Coast			
Hirsholmene, havet vest herfor og Ellinge Å's udløb		3	130
Hoburgs Bank		5	
Horsens Fjord, havet øst for og Endelave		2	2
Hvideodde Rev		1	28
Irbes saurums		3,974	59
Jasmund National Park		33	1
Kadetrinne		8	10
Kims Top og den Kinesiske Mur			2,015
Klinteskov Kalkgrund		1	4
Kokkolan saaristo/Kokkola Archipelago		7	
Kopparstenarna/Gotska Sandön/Salvorev Area		34	

MPA	Longlines	Midwater trawl	Mobile bottom-contacting gear
Kristiinankaupungin saaristo /Kristiinankaupunki Archipelago		685	
Kura Kurk		99	
Küstenbereiche Flensburger Förde von Flensburg bis Geltinger Birk, Flengurger Förde		4	170
Küstenlandschaft Bottsand – Marzkamp u. vorgelagerte Flachgründe, Östlichen Kieler Bucht		3	320
Læsø Trindel og Tønneberg Banke			6
Lahemaa		79	
Långör – Östra Sundskär			
Lawica Slupska	566	18	192
Lilla Middelgrund		7	543
Lillebælt		43	511
Liminka Bay /Liminganlahti		17	
Maden på Helnæs og havet vest for		4	
Mejl Flak			
Merenkurkun saaristo /Outer Bothnian Threshold Archipelago (The Quark)		413	
Morups Bank			279
Nakskov Fjord og Inderfjord			1
Närpiön saaristo /Närpiö Archipelago		9	
Nida–Perkone			
Northern Midsjöbanken		8	
Ostoja Slowinska	2		8
Pakri		666	
Pernajanlahtien ja Pernajan saariston merensuojelualue /Pernajabay and Pernaja Archipelago marine protection areas		430	
Pommersche Bucht–Rönnebank	53	482	3,496
Przybrzezne Wody Baltyku	315	269	3,571
Rahjan saaristo/Rahja Archipelago		405	
Rigas lica rietumu piekraste		8,361	10
Røsnæs, Røsnæs Rev og Kalundborg Fjord			3
Saaristomeri /Archipelago Sea		64	
Saltholm og omliggende hav			
Schlei incl. Schleimünde und vorgelagerter Flachgründe			31
Schultz og Hastens Grund samt Briseis Flak		1	13
Sejerø Bugt og Saltbæk Vig			67
Selga uz rietumiem no Tujas		4,166	
Signilskär – Märket		71	
Skælskør Fjord og havet og kysten mellem Agersø og Glænø			37

MPA	Longlines	Midwater trawl	Mobile bottom-contacting gear
Staberhuk, Großenbrode Meeresbereiche, Wagrien, Sagas-Bank		27	290
Stavns Fjord, Samsø Østerflak og Nordby Hede		1	
Stenrev sydøst for Langeland			25
Stevns Rev		23	16
Stora Middelgrund och Röde Bank			705
Store Middelgrund			4
Strandenge på Læsø og havet syd herfor		1	22
Sydfynske Øhav		1	128
Tammisaaren ja Hangon saariston ja Pohjanpitäjänlahden merensuojelualue /Tammisaari and Hanko Archipelago and Pojo Bay marine protection area		38	
Torhamns Archipelago		1	3
Tulliniemen linnustonsuojelualue/ Tulliniemi bird protection area		35	
Ujscie Odry i Zalew Szczecinski			
Uudenkaupungin saaristo/ Uusikaupunki Archipelago		1,097	
Väinameri		141	
Vilsandi		24	
Vorpommersche Boddenlandshaft National Park (West-Pommeranian Lagoon National Park)			13
Walkyriengrund			28
Zatoka Pomorska	3	2,757	6,367
Zatoka Pucka	1	67	103

Annex 6. Rationale of uncertainties in the integration tables for aggregating the subcriteria results

