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Towards an ecologically coherent network of well-managed Marine Protected Areas

– Implementation report on the status and ecological coherence of the HELCOM BSPA network

Executive Summary

Helsinki Commission

Baltic Marine Environment Protection Commission

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Preface

In 2003, during the first joint Ministerial Meeting of the Helsinki and OSPAR Commissions in Germany, the Member States of these two conventions and the European Commission agreed on a Joint Work Programme (JWP). The aim of the Programme was to complete networks of Baltic Sea Protected Areas (BSPAs) and OSPAR marine protected areas (MPAs) by 2010. These HELCOM and OSPAR marine protected areas were to be well-managed and together with the marine SPAs (Special Protection Areas) and SCIs (Sites of Community Importance) of Natura 2000 (N2000), were intended to form an ecologically coherent network in the Northeast Atlantic and the Baltic Sea. This commitment was reaffirmed by the HELCOM Baltic Sea Action Plan in 2007.

Further, it was decided that by 2009 EU Member States shall designate appropriate marine Natura 2000 sites as HELCOM BSPAs and that by 2010 all HELCOM Contracting States shall designate additional BSPAs under special consideration of offshore sites beyond their territorial waters. Contracting Parties also agreed to improve the protection efficiency of the network, and to assess the ecological coherence of the BSPA network along with the marine Natura 2000 sites in 2010.

In 2009 HELCOM decided that a Baltic-wide regional systematic approach for the selection of additional BSPAs should be applied to comply with these agreements. The computer-based Marxan site selection tool maximises the chance of creating a coherent network of MPAs. Such a network would satisfy all conservation targets with an intersubjectively-revisable method by minimising conflicts with other interests.

This Executive Summary presents the outcome of investigating and evaluating the status and ecological coherence of the BSPA and marine Natura 2000 networks as well as the main results of the site selection analyses carried out using Marxan. The assessments started with an extensive survey on existing data followed by a request for missing values to the HELCOM Contracting States in the form of precise questionnaires supported by clarifying maps. Due to extensive and time-consuming assessment tools, only data delivered by the end of July 2009 were used for the assessment of the ecological coherence. For the status overview of the BSPA network data that were provided later were also taken into account. BSPAs, SCIs and SPAs were assessed as separate networks and a combined BSPA/N2000 network was also evaluated. The full report contains detailed information on the methodologies used in the ecological coherence and site selection analyses as well as assessment results and citations for reference literature.

1 Introduction

It is commonly known that most human activities are placing increasing pressure on the world's oceans and their biodiversity. Two stress factors – pollution by nutrients and hazardous substances and fishing – produce probably the most harmful effects on marine ecosystems and their components. Other anthropogenic pursuits such as shipping, extraction of seabed resources and inshore and offshore installations also lead to disturbance of species and habitats and general degradation of marine ecosystem health.

To restore biodiversity and sustain the vital resources provided by the marine environment, several conventions and political frameworks at national and international levels have been signed since 1974. These frameworks and conventions call for an array of different tools and management measures to be implemented, including the designation of marine protected areas. However, until recently, most efforts to establish MPAs have focused on areas with scenic and recreational value or have highlighted ways to conserve individual species or habitats. This approach has led to the creation of *ad hoc* networks with substantial redundancies and many deficiencies.

***Fucus vesiculosus*, *Aurelia aurita*, shell gravel bottom.**

As the marine environment experiences increasing environmental degradation and more habitats and species are threatened or under decline, there has been a growing interest in designing comprehen-

BOX 1. HELCOM objectives and criteria for the assessment of the status and the coherence of the BSPA network[1]

1. A BSPA should give particular protection to the species, natural habitats and nature types 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 species' habitats concerned to be maintained at or, where appropriate, restored to a favourable conservation status in their natural range.
4. The network should protect areas with:
   - threatened and/or declining species and habitats
   - important species and habitats
   - 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
   - high natural biodiversity
   - rare, unique, or representative geological or geomorphological structures or processes
   - high sensitivity.
5. The minimum marine size of a BSPA should preferably be 3,000 ha for marine/lagoon parts.
6. The system should be enlarged stepwise by additional areas, preferably purely marine areas.
7. Criteria for the assessment of the ecological coherence:[2] adequacy, representativeness, replication of features, connectivity.

