ASCOBANS

Recovery Plan for

Baltic Harbour Porpoises

Jastarnia Plan

(2016 Revision)

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Executive Summary

This is the ASCOBANS species action plan for what is called Baltic harbour porpoise population primarily inhabiting the Baltic Proper. The population's abundance has recently been estimated at only 497 individuals (95% CI 80 – 1091) and it has a wide overall distribution range. During the winter season, it stretches from the Åland and Archipelago Seas in the north, to the Southern Baltic Proper in the southwest, and perhaps even further west thereof. In the summer season, however, when calving and mating take place, the majority of the population aggregates at and around the Hoburg's and Northern and Southern Mid-sea banks in the Baltic Proper. Thus, this area should be considered essential and probably the main breeding area for the Baltic harbour porpoise population. The population's current status calls for immediate conservation actions. Bycatch in gillnet fisheries has been recognized as the primary threat for the survival of the Baltic harbour porpoise population, although high contaminant levels are also of serious concern. Continuous and impulsive underwater noise and possibly also reduced prey quality are further contributing factors.

The Jastarnia Plan serves as a framework for international collaboration towards achieving ASCOBANS' interim goal of restoring the population to at least 80 per cent of carrying capacity, and, ultimately, a favourable conservation status for Baltic harbour porpoises.

The plan lists a number of actions, of which the following should be carried out as a matter of urgency:

1. Involve stakeholders, use alternative fishing gear, apply available technology such as pingers, and reduce or eliminate fishing effort to reduce the number of bycaught harbour porpoises in the Baltic towards zero.
2. Designate marine protected areas for harbour porpoises together with management plans and monitoring schemes for efficient contribution to the protection and monitoring of the population.
3. Minimize the impact of anthropogenic underwater noise through the use of available mitigation measures and implementation of internationally harmonized national threshold limits and guidelines.

The outline of the Plan is as follows:

1. *Introduction*: An outline of the scope, context and policy setting of the Plan, including information on previous conservation management actions, as well as overall objectives.
2. *Legal frameworks*: A list of relevant legal frameworks, including international conventions and agreements, European and national legislation and management arrangements.
3. *Governance*: An outline of the management structure identifying the roles, responsibilities and interactions between the key stakeholders, as well as the timeline from the development stage through the implementation and review stages.
4. *Scientific background:* Information on biology, status, environmental parameters, critical habitats, and attributes of the population to be monitored.
5. *Threats, mitigation measures and monitoring:* A summary of the known or suspected threats together with a discussion of their evidence of impact, and the mitigation measures for the key threats and how they will be monitored.
6. *Actions:* Descriptions of actions including information such as concise objective, rationale, activity or method, timeline, actors and priority.

1. Introduction

The harbour porpoise is the only cetacean species occurring throughout the year in the Baltic Sea. Genetic (Wiemann et al., 2010), morphometric (Galatius et al., 2012) and distributional studies (Sveegaard et al., 2015; SAMBAH, 2016a) indicate a separate harbour porpoise population in the Baltic Proper. Since the mid-20th century, its numbers have declined drastically. This decline has probably been caused by a combination of factors: commercial hunting up to the end of the 19th century which was resumed during the two world wars (Lockyer and Kinze, 2003; Skóra and Kuklik, 2003), severe ice conditions during the first half of the 20th century (Svärdson, 1955), environmental contaminants (Beineke et al., 2005; Berggren et al., 1999) probably causing immunosuppression, increased disease risk and reproductive failure (Jepson et al., 2005; Murphy et al., 2015), and, most importantly during the last decades, the use of synthetic gillnets (Hammond 2008, HELCOM 2013). Visual aerial surveys conducted in the southern Baltic Sea in 1995 and 2002 indicated that only a few hundred animals remained (Berggren et al., 2004, 2002) (Annex 1, Figure 1). The population is currently listed as Critically Endangered (CR) by IUCN (Hammond, 2008) and listed in Annex II and IV of the Habitats Directive.

Figure 1. Map of geographical terms used in the Jastarnia Plan.

With the aim of estimating the abundance and mapping the distribution of the harbour porpoise in the Baltic Sea, the LIFE+ project SAMBAH (Static Acoustic Monitoring of the Baltic Sea Harbour Porpoise) was carried out (www.sambah.org). Based on an acoustic survey using harbour porpoise click loggers deployed at 304 locations from May 2011 to April 2013, the abundance of the Baltic harbour porpoise population was estimated at 497 individuals (95% CI 80 – 1091) (SAMBAH, 2016a). The SAMBAH survey area covered the waters of 5 – 80 m depth from the Darss and Drogden underwater sills in the southwest, up to and including the Åland and Archipelago Seas and the EU waters of the Gulf of Finland in the northeast (Figure 1). Modelled maps of the probability of detecting harbour porpoises show a spatial separation between the Belt Sea and Baltic populations during the summer season (Figure 1) (SAMBAH, 2016a). Particularly during May – August, i.e. when calving and mating take place (Börjesson and Read, 2003; Lockyer, 2003), the Baltic harbour porpoises aggregate at and around the Hoburg's and Northern and Southern Mid-sea banks in the Baltic Proper (Figure 1). During the winter season, especially during January – March, the animals are more spread out across the study area and they overlap spatially with the Belt Sea population (Figure 2; enlarged in Appendix I, Figures 2a – 2b).

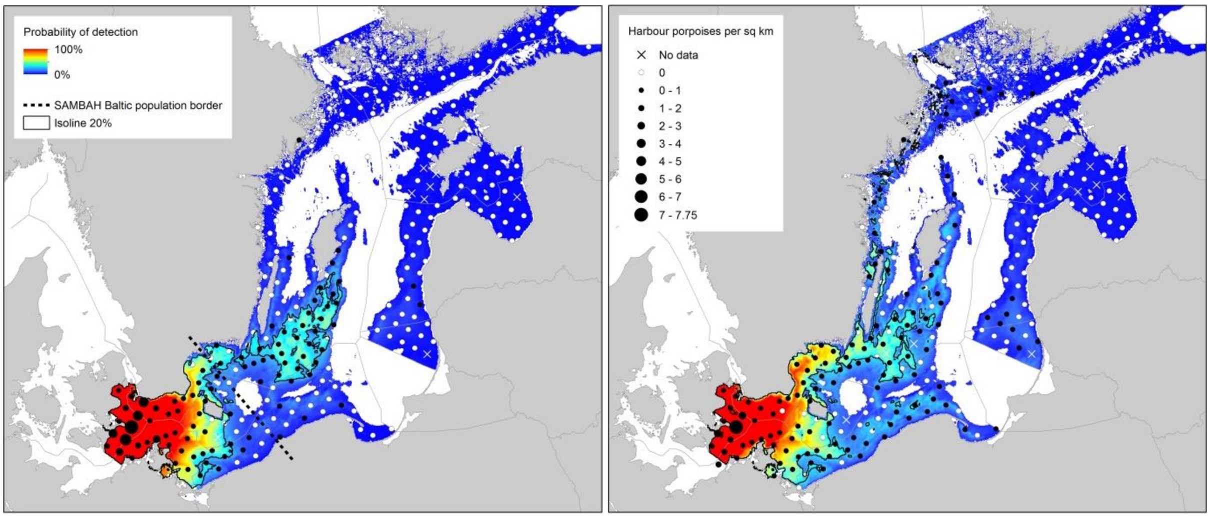

Figure 2. Predicted probability of detection of harbour porpoises per month in the SAMBAH project area during May – October (left) and November – April (right). The black line indicates 20% probability of detection, approximately equivalent to the area encompassing 30% of the population, often used to define high-density areas. The dots or crosses show the probability of detection at the SAMBAH survey stations. The border indicates the spatial separation between the Belt Sea and Baltic harbour porpoise populations during May – October according to SAMBAH (2016a).

The current threats in combination with the low population abundance estimate call for urgent mitigation action to secure the survival of the Baltic harbour porpoise. The distribution maps provide the first thorough spatio-temporal basis for efficient conservation measures. In addition, the overall year-round distribution range clearly demonstrates the importance of international cooperation to optimize the success of such measures.

This is the third version of the ASCOBANS Recovery Plan for Baltic Harbour Porpoises (ASCOBANS, 2002, 2009). Among other things, the lack of data has inhibited the implementation of concrete conservation measures. A total of 17 Special Areas of Conservation (SACs) within the Natura 2000 network have been designated for harbour porpoises in Danish (1), German (11), Polish (4) and Swedish (1) waters east of the Darss and Drogden underwater sills. For 13 of those sites the harbour porpoise population's status calls for a management plan, however none of the sites has a management plan including the harbour porpoise.

1.1. Overall objectives of the Jastarnia Plan

ASCOBANS has the interim goal of restoring the Baltic harbour porpoise population to at least 80% of the carrying capacity. In order to work towards achieving this interim goal and, ultimately, a favourable conservation status for Baltic harbour porpoises, Baltic Range States should, as a matter of urgency, seek to reach the following objectives:

1. Involve stakeholders, use and continue to develop alternative fishing gear and available technology such as pingers, and reduce or eliminate fishing effort to reduce the number of bycaught harbour porpoises in the Baltic towards zero.
2. Designate marine protected areas for harbour porpoises together with management plans and monitoring schemes for efficient contribution to the protection and monitoring of the population.

3. Minimize the impact of anthropogenic underwater noise through the use of available mitigation measures and implementation of internationally harmonized national threshold limits and guidelines.

In the short to medium term, the following objectives are of high priority:

4. Improve knowledge on population structure, assess population status and develop recovery targets.
5. Improve knowledge, develop indicators or threshold levels, and assess impacts of habitat degradation, such as increased levels of anthropogenic underwater noise, contaminants and decreased prey quality.
6. Improve monitoring methods for bycatch and estimate bycatch rates, including their spatio-temporal distribution.
7. Increase public awareness of the threats faced by Baltic harbour porpoises, the need to take action to conserve the species, and the options for action. Cooperate between ASCOBANS and other international bodies.

In the long term, the following objective is of high priority:

8. Monitor the absolute abundance and population trend with high precision.

2. Legal and institutional framework

2.1. International legal instruments and international organizations

In addition to ASCOBANS, a number of other international legal instruments or international organizations deal to a greater or lesser extent with the conservation of harbour porpoises in the Baltic Sea. Among these are the following:

The United Nations Convention on the Law of the Sea (UNCLOS) is an international treaty that seeks to regulate all aspects of the use of the ocean and seas and their resources. UNCLOS contains a general obligation to protect and preserve the marine environment and specific obligations for the various jurisdictional zones defined by the Convention, such as exclusive economic zones (EEZs), the continental shelf and the high seas. It also stipulates that parties to the convention shall cooperate with and work through competent international organizations in seeking to achieve the aims of the Convention.

The Convention on Biological Diversity (CBD) has three main objectives: conservation of biological diversity, sustainable use of the components of biological diversity, and fair and equitable sharing of the benefits arising out of the utilization of genetic resources. For the conservation of biodiversity, five strategic goals have been developed for a total of 20 targets called the Aichi Biodiversity Targets.

ASCOBANS was concluded under the auspices of the *Convention on the Conservation of Migratory Species of Wild Animals (CMS)*. CMS is an environmental treaty elaborated under the aegis of the United Nations Environment Programme. It provides a global platform for the conservation of migratory animals, defined as any population, or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of which cyclically and predictably crosses one or more jurisdictional boundaries. According to the fundamental principles of the Convention (Article II), the Parties acknowledge the importance of migratory species being conserved and of Range States agreeing to take action to this end whenever possible and appropriate, paying special attention to migratory species the conservation status of which is unfavourable, and taking individually or in co-operation appropriate and necessary steps to conserve such species and their habitat. CMS differentiates between species that are endangered (Article III) and those species that require international agreements for their conservation and management, or which have a conservation status which would significantly benefit from the international cooperation that could be achieved by an international agreement (Article IV). ASCOBANS was concluded under Article IV. CMS has also adopted several resolutions relevant for the protection of cetaceans.