Main criterion	Subcriterion	Uncertainty value of data	Justification	Uncertainty value of target	Justification	Uncertainty value of method	Justification
Representativity	Geographical representation	LOW (1)	The data is shapefiles of MPAs provided by countires.	LOW (1)	The target is based on recommendations from the CBD.	LOW (1)	The method is a standard GIS analysis of the shapfiles.
	Zonation	LOW (1)	The data is shapefiles of MPAs provided by countires.	LOW (1)	The target is based on recommendations from the CBD.	LOW (1)	The method is a standard GIS analysis of the shapfiles.
	Benthic marine landscapes	MODERATE (0.75)	The data is shapefiles derived from modelled maps produced by EUSeaMap project. Modelled data always includes some uncertainty.	MODERATE (0.75)	The lower of two targets (20%) was chosen for the assessment. Choosing the higher target (60%) would have resulted in a lower outcome of the assessment.	LOW (1)	The method is a standard GIS analysis of the shapfiles.
Replication	Marker species	LOW (1)	Data on species comes from the MPA database, reported by the countries.	HIGH (0.5)	Theoretical target of 3 replications is based on the previous assessment (HELCOM 2010). It's rather low and a species-specific target would be better.	MODERATE (0.75)	The analysis method assumes that a species is present throughout the sub-basin where it's reported to occur, which is a rather coarse scale for such an assessment.
	Marker biotope complexes	LOW (1)	Data on biotope complexes comes from the MPA database, reported by the countries.	HIGH (0.5)	Theoretical target of 3 replications is based on the previous assessment (HELCOM 2010). It's rather low and a biotope complex-specific target would be better.	MODERATE (0.75)	The analysis method assumes that a biotope complex is present throughout the 100x100 square where it's reported to occur, which is a rather coarse scale for such an assessment.
	Benthic marine landscapes	MODERATE (0.75)	The data is shapefiles derived from modelled maps produced by EUSeaMap project. Modelled data always includes some uncertainty.	HIGH (0.5)	Theoretical target of 3 replications is based on the previous assessment (HELCOM 2010). It's rather low and a landscape type-specific target would be better.	HIGH (0.5)	The method is easily biased by the scale of the data. The fine scale of the current data makes the outcome overly positive.
Adequacy	MPA marine size	LOW (1)	The data is shapefiles of MPAs provided by countires.	MODERATE (0.75)	The target was set by S&C 3-2015 meeting, and could perhaps be too high (depending on how important size is seen for efficient protection).	LOW (1)	The method is a standard GIS analysis of the shapfiles.
	MPA terrestrial size	LOW (1)	The data is shapefiles of MPAs provided by countires.	MODERATE (0.75)	The target was set by S&C 3-2015 meeting, and could perhaps be too high (depending on how important size is seen for efficient protection).	HIGH (0.5)	The method might is possibly scwede by small island inside larger marine MPAs which are interpreted as their own sites.

Connectivity	Theoretical connectivity	MODERATE (0.75)	The data is shapefiles derived from modelled maps produced by EUSeaMap project. Modelled data always includes some uncertainty.	HIGH (0.5)	Based on recommendations in Deltares report (2015), but no further reasoning was found for the amount of connections.	HIGH (0.5)	The GIS analysis is complex and easily biased by the scale of the data.
	Species-specific connectivity	MODERATE (0.75)	The data is shapefiles derived from modelled maps produced by EUSeaMap project. Modelled data always includes some uncertainty.	MODERATE (0.75)	Based on recommendations in Deltares report (2015), but no further reasoning was found for the amount of connections. However, species-specific dispersal distances are reliable.	HIGH (0.5)	The GIS analysis is complex and easily biased by the scale of the data.

Annex 7. Follow up of HELCOM Recommendation 35/1

Outline of follow up of actions in recommendation 35/1. NB that the rules for assessing level of accomplishment (blue, yellow, red) refer to the regional level. NA=Not applicable.

Action from Recommendation 35_1	**Level of implementation**	**Indicator/required information for national reporting**	**Indicator for aggregation at regional level**	**Accomplished (Regional)**	**Partly accomplished (Regional)**	**Not accomplished (Regional)**
a) reach the target set by the HELCOM 2010 Moscow Ministerial Declaration that at least 10% of the marine area in all sub-basins of the Baltic Sea including the EEZ areas beyond territorial waters is covered by MPAs where scientifically justified.	National	National reporting of numerical/geographical data on MPAs as required to the HELCOM MPA database	% area covered by MPAs in the respective sub-basin, in particular in EEZ areas beyond territorial waters	At least 10% of the marine area in all sub-basins of the Baltic Sea, including the EEZ areas beyond territorial waters, is covered by MPAs (presented per sub-basin)	10% of the marine area is covered by MPAs in some sub-basins, including the EEZ areas beyond territorial waters (presented per sub-basin)	Less than 10% of the marine area is covered by MPAs in all sub-basins, including the EEZ areas beyond territorial waters (presented per sub-basin)
b) designate new sites as HELCOM MPAs where ecologically meaningful, especially in offshore area beyond territorial waters	National/Regional	National reporting of numerical/geographical data on MPAs as required to the HELCOM MPA database	Increase in the nr and % of MPAs in offshore areas beyond territorial waters	The nr and/or % of MPAs in offshore areas is increasing in all sub-basins where the 10% is not met (*will level off and become redundant when 10% aim in all sub-basins is reached*)	The nr and/or % of MPAs in offshore areas is increasing in some sub-basins where the 10% is not met (*will level off and become redundant when 10% aim in all sub-basins is reached*)	The nr and/or % of MPAs in offshore areas is not increasing
c) ensure that HELCOM MPAs inter alia provide specific protection to those species, habitats, biotopes and biotope complexes included in the HELCOM Red Lists, as agreed in the HELCOM 2013 Copenhagen Ministerial Declaration, by considering these in the site selection procedure	National	National reporting of numerical/geographical data and information on MPAs as required to the HELCOM MPA database	Nr of threatened species present in MPAs Nr and area of threatened biotopes/habitats present in MPAs	1) The HELCOM network of MPAs provides protection to all HELCOM threatened species 2) The HELCOM network of MPAs provides protection to all HELCOM threatened biotopes/habitats (Both statements to be met for the recommendation to be accomplished)	1)The HELCOM network of MPAs provides protection to some HELCOM threatened species 2) The HELCOM network of MPAs provides protection to some HELCOM threatened biotopes/habitats	The HELCOM network of MPAs does provide any known protection to HELCOM threatened species and biotopes/habitats
d) ensure when selecting new areas, that the network of HELCOM MPAs is ecologically coherent and takes into account connectivity between sites including for example migration routes, species mobility and areas of special ecological significance such as spawning areas	National	National reporting of numerical/geographical data and information on MPAs as required to the HELCOM MPA database	Regular regional evaluation of ecological coherence of HELCOM MPAs using agreed criteria for assessment	The network of HELCOM MPAs is assessed as being ecologically coherent	Some criteria considered in the evaluation are reflecting ecological coherence	None of the criteria used in the assessment of the network of HELCOM MPAs are reflecting ecological coherence