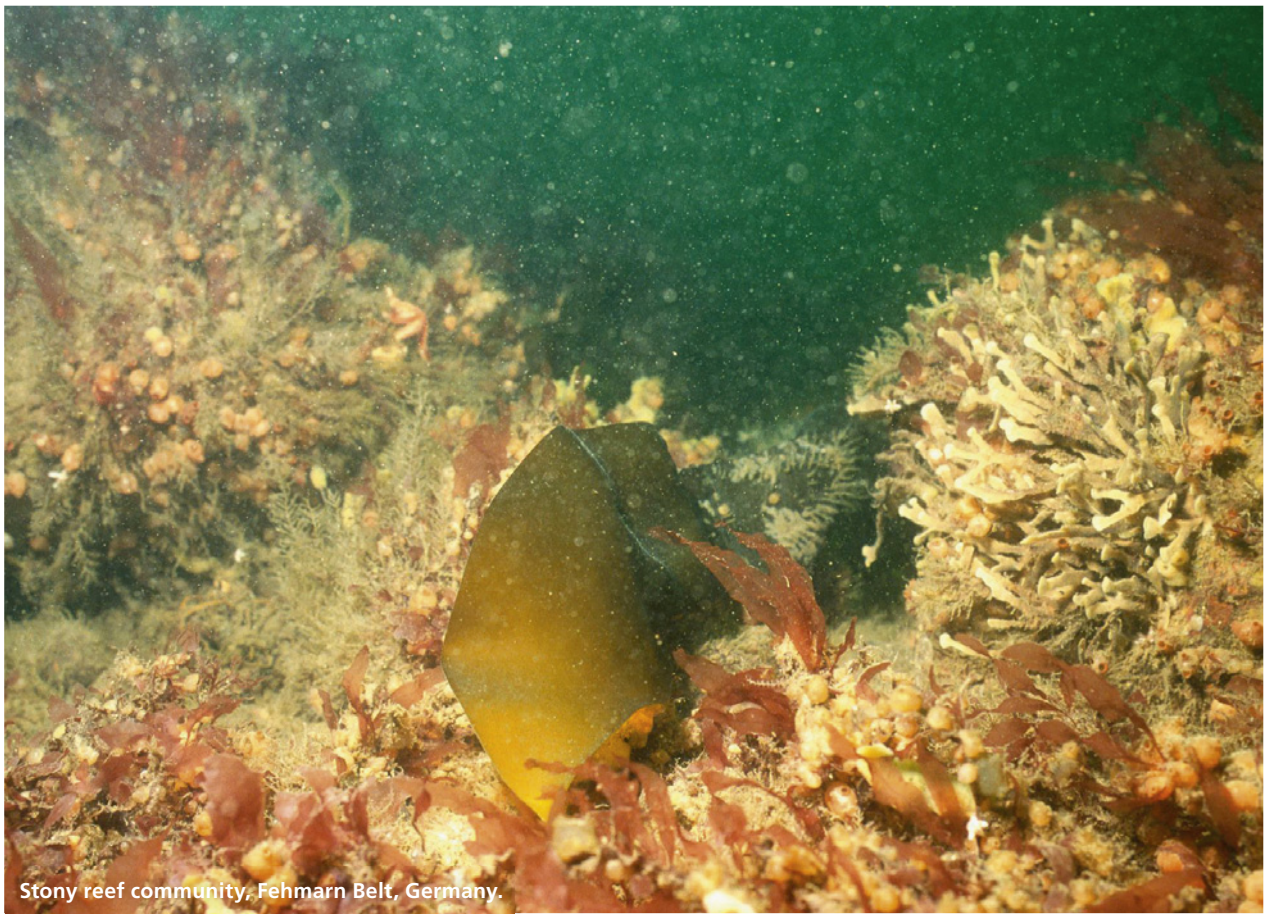
1) The objectives and criteria are based on the Joint HELCOM/ OSPAR Work Programme on Marine Protected Areas (Bremen 2003, available at: http://www.helcom.fi /stc/ fi les/BremenDocs/ Joint_MPA_Work_Programme.pdf), HELCOM Recommendation 15/5 on the System of Coastal and Marine Baltic Sea Protected Areas (BSPA, available at: http://www.helcom.fi /Recommendations/en_GB/rec15_5/), and to the Minutes of the Eight Meeting of Nature Protection and Biodiversity Group (HELCOM HABITAT 8/2006, available at: http://meeting.helcom.fi /c/document_ library/get_fi le?p_l_ id=16352&folderId=73533&name=DL FE-29471.pdf).

2) According to the EC Habitats Directive, a coherent European ecological network of special areas of conservation (Natura 2000) is composed of sites hosting the natural habitat types listed in Annex I and habitats of the species listed in Annex II, and enables the natural habitat types and the species' habitats concerned to be maintained or, where appropriate, restored at a favourable conservation status in their natural range.

sive networks of MPAs that also take account of social and economic considerations. Well-designed and well-managed MPA networks therefore ensure that entire ecosystem complexes comprising larger regions can become more resilient to external threats such as eutrophication, invasive species or climate change. Furthermore, in most cases they provide the opportunity for a sustainable use of marine resources.