In 2013, t*he Baltic Marine Environment Protection Commission* (*HELCOM)* updated its Recommendation 17/2 on the protection of the harbour porpoise in the Baltic Sea, which was first adopted in 1996. The Recommendation gives highest priority to avoiding bycatch of harbour porpoises, calls for close cooperation with ASCOBANS and ICES (*see below*) on the collection and analysis of data on population status and threats, and recommends the establishment of protected areas for harbour porpoises. Further, HELCOM develops core indicators for the assessment of the Baltic marine environment against targets that reflect good environmental status. For harbour porpoises there is one core indicator, 'Number of drowned mammals and waterbirds in fishing gear'. However this currently lacks monitoring data on bycaught harbour porpoises. There is also one candidate core indicator regarding 'Harbour porpoise distribution and abundance'. This indicator is aimed to be developed based on passive acoustic monitoring, which is currently not in place, and the indicator requires further development once the data become available. In addition to these, core indicators are being developed to evaluate the population condition of seals based on nutritional and reproductive status. Presently harbour porpoises are not included in these indicators. However comparable parameters could be developed. Available core indicators are to be used in the second holistic assessment of ecosystem health in the Baltic Sea (HOLAS II). The indicators on harbour porpoises are currently not foreseen to be operational in time to deliver evaluations to HOLAS II, thus information on the status of harbour porpoises will need to be included in a more descriptive manner in the holistic assessment.

The International Council for the Exploration of the Sea (ICES) has a Working Group on Marine Mammal Ecology (WGMME), which provides scientific advice in relation to marine mammals, and another Working Group on Bycatch of Protected Species (WGBYC), which collates and assesses information on bycatch monitoring and assessment for protected species, including mammals, birds, turtles, and rare fish. WGMME annually examines any new information relevant for population status, anthropogenic impacts (linking with the WGBYC) and management frameworks, and assesses how these can contribute to the regulatory requirements of Contracting Parties. WGBYC focuses on improvements of monitoring and mitigation methodologies and reviews the EU Member States' actions under Regulation 812/2004. Regarding monitoring of protected species bycatch, it provides advice on how monitoring can be improved, and has recently focused on how protected species monitoring might be addressed under the EU Data Collection Framework (DCF). Regarding bycatch mitigation, it looks at relevant bycatch mitigation measures and helps coordinate relevant experimental work.

The harbour porpoise in the Baltic Sea is listed as Critically Endangered (CR) by the *International Union for Conservation of Nature (IUCN)* (Hammond et al. 2008) and HELCOM (2013).

2.2. European legislation

The harbour porpoise is listed in Annex II and Annex IV of *Council Directive 92/43/EEC*, also called the *Habitats Directive*. The overall aim of the Habitats Directive is to maintain or restore, at a favourable conservation status, natural habitats and species of wild fauna and flora of Community interest. Annex II stipulates that EU Member States shall designate areas of the harbour porpoise's habitat as Natura 2000 sites and under Annex IV Member States are required to establish a system of strict protection throughout the natural range of the species. The protection measures shall encompass, for example, a prohibition of all forms of deliberate killing in the wild, deterioration or destruction of breeding sites, and deliberate disturbance, particularly during breeding, rearing and migration.

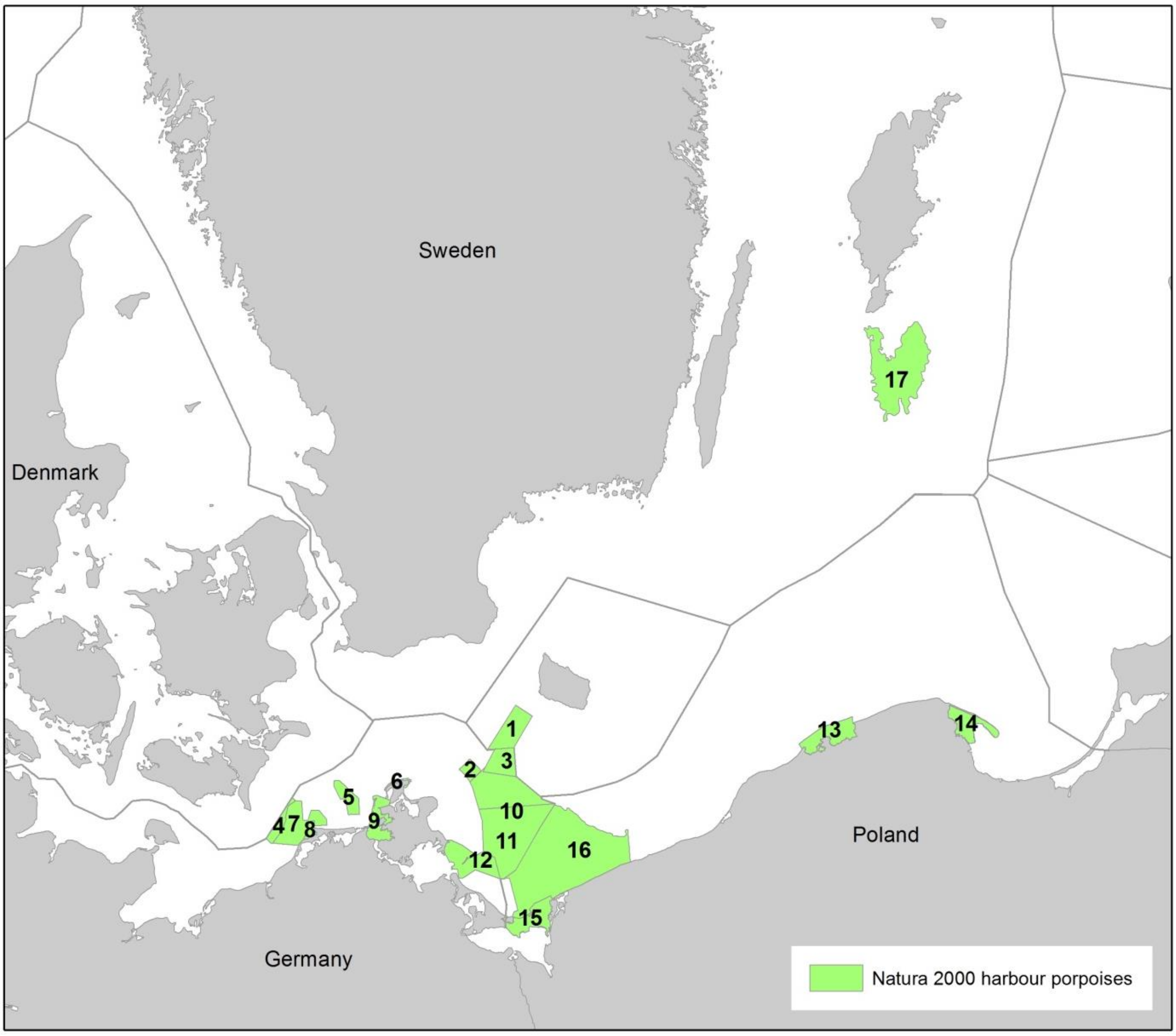

Figure 3. Natura 2000 sites from the Darss and Drogden underwater sills and eastwards, for which harbour porpoises are on the species list. The numbers refer to the serial numbers in Table 1.

From the Darss and Drogden underwater sills and eastwards, the EU Member States have up until now designated a total of 17 Natura 2000 sites with harbour porpoises on the species list (Figure 3, Table 1). The total marine area of these sites is 904,839 ha (data created on 14 April 2015 by the European Environmental Agency, EEA, and downloaded from http://www.eea.europa.eu/data-and-maps/data/natura-6 on 23 Feb 2016). For 13 of the 17 sites the harbour porpoise population's status calls for management plans (data from end of 2015 to 3 February 2016, downloaded from http://natura2000.eea.europa.eu on 3 May 2016), however none of the sites has a management plan including the harbour porpoise. In May 2016, the Swedish County Administrative Boards are preparing proposals of new Natura 2000 sites for harbour porpoises. The proposals for the Baltic Sea are based on results from the SAMBAH project.

Table 1. Natura 2000 sites from the Darss and Drogden underwater sills and eastwards, for which harbour porpoises are on the species list. For each site the total area, the marine area, the status of the population and whether a management plan is in place or not is are given. Population status indicates the ratio between the population within the site in relation to within the national territory, with A = 15 – 100%, B = 2 – 15%, C = 0 – 2%, D = non-significant. For population status D, the species does not have to be included in the site management plan.

Serial no.	Country	Site code	Site name	Total area (ha)	Marine area (ha)	Population status
1	DK	DK00VA261	Adler Grund og Rønne Banke	31,910	31,910	D
2	DE	DE1249301	Westliche Rönnebank	8,601	8,601	C
3	DE	DE1251301	Adlergrund	23,397	23,397	C
4	DE	DE1339301	Kadetrinne	10,007	10,007	C
5	DE	DE1343301	Plantagenetgrund	14,909	14,909	C
6	DE	DE1346301	Steilküste und Blockgründe Wittow	1,850	1,633	D
7	DE	DE1540302	Darßer Schwelle	38,421	38,421	C
8	DE	DE1541301	Darß	4,204	673	D
9	DE	DE1544302	Westrügensche Boddenlandschaft mit Hiddensee	23,278	19,949	D
10	DE	DE1552401	SPA Pommersche Bucht	200,417	200,417	B
11	DE	DE1652301	Pommersche Bucht mit Oderbank	110,115	110,115	B
12	DE	DE1749302	Greifswalder Boddenrandschwelle und Teile der Pommerschen Bucht	40,401	40,401	C
13	PL	PLH220023	Ostoja Słowińska	32,955	11,501	B
14	PL	PLH220032	Zatoka Pucka i Półwysep Helski	26,566	21,798	A
15	PL	PLH320019	Wolin i Uznam	30,792	5,761	B
16	PL	PLH990002	Ostoja na Zatoce Pomorskiej	243,059	242,718	B
17	SE	SE0340144	Hoburg's Bank	122,627	122,627	C
	Total			*963,509*	*904,839*	

According to Article 17 of the Habitats Directive, Member States shall report on the conservation status of the natural habitats and species that are of Community interest, such as the harbour porpoise. Based on the Member State assessments, the Commission delivers a summary assessment for each habitat or species on the biogeographical level. Member State reports shall be drawn up every sixth year. The assessments of the harbour porpoise conservation status in the Marine Baltic bioregion (Annex I, Figure 1), for the last two reporting periods, are shown in Table 2 (data downloaded from European Topic Centre on Biological Diversity, EIONET, database http://art17.eionet.europa.eu/article17/reports2012/, on 25 February 2016). As the harbour porpoise populations do not follow the same geographical borders as the bioregions, the status for the Danish and Swedish waters is a mix of animals from both the Belt Sea and the Baltic harbour porpoise populations, although to different extents. In the most recent assessment, no Member State reported any information on the future prospects of the harbour porpoise in the Marine Baltic bioregion.

Table 2. Member State assessments and summary assessment of the harbour porpoise conservation status in the marine Baltic bioregion following the Habitats Directive Article 17. Assessments are given for the last two reporting periods, 2001 -2006, and 2007 – 2012, respectively. No assessment is made by Finland as the species is reported as occasional.