Action from Recommendation 35_1	Level of implementation	Indicator/required information for national reporting	Indicator for aggregation at regional level	Accomplished (Regional)	Partly accomplished (Regional)	Not accomplished (Regional)
h) 1) develop and apply by 2015 management plans or measures for all existing HELCOM MPAs,	National	National reporting on status of management plans as required to the HELCOM MPA database	Nr or % of MPAs with management plans or measures	All HELCOM MPAs designated by 2014* have management plans or measures *year of adoption of recommendation	> 67%* of HELCOM MPAs designated by 2014 have management plans or measures *% MPAs with management plans in 2013 HELCOM assessment prepared for Ministerial Meeting (no new areas designated by 2014)	67%* of HELCOM MPAs designated by 2014 have management plans or measures *% MPAs with management plans in 2013 HELCOM assessment prepared for Ministerial Meeting
h) 2) and establish management plan or measures for every new MPA within five years after its designation,	National	National reporting on status of management plans as required to the HELCOM MPA database	Nr or % of new MPAs with management plans within 5 years of designation	All HELCOM MPAs designated after 2014 have a management plan within 5 years of designation	Some HELCOM MPAs designated after 2014 have a management plan within 5 years of designation	No HELCOM MPAs designated after 2014 have a management plan within 5 years of designation
i) update the management plans when necessary and in accordance with other legal requirements with a maximum of 12 years intervals	National	National reporting on implementation date of current management plans as required to the HELCOM MPA database		All management plans are updated with maximum of 12 years interval	Some management plans are updated with 12 years interval	No management plans are updated after 12 years
k) assess the effectiveness of the management plans or measures of HELCOM MPAs by conducting monitoring, and where feasible scientific research programmes, which are directly connected to the conservation interests of HELCOM MPAs, including the placement of monitoring stations inside the MPAs	National/Regional	National reporting on monitoring within MPAs as required to the HELCOM MPA database	Nr of MPAs with monitoring stations within the designated area	All (or certain %) HELCOM MPAs has monitoring stations with the designated area Assessment of the management effectiveness has been carried out	Some HELCOM MPAs has monitoring stations with the designated area Assessment of management effectiveness ongoing	No HELCOM MPA has monitoring station with the designated area Assessment management effectiveness not started.

In addition to the paragraphs assessed in this report, the following paragraphs are included in the Recommendation 35/1.

e) make use of computer-based site selection tools such as MARXAN for a HELCOM-wide approach which maximizes the chance of creating a coherent network of HELCOM MPAs and at the same time minimizing the impact of pressures and conflicts with other interests;

j) harmonise the designation of neighbouring HELCOM MPAs in transboundary marine areas, and where appropriate to join forces between neighbouring states when setting up management plans or measures for such HELCOM MPAs

l) include HELCOM MPAs as areas of particular ecological significance in coastal and maritime spatial planning processes and incorporate their management provisions in spatial plans and Integrated Marine and Coastal Management Strategies, respectively

m) update, when necessary, HELCOM MPA related guidelines and guiding documents in order to keep them in line with new knowledge and compatible with other international criteria, such as MSFD requirements, in particular those concerning spatial protection measures;

o) perform identification, designation and legal protection of HELCOM MPAs according to HELCOMs criteria and guidelines and base all management plans or measures on relevant HELCOM publications such as "Planning and management of Baltic Sea Protected Areas: guidelines and tools" (BSEP 105).For EU Member States the respective EU requirements and guidelines are regarded as adequate for designating and managing HELCOM MPAs;

q) continuously report the most recent numerical and descriptive data on HELCOM MPAs to HELCOMs data systems (HELCOM MPA database, GIS based map and data service)

r) regularly assess the status and development of HELCOMs MPAs according to the time tables set by HELCOM and to ensure that the assessments are applicable for corresponding EU and global reporting