In 2003 HELCOM made a regional-level decision to implement an ecosystem approach to the protection of the Baltic Sea marine environment and the management of human activities. This initiative also called for a more systematic regional approach to the design of the Baltic Sea Protected Areas (BSPA) network with the aim of ensuring that the entire range of Baltic Sea biodiversity would be comprehensively protected and that responsibility would be equitably shared among HELCOM member states. HELCOM's vision for the future is a Baltic Sea environment with diverse biological components producing a sound ecological balance and supporting a wide range of sustainable economical and social activities. An ecologically coherent network of well-managed BSPAs is probably the most important means of reaching the HELCOM ecological objectives outlined for the Baltic Sea area.

HELCOM, in consultation with OSPAR, agreed on objectives and criteria for the assessment of the status and ecological coherence of the network as well as HELCOM objectives for the status of BSPAs as listed in Box 1.



Stony reef community, Fehmarn Belt, Germany.

2 Present status of the BSPA network

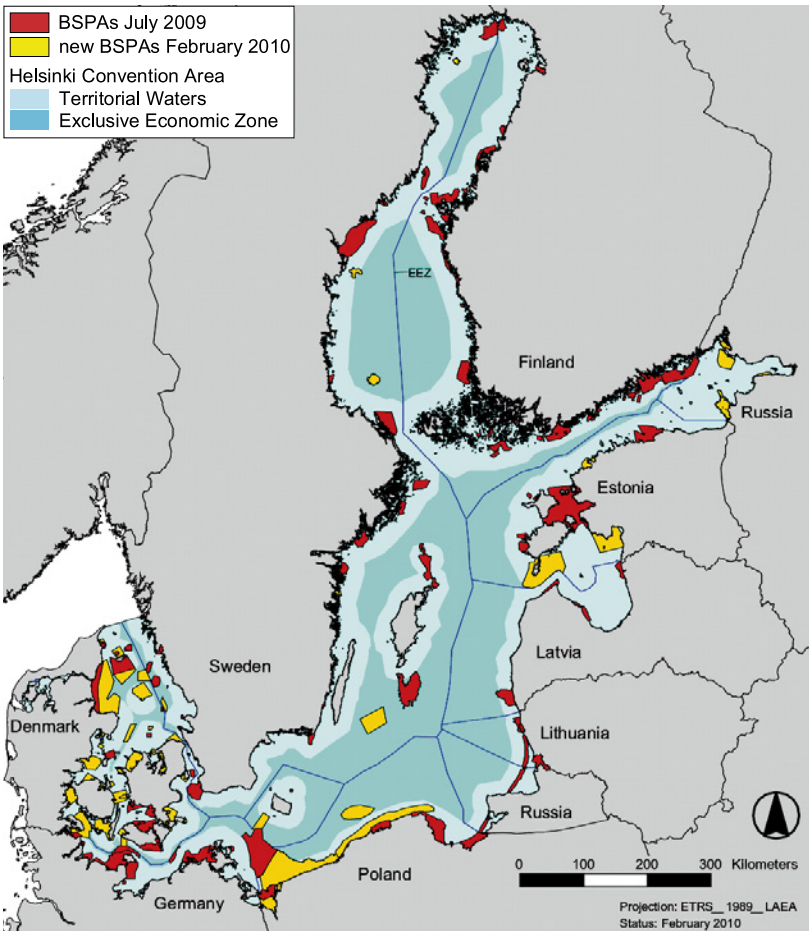


Figure 1. **Overview of marine BSPAs within the Baltic Sea. BSPAs which were designated before July 2009 are marked in red. BSPAs designated after July 2009 and before March 2010 (status: February 2010) are marked in yellow.**

The results for the present status of the BSPA network are encouraging: Up to the end of February 2010 159 BSPAs were officially designated by the nine Baltic Sea nations. This amounts to a marine area of 42,823 km² (Figure 1) which is considerably more than before the assessment started in 2008. In total, over 10.3% of the HELCOM marine area is currently covered by BSPAs, compared to only 3.9% six years ago and 5.5% two years ago (Table 1). Based on the information at hand, it can be asserted that in the year of biodiversity, the Baltic Sea is the first marine region to achieve the target of the CBD WSSD, and CBD decision (VII/30) which called for the effective conservation of at least 10% of each of the world's ecological regions by 2010 and for MPAs by 2012. With the BSPAs and Natura 2000 sites combined, 12% of the Baltic Sea is protected. Nevertheless, not all marine Natura 2000 sites in the HELCOM marine area are designated as BSPAs and many still lack proper management.