Member State	**2001 – 2006**	**2007 – 2012**
Denmark*	Unfavourable – Bad (U2)*	Unfavourable – Bad (U2)*
Estonia	Unfavourable – Inadequate with a negative trend (U1-)	Unfavourable – Inadequate (U1)
Germany*	Unfavourable – Bad (U2)	Unfavourable – Bad (U2)
Latvia	Unfavourable – Bad (U2)	Unknown (XX)
Lithuania	n.a.	n.a.
Poland	Unfavourable – Bad (U2)	Unfavourable – Bad (U2)
Sweden*	Unfavourable – Bad with a negative trend (U2-)*	Unfavourable – Bad (U2)*
Biogeographical summary	*Unfavourable – Bad (U2)*	*Unfavourable – Bad (U2)*

* The national assessment for the bioregion includes parts of the distribution ranges of both the Belt Sea and the Baltic harbour porpoise populations.

Directive 2008/56/EC of the European Parliament and of the Council, or the *Marine Strategy Framework Directive (MSFD)*, aims at achieving or maintaining good environmental status (GES) in the marine environment by the year 2020 at the latest. GES shall be determined by a set of eleven qualitative descriptors, of which four are directly relevant to the harbour porpoise; Descriptor 1 on maintaining biological diversity, Descriptor 4 on normal abundance and diversity of the elements of the marine food web, Descriptor 8 referring to concentrations of contaminants that are at levels that do not give rise to pollution effects, and Descriptor 11, stipulating that the introduction of energy, including underwater noise, shall not adversely affect the marine environment. In addition to these descriptors, the harbour porpoise is indirectly affected by e.g. Descriptor 3 referring to the aim that populations of all commercially exploited fish and shellfish are within safe biological limits, and Descriptor 6 related to the aim that seafloor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded.

One of the objectives of *Regulation EU 1380/2013 of the European Parliament and of the Council* on the *Common Fisheries Policy* (CFP) is that the CFP shall implement the ecosystem-based approach to minimize negative impacts of fishing activities on the marine ecosystem. For this purpose, conservation measures such as modifications or additional devices to reduce incidental capture of endangered, threatened and protected species, or limitations on the use of certain fishing gears, shall be adopted. Also highly relevant is the request that Member States should collect data on fleets and their fishing activities. Member States should manage the collected data and make them available to end-users and other interested parties. The data include biological, environmental, technical and socio-economic aspects, for example data on the impact of fisheries on biological resources and the marine ecosystem.

The aim of *Council Regulation EC 812/2004 on measures concerning incidental catches of cetaceans in fisheries* is to mitigate incidental catches of cetaceans by fishing vessels in specific areas. With regard to the Baltic Sea, the Regulation states that pingers are mandatory all year round in ICES statistical area 24, located west of Bornholm in the southern Baltic Sea, and an area in Hanö Bight in southern Sweden, for vessels above 12 m in length fishing with bottom-set gillnets or entangling nets (Annex I, Figure 1). For vessels above 15 m fishing with pelagic trawls, or bottom-set gillnets or entangling nets with mesh size equal to or greater than 80 mm, Member States shall design and implement monitoring schemes using on-board observers. The monitoring schemes shall be designed to achieve an estimate of the cetacean bycatch rate with a coefficient of variation (CV) not exceeding 0.3. For vessels under 15 m, Member States shall take the necessary steps to collect scientific data on incidental catches by scientific studies or pilot projects.

New projected regulations on fisheries data collection (COM(2015)294) and on technical measures (COM(2016)134), will repeal Council regulation 812/2004. The obligation to monitor bycatch of cetaceans will probably be included in the fisheries data collection regulation and bycatch mitigation measures, such as the obligation to use pingers on all set nets used on vessels of 12 m length or over, will be addressed by the regulation on technical measures. ASCOBANS does not consider this to be sufficient, and has proposed a new or an amended regulation focusing specifically on cetacean conservation objectives, coupled with the incorporation of the monitoring requirements and mitigation measures under the DCF for fisheries and the technical measures framework (ASCOBANS, 2015).

2.3. National Red Data Books or Red Lists

Table 3 gives an overview of the conservation status of the harbour porpoise according to national red data books or red lists. Note that Denmark, Germany and Sweden do not give a separate classification for the Baltic harbour porpoise population, but one general classification for all populations in their national waters.

Table 3. National red list status of the harbour porpoise in the Baltic Sea.

Country	Red list status	Reference
Denmark*	Vulnerable (VU)*	Wind & Pihl (2004)
Estonia	Data Deficient (DD)	Anonymous (2008)
Finland	Regionally extinct (RE)	Liukko et al. 2016
Germany*	Endangered (EN)	Haupt et al. (2009)
Latvia	Probably extinct (0)	Andrušaitis (2000)
Lithuania	Not listed	Rašomavičius (2007)
Poland	Least Concern (LC)	Glowacinski et al. (2002)
Russian Federation	Uncertain (4)	Iliashenko & Iliashenko (2000)
Sweden*	Vulnerable (VU)*	Artdatabanken (2015)

* No separate assessment has been made for the Baltic harbour porpoise population.

3. Governance

3.1. Coordination of the Jastarnia Plan

The Jastarnia Group is a working group of the ASCOBANS Advisory Committee, acting as the Steering Group for the ASCOBANS Recovery Plan for Baltic Harbour Porpoises. It evaluates progress in the implementation of the Plan, establishes further implementation priorities and makes appropriate recommendations, and carries out the periodic reviews of the Plan.

The Jastarnia Group is composed of representatives from the environment and fisheries sectors of the countries surrounding the Baltic Sea. The full Terms of Reference for the Jastarnia Group are available online (http://www.ascobans.org/en/working_group/jastarnia).

The actual implementation of this Plan falls within the remit of the Parties.

3.2. Timeline for implementation of the Jastarnia Plan

This Conservation Plan is adopted without prejudice to the exclusive competence of the European Union for the conservation of marine biological resources under the Common Fisheries Policy. Upon adoption, this revised Plan will supersede the revised Jastarnia Plan of 2009.

It is important that the revised plan and the recommendations outlined within it be implemented without delay, and that ASCOBANS undertake a formal re-evaluation and revision of the plan at least every five years. The next review should occur at the Advisory Committee Meeting before the Meeting of the Parties following the adoption of the Plan.

4. Scientific background

4.1. Biology, status and environmental parameters

4.1.1.Population structure

Since the previous revision of the Jastarnia Plan, three extensive studies on the population structure of the harbour porpoise in the Baltic region have been published: Wiemann et al. (2010) who analysed genetic samples from a total of 497 harbour porpoises, Galatius et al. (2012) who analysed the three-dimensional shape of 277 harbour porpoise skulls, and Sveegaard et al. (2015) who analysed the distribution pattern of a total of 96 harbour porpoises fitted with satellite transmitters, as well as genetic samples from 48 harbour porpoises and data on harbour porpoise echolocation frequency at 40 C-POD stations in the southwest Baltic Sea deployed in the framework of the SAMBAH project.

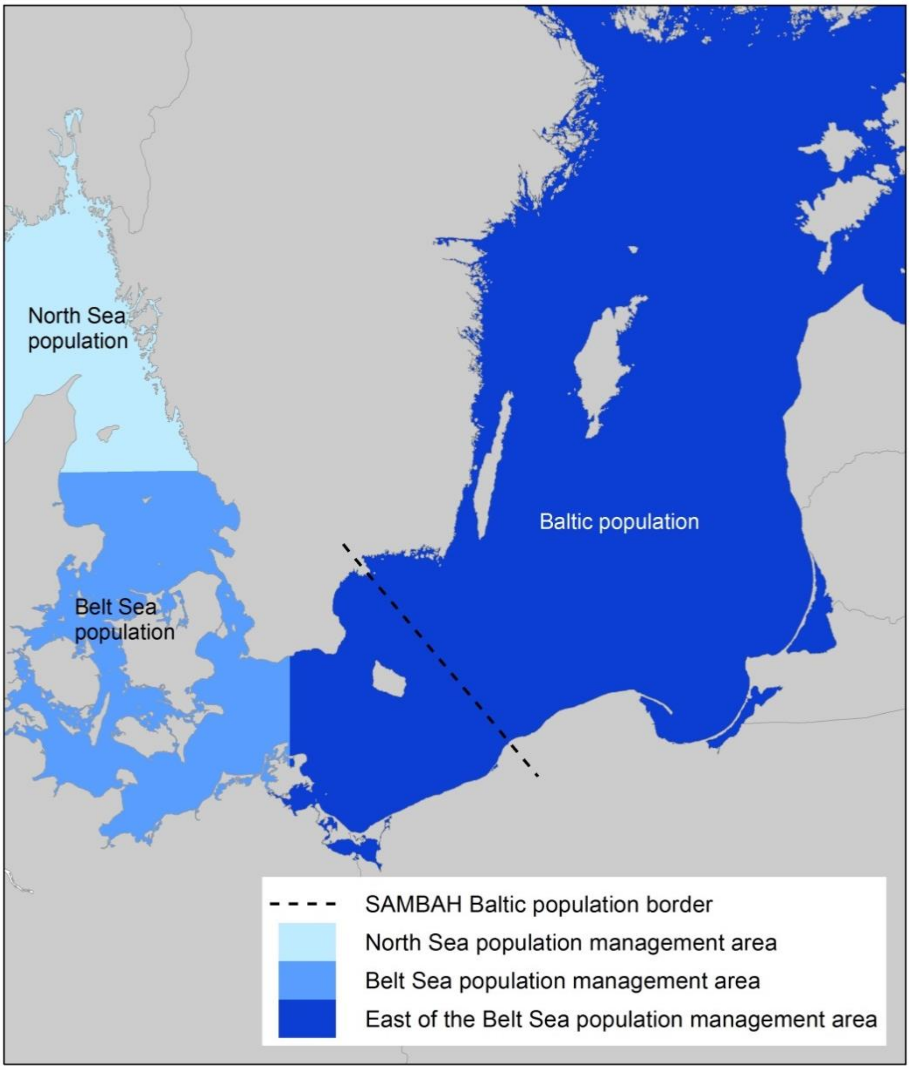

Figure 4. Harbour porpoise populations in the Baltic region. Blue shades indicates the borders proposed for the management unit of the Belt Sea population by Sveegaard et al. (2015), the dotted black line the spatial separation by the Belt and Baltic populations by SAMBAH (2016a). All borders are for the summer half-year only.

Both Wiemann et al. (2010) and Galatius et al. (2012) found significant but not always unequivocal differences between the animals from the southern Kattegat, Belt Sea and Western Baltic on the one hand (the Belt Sea population), and animals from further east in the Baltic Sea on the other hand (the Baltic population). Both tested for several alternative geographical delimitations between the populations. Wiemann et al. (2010) found that the most prominent split was at the Darss and Drogden underwater sills (Figure 1), however the number of samples from the sub-regions further east was relatively small. Galatius et al. (2012) tested for three different delimitations, of which the easternmost was the Darss and Drogden underwater sills. All three delimitations were found to be significant, although the results pointed somewhat more strongly to a split in Fehmarn Belt in combination with the Drogden Sill (Figure 1), i.e. further west than Wiemann et al. (2010) assumed. However, Galatius et al. (2012) also conclude that the morphometric approach is not very useful for establishing clear boundaries among different population units. Departing from these two studies, the aim of Sveegaard et al. (2015) was to define the geographical management unit of the Belt Sea population based on biological evidence during May – September. Identifying that very few harbour porpoises fitted with satellite transmitters in the inner Danish waters moved further east than 13.5°E, and noting a simultaneous drop in echolocation frequency at the 40 SAMBAH C-POD stations in the southwest SAMBAH area, Sveegaard et al. (2015) proposed this as the eastern border for the management unit of the Belt Sea population (Figure 4). However, they point out that this does not necessarily mean the best management delineation for the neighbouring populations, and the situation is especially uncertain for the Baltic population.