The quantity of BSPAs and the proportion of protected marine areas vary considerably among the Contracting States. While some present a suite of BSPAs covering between 20%and nearly 30% of their marine area, other Contracting States designated only between 3% and 7% of their marine area as BSPAs. Only four Contracting States fulfilled the target of 10% protection.

Table 1. **Number and size of managed or designated BSPAs. The Helsinki Convention marine area, territorial waters (TW) and exclusive economic zone (EEZ) of each Contracting State and the proportion protected is given. (Status: February 2010).**

	No. of BSPAs	Total area of BSPAs [km²]	Marine fraction of BSPAs [km²]		Marine area [km²]			Protected marine area [%]			Protected marine area [km²]	
			Sum	(%)	TW	EEZ	Total	TW	EEZ	Total	TW	EEZ
Denmark	67*	10 976	10 008	(91.2)	32 280	13 098	45 378	27.6	8.3	22.1	8 920	1 088
Estonia	7	7 237	5 980	(82.6)	24 728	11 593	36 320	24.0	0.4	16.5	5 937	43
Finland	22	6 100	5 512	(90.3)	51 809	28 962	80 771	10.6	0.0	6.8	5 509	2
Germany	12	4 866	4 561	(93.7)	10 806	4 529	15 335	19.4	54.5	29.7	2 092	2 469
Latvia	4	949	863	(91.0)	12 625	16 126	28 751	6.7	0.1	3.0	840	24
Lithuania	4	761	363	(47.7)	2 274	4 238	6 512	15.9	0.0	5.6	363	0
Poland	9	7 939	7 175	(90.4)	10 076	19 494	29 570	54.6	8.6	24.3	5 507	1 668
Russia	6	1 572	1 089	(69.2)	16 533	7 369	23 901	6.6	0.0	4.6	1 089	0
Sweden	28	8 383	7 273	(86.8)	76 055	71 352	147 407	5.9	3.9	4.9	4 523	2 749
Baltic Sea												
Feb. 2010	**159**	48 784	42 823	**(87.8)**	**237 186**	**176 760**	**413 946**	**14.7**	**4.6**	**10.3**	**34 779**	**8 044**
Dec. 2009	104	34 009	29 058	(85.4)	237 186	176 760	413 946	10.0	3.1	7.0	23 661	5 397
2008	89	27 405	22 569	(82.4)	/	/	413 946	/	/	5.5	/	/
2004	78	27 020	16 022	(59.3)	/	/	413 946	/	/	3.9	/	/

* one BSPA terrestrial only

3 Assessment of the ecological coherence of the BSPA network

The assessment of ecological coherence is a new and challenging subject. Although the term was used in the JWP and in the Habitats Directive, no operational definition existed from HELCOM or from OSPAR or the European Union. The HELCOM interpretation of ecological coherence includes four criteria: adequacy, representativity, replication, and connectivity. In practice, these criteria take into account MPA size and shape, coverage of species and their habitats, biotope types and landscapes, location of the MPAs across biogeographic borders, natural variation of species and biotope types within landscape types and the dispersal distance of individual species at different scales.

The assessment included all BSPAs and Natura 2000 sites as well as a combination of BSPAs and Natura 2000 sites. The latter was only assessed regarding the location and geometries of SPAs and SCIs since no meta-information on marine Natura 2000 sites was available for all Baltic Sea nations at that time.