In addition to the three published studies, SAMBAH found a spatial separation of harbour porpoises across the deep water area east of the island of Bornholm (SAMBAH, 2016a), i.e. east of the borders proposed by Wiemann et al. (2010) and of those investigated by Galatius et al. (2012) and Sveegaard et al. (2015). Based on expert judgement relying on visual inspection of the monthly maps of detection rate at SAMBAH C-POD stations, a border was drawn to delineate the area for which the abundance of the Baltic population was then estimated. In Annex I, Figures 3a – 3b, the monthly maps of harbour porpoises per square kilometre estimated at each SAMBAH station are shown. In addition to the primary aim of yielding a representative abundance estimate, care was taken not to underestimate the population's distribution range for management reasons. A six-month period was sought, and as a spatial separation was found during most months from approximately mid-spring to mid-autumn, the final placement of the line was for the months of May – October (Figure 4). Recent analyses of individual-specific genomic data (RAD-tag genotyping by sequencing) are consistent with the SAMBAH border, although the number of analysed samples is still limited (Lah et al. 2014). Additional studies using individual-specific genomic data are expected to yield further insights both of the population structure during summer when mating takes place, and movement patterns during the winter season.

4.1.2.Spatio-temporal distribution

In the SAMBAH project, both probability of detection and density were spatially modelled (SAMBAH, 2016b). The best detection model explained 53.5 per cent of the deviance and was found to be stable by inspection of the residuals, while the best density modelled explained up to 75.1 per cent although the model was found to be less stable (SAMBAH, 2016b). Mean probability of detection was modelled both per month and per season (May – October and November – April, respectively), while density was modelled per season only. In Figure 2, the mean probability of detection per season is presented, showing the different distribution patterns of harbour porpoises during May – October and November – April, respectively. During May – October, i.e. when calving and mating take place, the highest probability of harbour porpoise detection is on and around the offshore banks south of Gotland and east of Öland. During November – April, the animals are more spread out, ranging as far as the coasts of Poland and Lithuania, the southern part of the Latvian coast, along the eastern coast of Sweden up to the Åland Sea, and offshore areas in the southwestern Finnish EEZ. In Figure 5 (enlarged in Appendix I, Figures 4a – 4d), the mean density per season shows the same general pattern, although the areas with aggregations are more pronounced.

The seasonal movements of harbour porpoises in the southwestern part of the SAMBAH area support the pattern previously described by Benke et al. (2014). Based on acoustic monitoring of harbour porpoises in German waters of the Baltic Sea during 2002 – 2012, Benke et al. (2014) proposed that the Pomeranian Bay is primarily used by the Belt Sea population during July – October, and by the Baltic population during November – March.

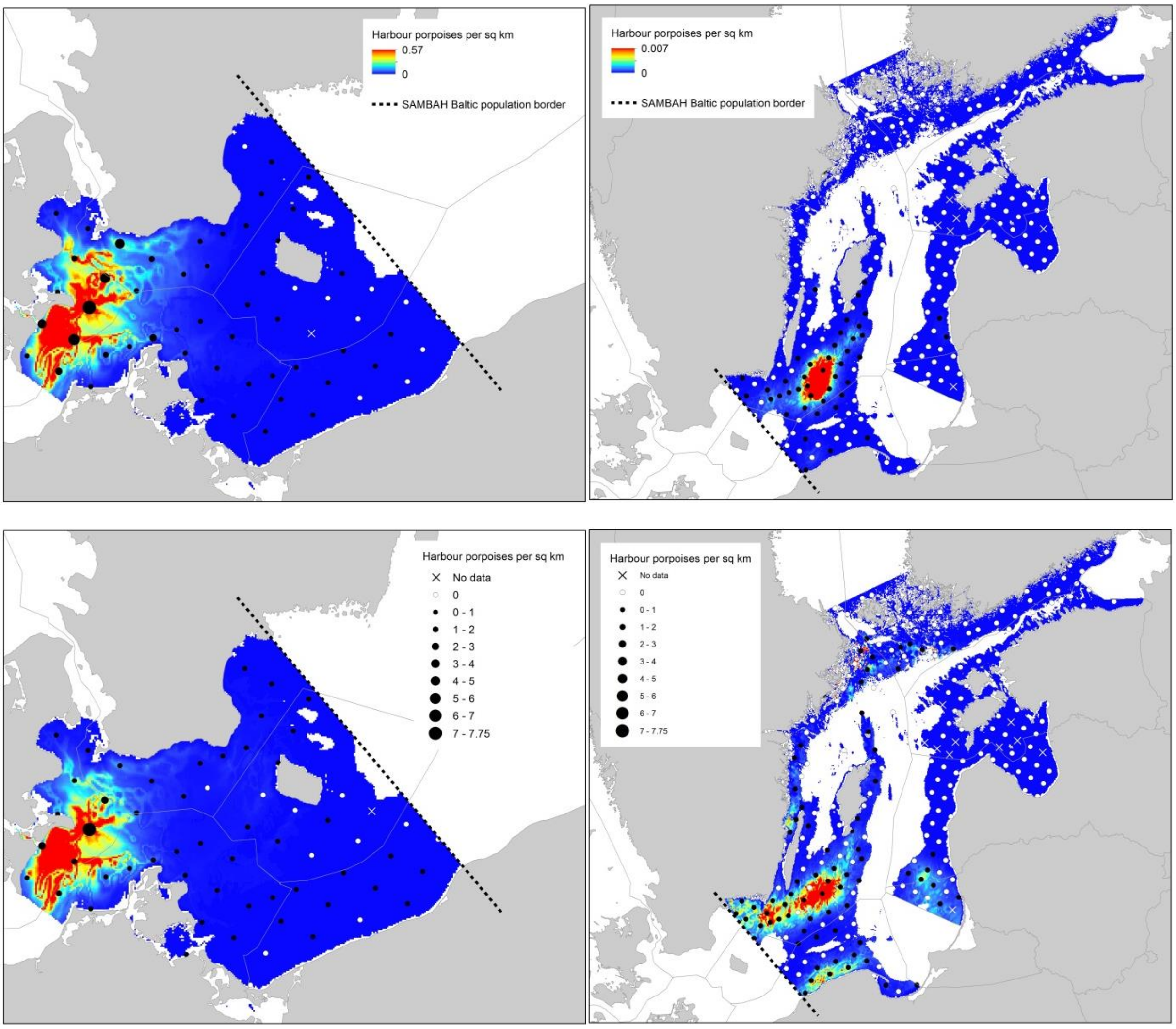

Figure 5. Predicted density of harbour porpoises in the SAMBAH project area during May – October (upper panels) and November – April (lower panels). The border indicates the spatial separation between the Belt Sea and Baltic populations during May – October according to SAMBAH (2016a). Note the different scales in the southwest and northeast parts of the project area.

4.1.3. Abundance and population trends

SAMBAH (2016a) estimated the population abundance of the Baltic harbour porpoise population at 497 animals (95 per cent CI 80 – 1091). This is the total number of harbour porpoises within the SAMBAH project area northeast of the spatial separation line during May – October (Figures 2 and 5). For the southwest part of the SAMBAH area during May – October, i.e. the area inhabited by a portion of the Belt Sea population, the abundance estimate was 21,390 harbour porpoises (95 per cent CI 13,461 – 38,024). During November – April, when no clear spatial separation could be found between the Belt Sea and the Baltic populations by visually inspecting the detection rate at the SAMBAH C-POD positions, the total number of harbour porpoises within the SAMBAH area was estimated at 2,889 animals (95 per cent CI 1,285 – 8,380). This indicates that the majority of, but not all Belt Sea animals left the southwest part of the SAMBAH area during the winter season. It is not known if all Baltic animals stayed within the SAMBAH area or migrated even further west.

Previously, two visual line-transect surveys had been carried out in the southwestern Baltic Sea. These have generated very few observations, yielding uncertain abundance estimates and no data on distribution. In 1995, an aerial survey sighted three groups of single harbour porpoises and estimated a group abundance of 599 with a 95 per cent CI of 200 – 3,300 groups (Hiby and Lovell, 1996, Berggren et al., 2002). A new survey in 2002, again only in the south-western part of the Baltic Sea, sighted two single animals and estimated a total of 93 groups with a 95 per cent CI of 10 – 450 groups (Berggren et al. 2004). These surveys extended to the northeast to only include the southern portion of the Baltic Sea Annex I, Figure 1), so that the results are not comparable to the SAMBAH population estimate.

For want of previous abundance estimates, a population trend can only be derived from other sources of information. Based on a review of catches, bycatch, strandings and opportunistic sightings, Koschinski (2001) concludes that the population has declined considerably in abundance and distribution during the last century. A substantial decline in the number of bycaught, stranded and sighted harbour porpoises has also been reported for Polish waters during 1922 – 1999 (Skóra and Kuklik, 2003).

4.1.4. Basic biology: feeding, habitat preferences, reproduction and survival

The harbour porpoise is generally found to feed on small, schooling fish, but also to adapt to local and seasonal conditions. In the Baltic region, the diet is usually dominated by pelagic clupeids, such as herring (*Clupea harengus*), and bottom-dwelling gadids, such as cod (*Gadus morhua*) (Aarefjord et al., 1995; Börjesson et al., 2003; Sveegaard et al., 2012). Variations in isotopic ratios (Fontaine et al., 2007) support findings on stomach contents (Aarefjord et al., 1995), showing a general shift from pelagic prey species in deep water off northern Norway to more coastal and/or demersal prey in more shallow waters in the Belt and Baltic Seas. Analyses of skull morphometrics even indicate an adaptation on an evolutionary timescale, with the Belt Sea population more adapted to feeding on benthic and demersal prey than the Skagerrak-North Sea and the Baltic populations (Galatius et al., 2012)

Regarding habitat preferences, only preliminary information is available for the Baltic harbour porpoise. In addition to predicting the probability of detection and density, spatial modelling was used to investigate the relationships between 18 environmental predictors and the spatio-temporal distribution of harbour porpoises in the SAMBAH project (SAMBAH, 2016b). It should be noted that the outcomes of such an analysis are limited by the availability of predictors, and that the relationships found may only be statistical and not causal. Nevertheless, analyses were carried out with both probability of detection and density as response variables since different processes may govern their spatio-temporal patterns. For each of the two response variables, the significance and the response curves of the four models with the highest explained deviance were studied and preliminary conclusions were drawn.

The analyses show that in general within the SAMBAH area, harbour porpoises were found to occur in higher numbers in areas with higher salinity. This is not unexpected as the salinity is higher in the southwestern part that is mainly inhabited by the Belt Sea population. Depth was also found to be a strong predictor, with harbour porpoises primarily occurring in waters shallower than 40 m and with a tendency to higher densities at 20 – 40 m depth. Regarding the topographic position, harbour porpoises occurred more frequently in generally even areas, although there was also a tendency to higher densities in somewhat elevated areas. This corresponds to the higher detection rates and densities over the relatively even seafloors in the southwestern part of the SAMBAH area, but also to the higher densities over the slopes of the offshore banks in the central Baltic Proper (SAMBAH, 2016b). The locations of the Hoburg's, Northern and Southern Mid-sea Banks are shown in Figure 1.

The one-year reproductive cycle for harbour porpoises in the Baltic region is shown in Figure 6. The Figure is primarily based on data from Börjesson and Read (2003) and Lockyer and Kinze (2003), although comparisons have also been made to data reviewed by Lockyer (2003). The animals caught in the Little Belt (Figure 1) in 1942 – 1944 were assumed to be animals migrating out of the Baltic Sea during winter (Møhl-Hansen, 1954). However it is unknown whether these animals originated from the Belt Sea or Baltic populations as they are defined today.

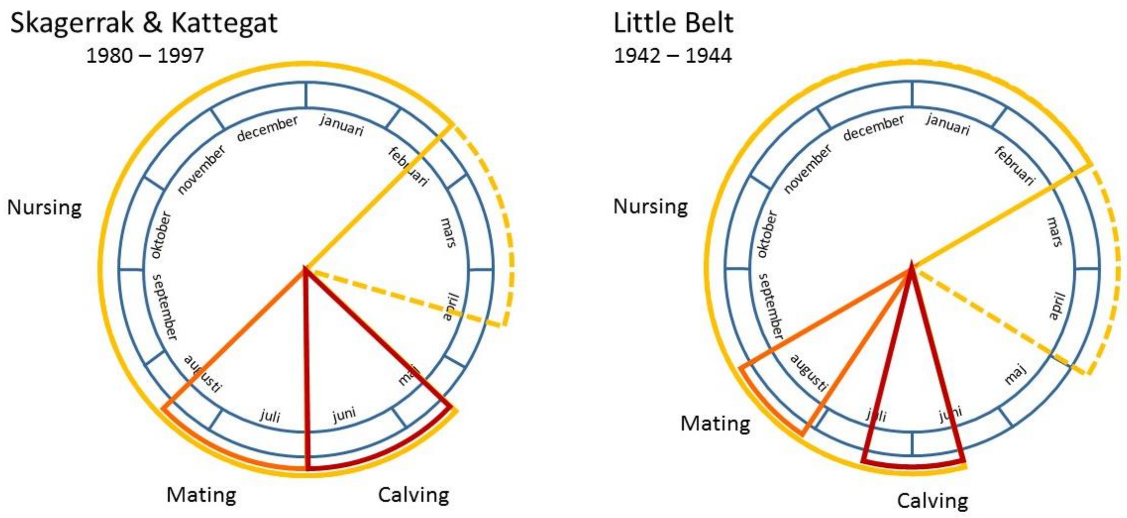

Figure 6. Yearly reproductive cycle for harbour porpoises bycaught or stranded in the Kattegat and Skagerrak Seas during 1980 – 1997, and caught in the Little Belt, Denmark, during 1942 – 1944. The harbour porpoises caught in the Little Belt may be migrating animals from the Baltic population. Data primarily from Börjesson and Read (2003) and Lockyer and Kinze (2003)

Lockyer and Kinze (2003) present data on age, growth and reproduction of harbour porpoises in Danish waters from a database on nearly 1,900 individuals collected from 1934 to 2003, even though not all data were available for all individuals. The data were combined for all years and locations, but separated by sex. The largest age class was 0 years, with a rapid decline to 2 years, followed by a continued slow decline. Longevity was 22 – 23 years, but less than 5 per cent of the animals had lived beyond 12 years. Sexual maturity was estimated to occur between the ages of 3 and 4 years in both sexes and data supported a pregnancy every second rather than every year, although the potential for an annual pregnancy existed. The total number of calves delivered during the lifetime of a female was estimated at four to six.

4.2. Critical habitats

The Convention on Biological Diversity (CBD) has adopted seven scientific criteria for identifying ecologically or biologically significant marine areas in need of protection in open-ocean waters and deep-sea habitats (EBSAs; annex I, decision IX/20). Five of the criteria are mainly applicable to habitats, but two are directly applicable for identification of critical habitats of the Baltic harbour porpoise:

- Special importance for life history stages of species.
- Importance for threatened, endangered or declining species and/or habitats.

The Habitats Directive Article 4 states that for aquatic species listed in Annex II and ranging over wide areas, only sites where there is a clearly identifiable area representing the physical and biological factors essential to their life and reproduction shall be proposed as SACs. The site selection criteria for SACs are further developed in guidelines developed by the European Commission (EC 2007). For Annex II species, these are:

- Size and density of the population of the species present on the site in relation to the population present within the national territory.
- Degree of conservation of the features of the habitat which are important for the species concerned and restoration possibilities.
- Degree of isolation of the population present on the site in relation to the natural range of the species.
- Global assessment of the value of the site for conservation of the species concerned.

Further, Ross et al. (2011) give ten guiding principles for the delineation of priority habitat for endangered small cetaceans. These include the cetacean's requirements regarding the habitat's physical, chemical and biological features; the size of the habitat size and its connections to the surroundings; specific requirements for reproduction, specialized social behaviours or temporal patterns; anthropogenic threats; and management approaches.

Given the criteria and principles set out above, and due to the lack of information on Baltic habitat preferences derived from other sources than modelling of detection rate and density, and the almost year-round engagement in reproductive activity by adult harbour porpoise females (mating, pregnancy, calving and/or nursing), critical habitats for Baltic harbour porpoises can currently only be identified based on areas of high probability of detection or density. With further information on habitat use or responses to anthropogenic pressures, potentially varying among different life stages or sexes, the identification of critical habitats and the management needs of those habitats may be developed further.

In the Baltic Sea, high-density areas for harbour porpoises have been identified based on predictions of probability of detection per month. Two levels of high-density areas were defined: larger areas encompassing 30 per cent or more of the population, and smaller sub-areas encompassing 7.8 per cent of the population. In the Skagerrak and Kattegat Seas, areas encompassing 30 per cent of the population have been used to identify high-density areas of harbour porpoises (Sveegaard et al., 2011). To convert from probability of detection to proportion of the population, it was assumed that there is a linear relationship between probability of detection and density, and that the average density within each 10 per cent interval of probability of detection is representative for the probability within the entire area of that interval. The latter means that for e.g. the area covered by the interval of 20 – 30 per cent probability of detection, it was assumed that for any grid cell within that area, the probability of detection was 25 per cent. The areas of every 10 per cent interval were calculated on the prediction of average probability of detection per month for the distribution range of the Baltic harbour porpoise population during May – October as defined by SAMBAH (i.e. east of the SAMBAH population border). By summing up the areas of all 10 per cent intervals and relating those to 100% of the population, it was found that during May – October, 30 per cent of the population was within the isoline of ≥30 per cent probability of detection, and 7.8 per cent of the population was within the isoline of ≥20 per cent probability of detection. For the first Commission criteria, the proportion of the national population present on the site shall be estimated and assigned into one of the following classes: A: 100 per cent >p>15 per cent ; B: 15 per cent >p>2 per cent ; C: 2 per cent >p>0 per cent , D=non-significant. With disregard to national borders, this implies that the larger identified areas encompassing 30 per cent of the population are of class A, while the smaller sub-areas encompassing 7.8 per cent of the population are of class B.

As the reproductive behaviour of harbour porpoises and their spatial distribution and anthropogenic pressures vary over the year, the isolines of 20 per cent and ≥30.0 per cent probability of detection, respectively, were applied to the predictions of probability of detection for the following three-month periods: February – April, May – July, August – October, and November – January, respectively. The resulting high-density areas are shown in Figure 7 (enlarged in Annex I, Figures 5a – 5f). During the two summer quarters, high-density areas were only identified east of the Baltic harbour porpoise population border defined by SAMBAH. During the two winter quarters, the spatial overlap between the Baltic and Belt Sea population in the southwestern Baltic Sea prevents any correlation between the probability of detection and the proportion of the Baltic harbour porpoise population, so that high-density areas were identified by applying the same isolines of detection as during summer. This implies that the high-density areas delineated during November – April are not correlated to the proportion of the Baltic harbour porpoise population, and the identified area southwest of the SAMBAH border is utilized by a mix of animals from the Baltic and Belt Sea populations.

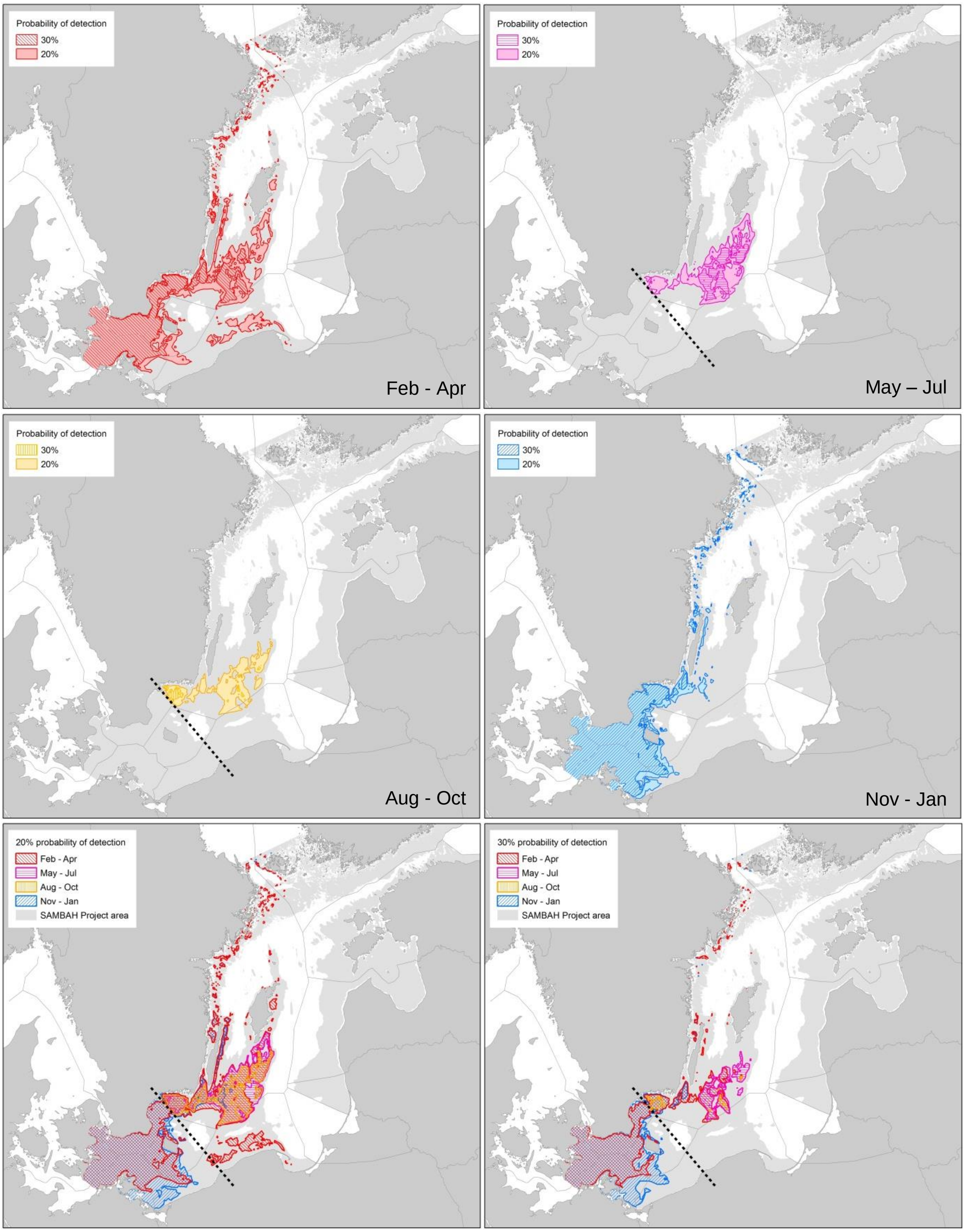

Figure 7. High-density areas for harbour porpoises in the SAMBAH area (shaded) based on predictions of probability of detection. The four upper panels show the high-density areas of two different levels per quarter, and the two lower panels show the full-year pictures for each of the two density levels. During May – October, the isoline of 20% probability of detection encompasses approximately 30% of the Baltic harbour porpoise population, while the isoline of 30% probability of detection encompasses approximately 7.8% of the Baltic harbour porpoise population. During November – April, the same isolines for probability of detection are shown without correlating them to the proportions of the population. Southwest of the SAMBAH population border, the high-density areas are inhabited by animals from both the Baltic and the Belt Sea populations during November – April.