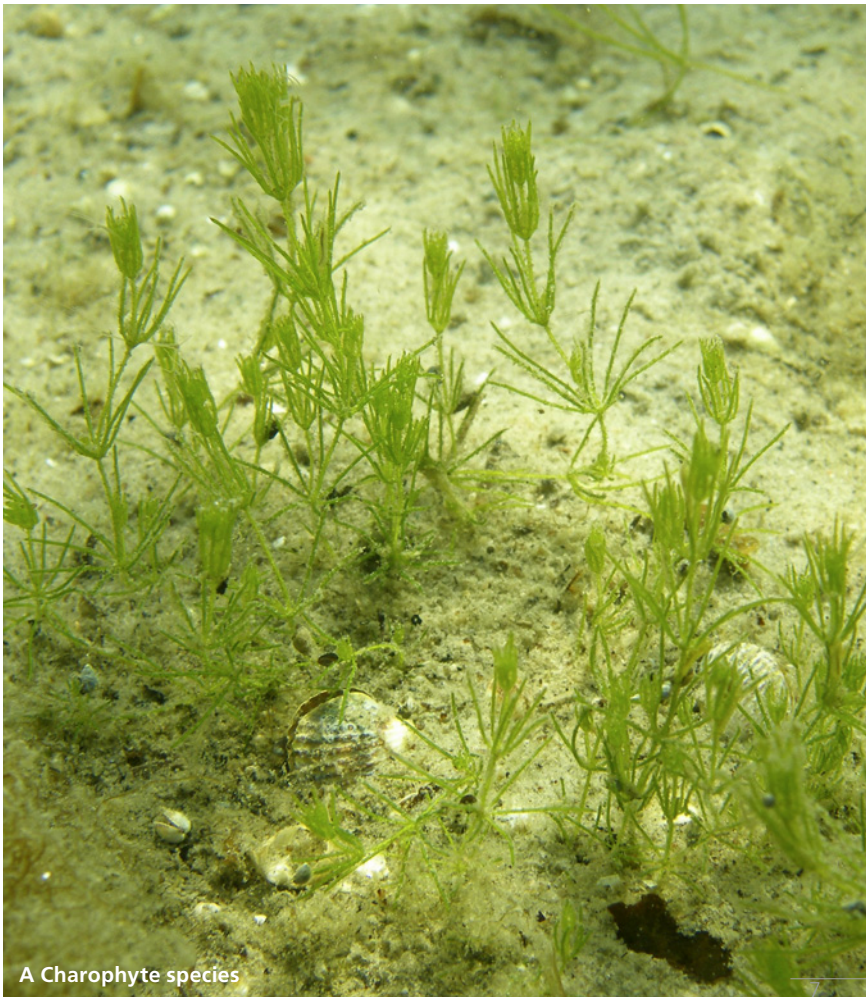
Although the actual BSPA database contains more data than was available before the survey for this report, information is still not complete and therefore it is not possible to present any assessment with a high level of significance. Particularly in cases where some of the coherence criteria were positively assessed it must be kept in mind that ecological coherence with the available data can only be evaluated in relative terms, based on the likelihood that objectives are being met. Further, during the assessment period the BSPA database included only limited information on grey seals. Therefore a proper assessment of the coherence of the network in relation to this species was not possible.

3.1 Adequacy

The given criteria for **adequacy** could be met with respect to the size of BSPAs, because 77.5% of the BSPAs are larger than 3000 ha as stipulated by HELCOM Recommendation 15/5 on BSPAs. Conversely, only 25% of the SCIs and 15% of the SPAs can be considered adequate in size if the HELCOM standard cited above is applied. Adequacy in terms of protection of 21 chosen indicator species[1] (four algae, two macrophytes, five fish, six bird and four mammal species) could not be met in all cases. With respect to the seven chosen biotope type indicators, all are protected within the BSPA network.

Adequacy was also investigated regarding selected essential habitats and the environmental quality of the network. The latter was analysed in relation to data on shipping traffic, fishing intensity and eutrophication status. Overall, the quality of all the networks examined can be described as inadequate with respect to these three anthropogenic pressure criteria. This holds true especially for the eutrophication status, since 96 of the BSPAs as well as 97% and 91% of all SPAs and SCIs, respectively, are classified as `affected by eutrophication', with most of them assessed as being of poor or bad quality.

Insufficient adequacy could also be inferred regarding specified essential habitats such as



A Charophyte species

1 The distribution and abundance of indicator species and biotope types was not taken into account for the assessment.

Zostera and charophyte distributions. As a result, of a total of 28 BSPAs, only one fifth of the *Zostera* habitats were protected. Even for the combined network of Natura 2000 sites and BSPAs adequacy still remains limited to 40% coverage of known *Zostera* habitats. In the case of the distribution of charophyte species a total of 23 species are documented for the Baltic Sea, of which 19 species are present in the BSPA network and 20 species each in the SCI, SPA and BSPA/ N2000 networks. Nearly 28% of the area of of important bird areas (IBAs) overlaps with the BSPA network and more than half of the IBA area converge with SPAs. Since IBAs are key sites for bird protection and the EU Birds Directive obliges Member States to designate the most appropriate areas for birds as SPAs, the above percentages seem to be inadequate.