4.3. Attributes of the population to be monitored

The ultimate success or failure of the Jastarnia Plan is defined by improvements (or lack of improvements) in the conservation status of the Baltic harbour porpoise, which can only be assessed by monitoring. The potential 'attributes' of the Baltic harbour porpoise that can be considered for monitoring, to determine the success of the overall plan and/or individual actions and to amend the Jastarnia Plan are listed below, together with the numbers of the relevant Actions (described in section *6. Actions*).

- Bycatch rates and total annual estimate in relation to estimated mortality limits: RES-03, MON-03, RES-04, RES-08
- Environmental status in regard to impact of impulsive or continuous anthropogenic underwater noise on harbour porpoises: RES-07
- Harbour porpoise health status, contaminant levels, and life-history parameters: MON-04
- Harbour porpoise abundance and distribution: PACB-01, MON-01, RES-02, MON-02
- Harbour porpoise population viability: RES-08

The development of suitable indicators shall be undertaken in close cooperation with HELCOM's development of core indicators for marine mammals.

5. Threats, mitigation measures and monitoring

5.1. Identification of threats

The information presented below is primarily related to the individual level, although there are ongoing efforts at developing frameworks for assessing population level consequences (Harwood et al., 2016). For the harbour porpoise population in the "Inner Danish Waters", approximately corresponding to the defined management borders of the Belt Sea population (Figure 4) (Sveegaard et al., 2015), an individual-based mathematical model has been developed and applied (Nabe-Nielsen et al., 2014). The model includes both physiological and behavioural responses to the following threats: bycatch, underwater shipping noise, underwater noise from offshore wind turbines in operation (not construction noise), and prey depletion. Given the model assumptions, the population was found to be most sensitive to bycatch mortality, followed by the speed at which food species recover after being depleted. Whether or not underwater noise from shipping and windfarms in operation had a significant negative impact was related to the recovery time of prey. No similar modelling information is available for the harbour porpoise population in the Baltic Sea.

ICES WGMME has developed a threat matrix and applied this to the harbour porpoise in the Baltic Sea using expert judgement based on available scientific data (ICES 2015b). In the highest threat category, bycatch and contaminants have been listed. For these, it is judged that there is evidence or a strong likelihood of negative population effects, mediated through effects on individual mortality, health and/or reproduction. In the medium category, underwater noise from pile driving and shipping, and prey depletion by removal of non-target species are listed. For these, evidence or a strong likelihood of impact at individual level on survival, health or reproduction are assumed to exist, but effect at population level is not clear. Finally, seven threats are listed in the low category as having possible negative impact on individuals but evidence is weak and/or occurrences are infrequent. Examples of those threats are nutrient enrichment, litter, barriers to species movements and introduction of pathogens. The low category threats are not dealt with in this document. In the WGMME matrix, habitat degradation is also listed in the highest threat category. However after consultation with ICES WGMME, this seems to be an error and the threat matrix will be revised accordingly in the 2016 report (Graham Pierce, 4 April 2016, pers.comm.). The cumulative anthropogenic impact, including habitat degradation, on the Baltic Sea ecosystem has been assessed as high (Korpinen et al., 2013). This may well affect harbour porpoises, but due to lack of evidence on functional relationships, habitat degradation is not dealt with in this document. In addition to the threats identified by ICES WGMME, the compilation below also includes active military sonar as substantial impacts zones have been estimated for harbour porpoises in the Baltic Sea.

5.1.1.Bycatch in gillnets

For harbour porpoises in the Baltic Sea, bycatch in gillnets is recognized as the greatest source of anthropogenic mortality (Hammond 2008, HELCOM 2013). Since the introduction of synthetic gillnets in the Baltic Sea in the early 1960s, the effort and fishing practices have undergone considerable changes due to changes in profitability and management policies. This calls for recent data on bycatch. Therefore the following compilation focuses on bycatch data from the year 2000 and onwards in the waters east of the Darss and Drogden underwater Sills (Figure 1).

Figure 8 (enlarged in Annex I, Figures 6a – 6b) shows the spatial distribution of probability of detection of harbour porpoises per month, averaged over May – October and November – April, respectively (data from SAMBAH, 2016a), together with the total hours fished per ICES rectangle with gillnets of a mesh size of ≥ 90 mm during April – September and October – May 2014, respectively (STECF, 2015; data downloaded from the European Commission DCF – Data dissemination database on 13 April 2016, https://datacollection.jrc.ec.europa.eu/dd/effort/maps). The fishing effort is available per quarter, wherefore the two quarters that fit the seasonal distribution of harbour porpoises best are shown together. For spatio-temporal estimates of the bycatch risk of harbour porpoises, the resolution of both harbour porpoise distribution and fishing effort need to match the management needs.

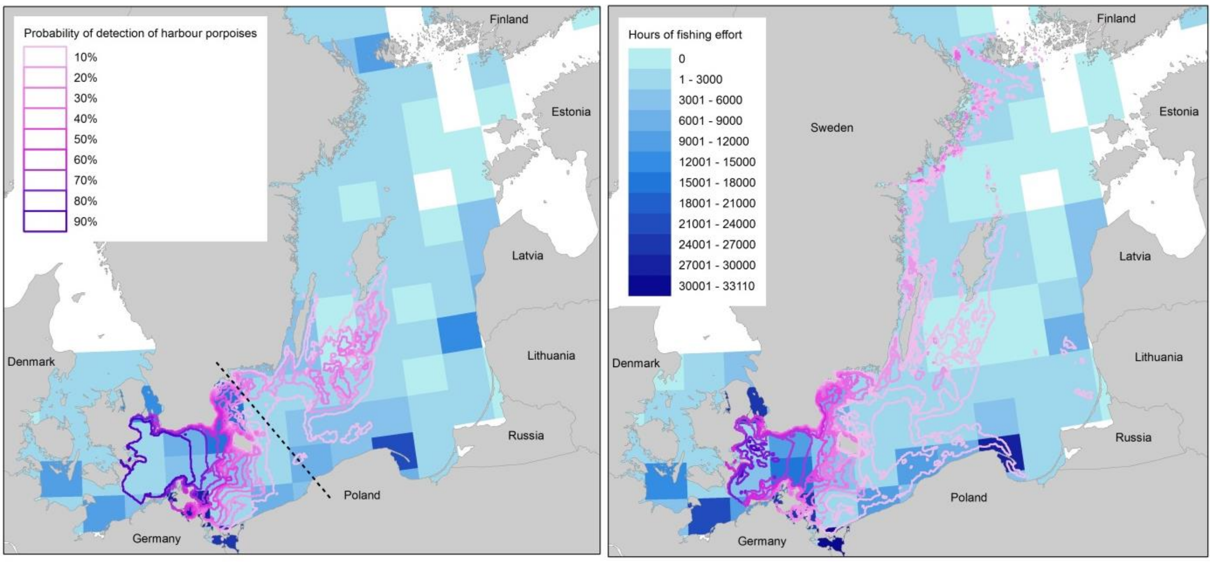

Figure 8. Monthly probability of detection of harbour porpoises 2011 – 2013 within the SAMBAH area (data from SAMBAH, 2016a), together with total hours fished per ICES rectangle with gillnets of a mesh size of ≥ 90 mm during April – September and October – May 2014, respectively (STECF, 2015; data downloaded from the European Commission DCF – Data dissemination database https://datacollection.jrc.ec.europa.eu/dd/effort/maps). The dotted line indicates the border used for estimating abundance of the Baltic harbour porpoise population in SAMBAH.

ICES WGBYC has undertaken a historical review of Regulation 812/2004, based on the annual data reported by the Member States 2006 – 2013 and other data sets provided by the ICES Member States (ICES 2015a). In short, the review shows that the evaluation of bycatch under the regulation is limited due to the lack of an accurate estimate or census of total fishing effort from relevant European waters, considerable uncertainty in the representativeness of total fishing effort in the Member State reports, and inconsistent submission of annual reports by some Member States. Further, compared with other data collection frameworks, monitoring under the regulation results in significantly fewer bycatch observations. The reasons for these differences are not entirely clear, but a combination of several factors is proposed. Nevertheless, for ICES statistical areas 24+ (Figure 1), a bycatch rate of 0.000 – 0.004 (95% CI) harbour porpoises per gillnet day at sea was estimated for 2006 – 2013. The bycatch rate was based on zero observed harbour porpoise bycatch in 741 “pingered” and “non-pingered” gillnet days during 2006 – 2013 (ICES 2015a).

National bycatch data

In Denmark, systematic information on stranded or killed marine mammals has been collected in a national database since 1991. A compilation of data on harbour porpoises from the reports covering the years 2006 – 2014 shows that on the average 2.75 harbour porpoises per year were collected in the waters east of the Darss and Drogden underwater sills (range 1 – 7), of which 0.67 on the island of Bornholm (range 0 – 3) (geographical terms shown in Figure 1). The cause of death has generally not been determined for these animals (Jensen et al., 2008, 2012; Thøstesen et al., 2009, 2010, 2011, 2013; Jensen & Thøstesen 2014; Jensen 2015).

In Latvia, two harbour porpoises were reported as bycaught in 2003 – 2004 (ICES 2005).

In German Baltic waters, data on bycatch are only available for the federal state of Schleswig – Holstein and the waters west of Rügen in Mecklenburg – Western Pomerania (Figure 1) (Rubsch and Kock, 2004; Siebert et al., 2006), i.e. west of the area covered by the Jastarnia Plan.

In Polish waters, data on harbour porpoise bycatch and strandings are collected by Hel Marine Station of the Institute of Oceanography, University of Gdansk. During the period 1990 – 2009, a total number of 66 harbour porpoises were reported as bycaught (Hel Marine Station database). Of 49 of these animals, 39 per cent were bycaught in semi-driftnets for salmonids, 35 per cent in set gillnets for cod, 21 per cent in other set gillnets, 3 per cent in pelagic trawls and 2 per cent in driftnets (EC-DGMARE, 2014). In all Polish national reports to ASCOBANS from 2010 to 2014, only one case of bycatch was reported. This individual was caught in a Polish cod net in 2014. Since the driftnet ban in 2008, the Polish offshore fishery with drifting surface nets of strings ranging up to 21 km and operated by vessels above 12 m in length have ceased. However, the inshore semi-driftnet fishery has continued as before as this gear is classified as a set gillnet (GNS) and not a driftnet (GND). The semi-driftnet usually consists of one to two surface net panels (30 – 70 m in total length), it is anchored at one end, and deployed mainly by vessels below 12 m in length. The mesh size of both the offshore driftnets and the inshore semi-driftnets is 157 mm. The inshore semi-driftnet fishery is mainly used in the Gulf of Gdansk including Puck Bay, which is also the hotspot for harbour porpoise bycatch (EC-DGMARE, 2014).

In Sweden, telephone interviews on bycatch of marine mammals and seabirds were carried out with 220 randomly selected Swedish commercial fishermen using any gear type in 2002. This corresponds to almost 17 per cent of the total Swedish fishing fleet in 2001. Harbour porpoise bycatch were reported from the Skagerrak and Kattegat Seas, but not from the Baltic Sea (Lunneryd et al., 2004).

No harbour porpoise bycatch has been documented in Estonia, Finland or Lithuania for the years since 2000.