3.2 Representativity

The assessment of **representativity** of the MPA networks in the Baltic Sea was performed in respect of three criteria: presence of indicator species and biotopes[1], benthic marine landscapes and inshore/offshore representation. As a result, all seven indicator biotope types and all of the indicator species were found to be represented within the Baltic Sea wide BSPA network except for *Zostera noltii* and *Gavia immer*. From the 60 benthic marine landscapes types most were inadequately represented with less than 20 % of their total area within the BSPA, SCI, SPA, and BSPA/ N2000 networks. In terms of inshore/ offshore representation a strong bias was observed towards inshore areas since more than 80 % of each network is located within the Territorial Waters. This tendency was confirmed by intersecting each network with surface covering information on an offshore index with values between 1 (low offshore-conditions) and 10 (high offshore-conditions). For the SCIs and SPAs mostly average values of three or less could be calculated. BSPAs were more equally distributed with about 20 % of all sites showing an index of 1 and about 10 % an index between 2 and 9.

3.3 Replication

The assessment of **replication** was performed regarding the aforementioned indicator species and biotope types[1] as well as the benthic marine landscapes. As a result, all seven indicator biotope types and 18 out of 19 occurring indicator species were found to be adequately replicated within the Baltic Sea wide BSPA network. In terms of Baltic Sea-wide between-site replication (number of replicates within the network), 16 landscape types were not sufficiently replicated in the BSPA network and 13 and 16 landscape types are not sufficiently replicated in the SCI and SPA networks, respectively. For Baltic Sea-wide within-site replication (number of replicates within the protected areas) 10, 11 and 14 landscape types were adequately replicated within the BSPA, SCI and SPA networks, respectively.

3.4 Connectivity

The assessment of **connectivity** was performed according to theoretical and species-specific dispersal distances. Based on scientific recommendations 25 and 50 km border to border distances between patches of five chosen landscape types were applied for theoretical dispersal distances. With respect to the species-specific connectivity analysis, a set of five species common and widespread in the Baltic Sea was considered for the analysis: *Macoma baltica, Psetta maxima, Furcellaria lumbricalis, Idotea baltica* and *Fucus vesiculosus*. Based on the habitats of these species, suitable landscape types were selected for each species and combined to define their potential geographical distribution. For both approaches a neighbourhood analysis was carried out for each landscape patch- the number of neighbours within the connectivity radius and the number of connections. Secondly, it was determined how many clusters resulted from buffering each landscape patch by half the theoretical and species-specific dispersal distances, respectively. Both procedures showed that for the two types of analysis the best connectivity could be derived by combining BSPAs and Natura 2000 sites followed by SCIs, SPAs and BSPAs.

1 The distribution and abundance of indicator species and biotope types was not taken into account for the assessment.

4 Selecting an efficient and representative network of Baltic Sea Protected Areas

Programmes and measures for marine conservation involve finding effective sets of protected areas and meeting quantitative targets, for example protecting 30% of the range of each species as cheaply as possible. This approach is known as systematic conservation planning and it follows to a large extent the same criteria set out for an ecologically coherent network.

The computer-based decision support tool, Marxan, and the Marxan interface Zonae Cogito were used to identify a set of achievable representative networks of marine protected areas in the Baltic Sea. Marxan produces suitable planning areas that accomplish a number of ecological, social and economic goals as defined by the user in the most efficient manner and with an intersubjectively-revisable method.

Modelled benthic marine landscapes were used as the main surrogate for biodiversity in the Baltic Sea, because only this data set was of high significance, and covered the entire study area. Other conservation features considered in the analyses included near-shore environments (like lagoons and lagoon-like bays, sounds, archipelagos and estuaries), Charophyte richness, grey seal haul-outs, Important Bird Areas, *Mytilus* densities and *Zostera* distribution. Each of these conservation features was given an individual conservation target reflecting both existing political agreements and scientific recommendations.

To minimize conflicting interests, data on the following human activities were considered: oil terminals, harbours, shipping accident risk areas, shipping traffic density, human population density, industries and urban areas. In addition the study area was divided into sub-regions according to the HELCOM sub-basins and the exclusive economic zones (EEZ) of the nine HELCOM countries. This division permitted setting a minimum conservation requirement for each sub-region. The existing BSPAs and marine Natura 2000 sites were also locked in to the Marxan analyses, meaning that the proposed networks would include the existing areas as well as suggestions for additional sites.

A range of scenarios (for full list see the main report, BSEP 124B) with varying total network coverage and different levels of conservation ambitions was analysed. Based on the results of the analyses, it is possible to see some trends. Rather than yielding exact answers on the appropriate sites or their precise location, the results reflect the inadequacy of the protection afforded to Baltic Sea biodiversity.

Bubbling Reef, Goldsinny Wrasse (*Ctenolabrus rupestris*), Kattegat.