Ghost nets
In addition to actively used gillnets, derelict fishing nets called “ghost nets” may also catch harbour porpoises. On a global scale, less than 10 per cent of the volume of marine litter has been estimated to be discarded fishing gear, and ghost-fishing has been recognized as an issue of global significance by the United Nations Environment Programme (UNEP) and Food and Agriculture Organization of the United Nations (FAO) (Macfadyen et al., 2009). In the Baltic Sea, a number of projects and activities have been carried out to estimate the amount and impacts of derelict fishing gear, and on prevention, retrieval and recycling of derelict fishing gear. In a project carried out in Polish and Lithuanian waters (WWF Poland 2013), the annual loss of gillnet panels (not strings) for cod or flounder were estimated at 5,500 – 10,000 during 2005 – 2008. Upon correction of the data according to results in diving operations in 2012, the total amount of pair trawl netting entangled in ship wrecks was estimated at 270 – 810 tonnes in the Polish EEZ and 67 – 100 tonnes in the Lithuanian EEZ. In an experiment to measure the catch efficiency of ghost nets, 24 cod nets were set in the Hanö Bight (Figure 1) in southern Swedish waters over 27 months, starting in 1998 – 1999 (Tschernij and Larsson, 2003). Over the first three months, catch efficiency was reduced to around 20 per cent of its initial value. Thereafter, the monthly reduction was less strong and after 27 months it seemed to have stabilized at around 5 – 6 per cent. Based on these results and an estimation of the number of lost cod net panels in 2009, WWF Poland (2013) estimated that in the Baltic Sea, a total of 20.8 tonnes of cod were caught in the cod net panels that were lost in 2009. In summary, WWF Poland (2013, 2015) concludes that with high probability, ghost nets deposited on ship wrecks have a significant negative impact on fish resources in the Baltic Sea. For harbour porpoises, there are currently no quantitative assessments on the potential problem. Even though stranded harbour porpoises have been encountered entangled in fishing gear, it is usually difficult to distinguish between entanglement in active or discarded gear (Laist, 1997; Simmonds, 2012).

An evaluation of global and regional protocols for data collection and management measures to prevent and remediate derelict fishing gear and ghost fishing has been carried out by (Gilman, 2015). Based on the findings, recommendations are given on modifications the organizations' mandates, harmonization of data collection protocols, and implementation of a broader suite of mandatory and/or complementary management methods.

5.1.2.Contaminants

As harbour porpoises feed at higher trophic levels and have a large lipid store, environmental contaminants such as persistent organic pollutants (POPs) and heavy metals are biomagnified in their tissues, leading to an increased risk of individual and population level toxicity.

Examples of POPs are chlorinated or bromated compounds and perfluorinated alkylated substances (PFASs). Among the chlorinated or bromated compounds are polychlorinated biphenyls (PCBs), dichlorodiphenyltrichloroethane (DDT), polybrominated diphenyl ether (PBDE) and dioxins (e.g. polychlorinated dibenzo-p-dioxins, PCDDs). Due to a high number of PCB congeners, analyses are often made of their total concentration, presented as ΣPCBs. The toxicity of PCBs, dioxins and dioxin-like compounds such as dibenzofurans (PCDFs) can be expressed as a single value by using the toxic equivalency (TEQ) system. Among the PFASs are perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA). While compounds such as PCBs, DDT and dioxins are accumulated and analysed in fatty tissues such as blubber, PFASs and heavy metals such as mercury (Hg) are primarily accumulated and analysed in the liver.

In harbour porpoises, stranded specimens have been found to have significantly higher concentrations of ΣPCBs than animals that have died of physical trauma (mainly bycatch) (Beineke et al., 2005; Jepson et al., 1999). Further, increased levels of PCBs and PBDE have been found to be associated with emaciation and an impaired health, and correlated to phenotypical changes in thymus and spleen (Beineke et al., 2005). Follow-up studies have given support to the hypothesis that PCBs and PBDE cause increased disease susceptibility due to an impaired immune response (Beineke et al., 2007a, 2007b), and a threshold value of 17 mg ΣPCB /kg lipid has been suggested for adverse health effects (Jepson et al., 2005). Other published ΣPCB toxicity thresholds for marine mammals are 9 mg/kg lipid for the onset of physiological impacts (Kannan et al., 2000), and 41 mg/kg lipid for causing profound reproductive impairment in ringed seals (*Pusa hispida botnica*) in the Baltic Sea (Helle et al., 1976).

Regarding reproductive health, the relationships between concentrations of summed PCB congeners (ΣPCBs) and reproductive failure have been investigated in 329 female harbour porpoises stranded in UK waters in 1990 – 2012 (Murphy et al., 2015). In the sexually mature females, 19.7 per cent showed evidence of reproductive failure (foetal death, aborting, dystocia or stillbirth), and 16.5 per cent had infections of the reproductive tract or tumours of tissues in the reproductive tract that could contribute to reproductive failure. ΣPCBs was found to be a significant predictor of mature female reproductive status, with resting mature females (non-lactating and non-pregnant) more likely to have a higher PCB burden. Health status was also a significant predictor, with successfully reproducing females more likely to have good health status compared with other individuals. In this study, the mean ΣPCBs for resting mature females was 18.5 mg/kg lipid, which was significantly higher than for both lactating (7.5 mg/kg) and pregnant females (6 mg/kg), though not significantly different to sexually immature females (14.0 mg/kg). In comparison to male harbour porpoises, Jepson et al. (1999) showed that adult females had significantly lower ΣPCBs levels than adult males due to maternal transfer of PCBs to offspring.

In the Baltic Sea, concentrations of ΣPCBs in harbour porpoises have been reported from analyses of specimens collected in the 1980s and 1990s (Table 4). In comparison with the published threshold values for the onset of physiological impacts (9 mg/kg lipid (Kannan et al., 2000)), adverse health effects (17 mg/kg (Jepson et al., 2005)) and profound reproductive impairment (41 mg/kg (Helle et al., 1976)), the PCB concentrations in Baltic harbour porpoises have been alarmingly high.

Table 4. Concentrations of ΣPCBs of harbour porpoises in the Baltic Sea. All animals from the German Baltic Sea were collected west of the Darss underwater sill.

Geographical area	Years	Source	No. of samples of age and sex class	Mean (range) of ΣPCBs (mg/kg lipid)	Reference
East of the Darss and Drogden sills, Sweden	1985-1993	Bycaught	13 immature	16 (2.9-32)	(Berggren et al., 1999)
East of the Darss and Drogden sills, Sweden	1988-1989	Bycaught	4 mature males	46 (14-78)	(Berggren et al., 1999)
Schleswig-Holstein, Mecklenburg-Western Pomerania, Germany	1994-1995	Stranded or bycaught	17 immature, 1 mature female	14.9 (5,6-38.6)	(Bruhn et al., 1999)
Puck Bay, Poland	1989-1990	Bycaught	3 immature	23-42	(Kannan et al., 1993)

The high concentrations of PCBs in Baltic harbour porpoises in relation to harbour porpoises sampled further west correspond to the spatial pattern of TEQ values of dioxins and dioxin-like PCBs in herring sampled at 11 locations from the British Isles to the coast of Latvia in 1999 – 2002. From west to east, the TEQ value increased by 35 times (Karl and Ruoff, 2007). However since the 1990s, environmental monitoring of guillemot eggs (*Uria aalge*) and herring show that the concentrations of POPs and the TEQ values have decreased in the Baltic environment. The rate of decrease varies among different compounds and PCB congeners (Jörundsdóttir et al., 2006; Miller et al., 2014; Szlinder-Richert et al., 2009). For Baltic ringed seals, a long-term analysis has been carried out of dioxins (PCDDs), dioxin-like dibenzofurans (PCDFs) and dioxin-like PCBs. The seals were bycaught or incidentally shot, mistaken for grey seals (*Halichoerus grypus*), from 1978 to 2014. With a few exceptions, the concentrations decreased until around 2000, after which time they have been stable (Roos & Hagström, 2015).

PFOS and PFOA have been recognized as emerging environmental contaminants because of their ubiquitous occurrence in the environment, biota and humans. The compounds have been detected globally in the tissues of fish, bird and marine mammals (Suja et al., 2009). PFOS bio-accumulate by binding to specific proteins in liver, kidney and blood plasma (Van de Vijver et al., 2003). Contrary to e.g. PCBs and dioxins, long-term environmental monitoring of concentrations of PFOS in guillemot eggs shows that its levels are increasing in the Baltic marine environment. Between 1968 and 2003, there was an almost 30-fold increase in PFOS concentrations, with a sharp peak in 1997 followed by decreasing levels up to 2002. PFOA was not detected in any of the samples (Holmström et al., 2005). A later time-series has been analysed for harbour porpoises from the German Baltic and North Seas. Of three analysed PFAS compounds, PFOS was predominating and its concentration decreased from 1991 to 2008. Of the two other analysed compounds, one decreased (perfluoroalkyl sulfonates, PFSAs) and one increased (perfluoroalkyl carboxylate, PFCA) over time. A comparison of the spatial distribution of the contaminant concentrations showed consistently higher concentrations in the Baltic Sea and lowest concentrations in the Icelandic population of the Atlantic Ocean (Huber et al., 2012).

In addition to POPs such as PCBs and DDT, heavy metals such as mercury (Hg) have been shown to cause immunosuppression in several species of marine mammals (Desforges et al., 2016). In Baltic harbour porpoises, significant correlations have been found between age and mercury (Ciesielski et al., 2006; Siebert et al., 1999). While significant associations have been found between mercury levels and severity of lesions have been found in harbour porpoises stranded or bycaught in the German Baltic and North Seas in 1991 – 1993, no significant relationships were found between mercury concentration and nutritional status/condition of harbour porpoises stranded or bycaught in Polish waters in 1996 – 2003 (Ciesielski et al., 2006).

5.1.3.Underwater noise

The harbour porpoise has very acute hearing, a wide hearing range (Andersen, 1970; Kastelein et al., 2002; Lucke et al., 2009), and a high responsiveness to sounds (e.g. Dähne et al., 2013; Dyndo et al., 2015; Teilmann et al., 2006). This makes the species susceptible to impact from a vast frequency range of anthropogenic underwater noise, from shipping, seismic surveys with airguns and pile driving, to military sonars and echo-sounders.

Underwater noise is often divided into two categories: impulsive or continuous noise. In turn, the impact of underwater noise on marine organisms is often divided into three categories: masking, behavioural response or physiological injury (Richardson et al., 1995; Southall et al., 2007). Physiological injury is generally considered to range from temporary threshold shift (TTS), via permanent threshold shift (PTS) to the more extreme case of severe or fatal injuries. TTS does not involve a destruction of hair cells and the definition of the hearing loss as temporary is based on the assumption that destruction of hair cells is the primary cause of inner ear hearing loss. However, recent work by Kujawa and Liberman (2015) has shown that noise exposures causing TTS (and no hair cell loss) cause permanent loss of >50 per cent of cochlear-nerve/hair-cell synapses. Given that noise levels below the TTS threshold have been shown to cause neurologically-based PTS, the TTS-PTS concept is likely to be re-evaluated, although much of the information currently available is based on this.

Recent analyses of behavioural reactions and TTS onset during exposures to various anthropogenic noise sources indicate that for toothed cetaceans whose hearing is geared to very high frequencies, such as the harbour porpoise, the two most important factors determining whether and to what extent there is an impact is the duration or repetition rate of the stimulus and the level above the hearing threshold (sensation level) (Tougaard et al., 2015). For avoidance behaviour, a sound pressure level (SPL) of $L_{eq\text{-}fast}$ 45 dB above the harbour porpoise's hearing threshold was proposed as an exposure limit for harbour porpoises, where $L_{eq\text{-}fast}$ denotes the total sound energy averaged over 1/8 of a second. For TTS, a sound exposure level (SEL) of 100 – 110 dB above the porpoises' hearing threshold for pure tones at the relevant frequency was suggested as a preliminary exposure limit, however this was based on limited data.