5 Conclusions

The findings show very encouraging developments during the past years in establishing BSPAs in the Baltic Sea and the achievement of the international target of 10% regional coverage of BSPAs. In spite of this, neither the current network of Baltic Sea Protected Areas nor a common BSPA/Natura 2000 network could be considered to be ecologically coherent with respect to all four coherence criteria.

One major reason for this is the strong bias of the network towards near-shore and inshore areas. This fact influences each of the applied coherence criteria. It should be kept in mind, however, that more than 80% of all Baltic Sea-wide Natura 2000 sites have an area below the HELCOM minimum recommended size of 3000 ha for BSPAs, because no size limitations are prescribed for Natura 2000 sites. This is also one of the main reasons why not all Natura 2000 sites have been designated as BSPAs.

The primary aim of the site selection analysis was to find solutions that complement the existing protected areas network. Instead of giving precise answers on how much territory should be protected, or where additional areas should be located, the results provide general proposals for consideration depending on the ultimate goals of conservation initiatives

The results indicate that if the aim is to provide more comprehensive protection to the entire range of biodiversity in the basin, the network of BSPAs should be expanded to at least twice its present size (Figure 2). This finding is in line with recommendations arising from various scientific studies, some political frameworks and the results of the Balance project, where the scenario of 20% representation target and nearly 30% coverage of the Baltic Sea was considered the most appropriate.

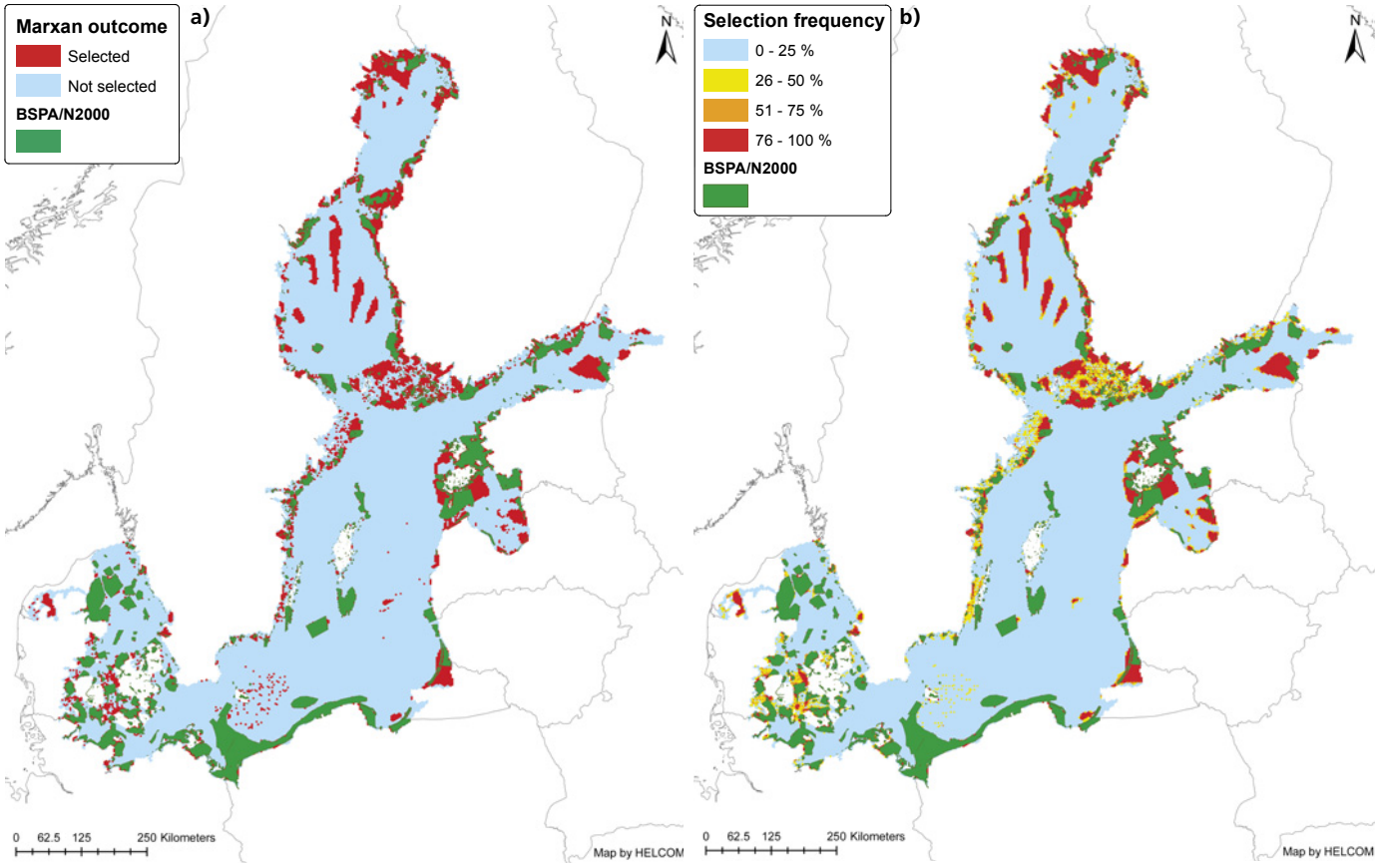


Figure 7. a) Best outcome of complementary sites; and b) Selection frequency of different areas with higher representation targets, minimum 12% sub-regional coverage and including existing BSPAs and marine Natura 2000 sites. Red and orange colours indicate areas with high selection frequency and low flexibility whereas yellow indicates areas offering more flexibility (which tells us that many alternative areas can be equally efficient in meeting the same target). Blue areas were selected less than 25% of the time and therefore are of lower priority. Areas with low flexibility are crucial to efficiently meet the set conservation targets. For targets see Tables 3 and 4 in the main report (BSEP 124B).

However, when interpreting the results of these analyses it is important to be aware of the limitations and quality of the data layers used. These factors considerably influence the applicability of the results. Apart from the ecological coherence criteria, this primarily relates to the restricted availability and quality of the available data. Additionally, entries in the updated BSPA database were inadequate in many respects. While all countries generally provided good responses to the survey, a number of BSPAs still lack important information. This is particularly the case with respect to the questionnaire categories on protected species and biotope types, as well those relating to management measures.

For the time being therefore, it is not possible to fully assess the protection efficiency of the current network. In general, the availability and integrity of biological data - particularly on environmental quality and the distribution of underwater species and biotope types covering the entire Baltic Sea basin need to be improved to ensure more accurate analyses in the future.

Apart from establishing an ecologically coherent network of BSPAs, a critical HELCOM objective is a well-managed network. Proper management is a prerequisite for safeguarding the long term conservation goals set for the individual sites and for the network as a whole. Many of the existing Baltic Sea Protected Areas and Natura 2000 sites still lack management plans and/or measures and therefore it is not possible to fully assess the protection efficiency of the current network. Furthermore, fishing is not prohibited or restricted in any of the protected areas. Investment in the elaboration of site-specific management measures is therefore of utmost importance if Member States are to achieve an ecologically-coherent network of well-managed BSPAs.

The HELCOM Baltic Sea Action Plan and other international agreements require ecosystem-based management to be applied to protecting the marine environment and to manage human activities. These instruments also underscore the importance of applying a systematic regional approach to marine protection and resource management. A regional approach maximises the chance of creating a network that is ecologically coherent, that protects the entire range of biodiversity in the region and also accommodates socio-economic factors.

The outcome of the assessment leads to the following proposals for further HELCOM work:
To secure the establishment of a network of BSPAs that fulfils all the criteria for ecological coherence (representativity, replication, adequacy and connectivity) and thereby provides sufficient protection to the entire ecosystem of the Baltic Sea it is necessary:

- that HELCOM HABITAT identifies additional potential BSPAs at the latest by the end of 2011 using the information provided in this assessment. Contracting States should also designate appropriate new BSPAs at the latest at HELCOM HABITAT 14/2012
- in doing so, to focus on providing protection to species and habitats identified in HELCOM as being threatened and/or declining. EU Member States should consider the obligations of the Birds- and Habitats Directives and their Annexes as well as the EU Marine Strategy Framework Directive, and in particular should designate new off-shore areas including the EEZ to ensure that BSPAs not only cover a total of at least 10% of the Baltic Sea area as a whole, but if scientifically justified, at least 10% of all its sub-basins[2] as well.
- to develop and apply by 2015, management plans and/or measures[3] for existing BSPAs, and that every new BSPA designation should be followed by establishment and implementation of a management plan and/or measures within five years of its creation.

2 As specified in the HELCOM Red List of marine and coastal biotopes and biotope complexes of the Baltic Sea, Belt Sea and Kattegat (BSEP No: 75).
3 As defined in the HELCOM publication on Planning and management of Baltic Sea Protected Areas: guidelines and tools from 2006 (BSEP No: 105).

The main report

HELCOM (2010). Towards an ecologically coherent network of well-managed Marine Protected Areas - Implementation report on the status and ecological coherence of the HELCOM BSPA network. Baltic Sea Environment Proceedings 124B, Helsinki Commission.

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