Noise generating activities
One of the most extreme sources of underwater noise is detonations of underwater explosions, producing some of the highest peak sound pressures of all underwater anthropogenic sound sources. Underwater explosions can be used in e.g. construction work or navy exercises, or for controlled detonations of unexploded ordnance for safety concerns. In the Dutch part of the southern North Sea, noise levels were measured and modelled for controlled detonations of approximately 230 pieces of unexploded ordnance with charge masses ranging from 10 – 1,000 kg (most 125 – 250 kg) (von Benda-Beckmann et al., 2015). There was a trend towards increasing effect distances with increased charge mass, with substantial scatter due to variations in water depth in which explosives were detonated. The estimated effect distances varied greatly, from hundreds of metres to 15 km for PTS and about 3 – 25 km for TTS. Based on modelled sound exposure maps, impact thresholds for harbour porpoises and seasonal models of harbour porpoise distribution, a total of 1,280 – 5,450 harbour porpoise PTS events was estimated within the Dutch North Sea during one year. Unexploded ordnance is of high importance in the Baltic Sea. Although it has been estimated that around 40,000 tons of chemical munitions were dumped in the Baltic Sea mainly around Bornholm (HELCOM, 1995), it is yet not well known how much unexploded ordnance is still in the whole Baltic Sea. For Germany, it has been estimated that 1,300,000 tons are still in the North Sea and 300,000 tons in the Baltic Sea (Böttcher et al., 2011).

The noise levels generated during construction of offshore installations such as wind farms are highly dependent on the choice of foundation type, which in turn is dependent on the soil structure. For offshore windfarms, monopiles driven into the seabed with a hydraulic hammer are most common. Examples of other piled foundations are tripod or jacket foundations. Increased diameter of the pile or the hammer, harder soils, and increased blow energy generates higher source levels (Bailey et al., 2014; Betke 2008). The most commonly used foundation type that generates lower noise levels is gravity foundations. During pile driving of offshore monopile foundations, harbour porpoises are typically deterred by 18 – 25 km (Brandt et al., 2011; Dähne et al., 2013; Tougaard et al., 2009a). In addition to behavioural impact, pile driving can also cause TTS in harbour porpoises (Brandt et al., 2011; Dähne et al., 2013; Lucke et al., 2009). To avoid this, pingers (acoustic deterrence devices, ADDs) and/or seal scarers (acoustic harassment devices, AHDs) are often used to displace harbour porpoises from the zone of physical injury. Thereby TTS is not discussed further for pile driving in this document.

Seismic surveys to find oil and gas, but also for research programmes, creates impulses of up to 262 dB re 1 µPa $_{peak\text{-}peak}$ and 30 – 60 ms duration (Götz et al., 2009) with a repetition rate ranging between 8 and 20 s. Thompson et al. (2013) report that porpoises react within 5 – 10 km radius to a seismic survey with peak-to-peak received levels (RLs) of 165 – 172 dB re 1 µPa and sound exposure levels (SELs) of 145 – 151 dB re 1 µPa²s. Compared to natural variation in acoustic detections of harbour porpoises, the airgun noise caused a significant but small reduction, and animals were typically detected again at within a few hours the seismic vessel had passed. In addition, Pirotta et al. (2014) report for the same survey that the probability of buzzing was reduced by 15 per cent, and that the probability of recording a buzz was positively correlated with distance to the vessel, indicating a loss in feeding opportunities during the seismic episode.

Active sonars are often used by national armed forces for searching and investigating objects on the water surface, in the water column, on the sea floor or in the sediment. For antisubmarine warfare sonars to be efficient in the shallow brackish environment of the Baltic Sea, higher frequencies and other pulses are used in comparison to the NATO low- and mid-frequency active sonars (LFAS and MFAS) that are relatively well studied in terms of environmental effects. In the Baltic Sea, the sonar frequencies typically range from 20 to 100 kHz. One sonar type is the variable depth sonar (VDS) that generally is towed behind a vessel and can transmit a variety of pulses at frequencies around 25 kHz, with a source level up to 220 dB re 1 µPa at 1 m. Based on VDS noise characteristics, noise propagation modelling, and published data on threshold levels for harbour porpoise behavioural reactions and injury, the impact zones of a VDS have been estimated to 1 – 20 km for behavioural reactions and 3 – 6 km for physical injury of harbour porpoises in the Baltic (Andersson and Johansson, 2016).

For continuous noise, the current knowledge level is more limited than for impulsive noise. Hermannsen et al. (2014) recorded ship noise at four locations in shallow waters (15 – 20 m) in inner Danish waters. This showed that across the entire frequency band of 0.025 – 160 kHz, vessel noise from a range of different ship types substantially elevated ambient noise levels at ranges between 60 and 1,000 m. Estimates of masking effects on harbour porpoises showed that ship noise is able to cause a decrease in hearing range of more than 90 per cent within 1,190 m in the 1/3 octave bands of 1 and 10 kHz. At 125 kHz, i.e. the frequency of harbour porpoise echolocation signals, the maximum communication range between a harbour porpoise mother and calf was estimated to be reduced from approximately 500 m (Clausen et al., 2011) to only 40 m.

Regarding behavioural response, Dyndo et al. (2015) recorded the behaviour of harbour porpoises in a net pen while they were exposed to a high number of vessel passages. The noise level for each of the 12 octave bands with centre frequencies between 31.5 Hz and 63 kHz was measured, together with the 1/3 octave bands with a centre frequency as proposed by the MSFD (see below). Similarly to Hermannsen et al. (2014), considerable energy was found across the recording range, although most power was below 10 kHz. Across all passages of a wide range of vessel types, almost 30 per cent elicited a strong stereotypic behavioural response in the form of porpoising. By several complementing statistical analyses, it was concluded that higher levels of medium- to high-frequency components (0.25 – 63 kHz octave bands) of vessel noise significantly increase the probability of porpoising. Analyses of the MSFD 1/3 octave bands around 63 and 125 kHz showed a non-significant relation to harbour porpoise behaviour.

In addition to the studies on shipping noise, there is also information on continuous noise from offshore wind turbines in operation. Based on noise measurements from three different types of wind turbines in Danish and Swedish waters during normal operation, the zone of audibility for harbour porpoises was estimated at 20 – 70 m from the foundation (Tougaard et al., 2009b). A masking experiment measuring auditory evoked potentials in a captive harbour porpoise indicate that the potential masking effect is limited to short ranges in the open sea (Lucke et al., 2007). Given the very limited estimated impact, wind turbines in operation are not considered further in this document.

Spatio-temporal distribution of underwater noise
Under the MSFD, hitherto two indicators have been developed for Descriptor 11 on introduction of energy/noise:

11.1. Distribution in time and place of loud, low and mid frequency impulsive sounds
11.2. Continuous low frequency sound

Despite the knowledge gap on the relationship between ambient noise levels and the state of the ecosystem, Dekeling et al. (2013) have undertaken work to make the indicators operational. For

Indicator 11.1, ICES has set up a registry in support of HELCOM and OSPAR. The registry provides an overview of the spatial and temporal distribution of impulsive noise events over the frequency band of 10 Hz to 10 kHz causing a "considerable" displacement (http://www.ices.dk/marine-data/data-portals/Pages/underwater-noise.aspx). "Considerable" displacement is defined as displacement of a significant proportion of individuals for a relevant time period and at a relevant spatial scale. All activities by impact pile-drivers are to be included, together with sonars, airguns, acoustic deterrent devices and explosives above certain thresholds (Dekeling et al., 2013). By 26 May 2016, the beta version of the registry does not yet include any data for the Baltic marine region.

For indicator 11.2, the trends of ambient noise measured in 1/3 octave bands centred at 63 and 125 Hz are to be monitored. In the Baltic marine region, the LIFE+ project BIAS (September 2012 – August 2016) measured the ambient noise during 2014 and is currently modelling monthly soundscape maps based on the measurements, data on AIS traffic and environmental covariates (www.bias-project.eu). In addition to the MSFD centre frequencies, BIAS also measured the ambient noise at 2 kHz. Being a compromise between the hearing ranges of herring, seals and the harbour porpoise, 2 kHz was chosen as an ecologically relevant frequency. As shown by both Dyndo et al. (2015) and Hermannsen et al. (2014), the MSFD frequencies are unsuitable for assessing impact of continuous noise on harbour porpoises.

In anticipation of maps from the ICES registry of impulsive noise events and the BIAS soundscape maps of continuous noise, Figures 8 – 11 (enlarged in Annex I, Figures 7a – 9b), show the spatial distribution of harbour porpoise occurrence together with present and planned offshore windfarms, mines and dumped ammunition, and AIS traffic. Note that the potential impact zones of these activities vary greatly depending on how they are carried out.

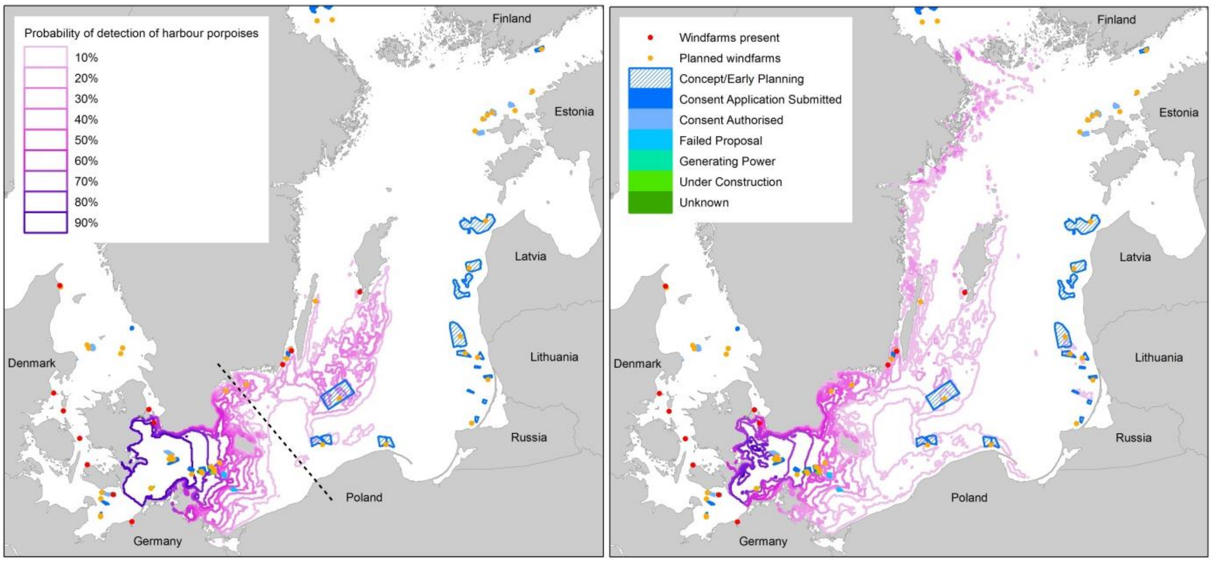

Figure 9. Monthly probability of detection of harbour porpoises within the SAMBAH area during May – October (left) and November – April (right) 2011 – 2013 (data from SAMBAH, 2016a), together with present and planned offshore windfarms in 2009 (Swedish Environmental Protection Agency, 2010). The dotted line indicates the border used for abundance estimation of the Baltic harbour porpoise population in SAMBAH.

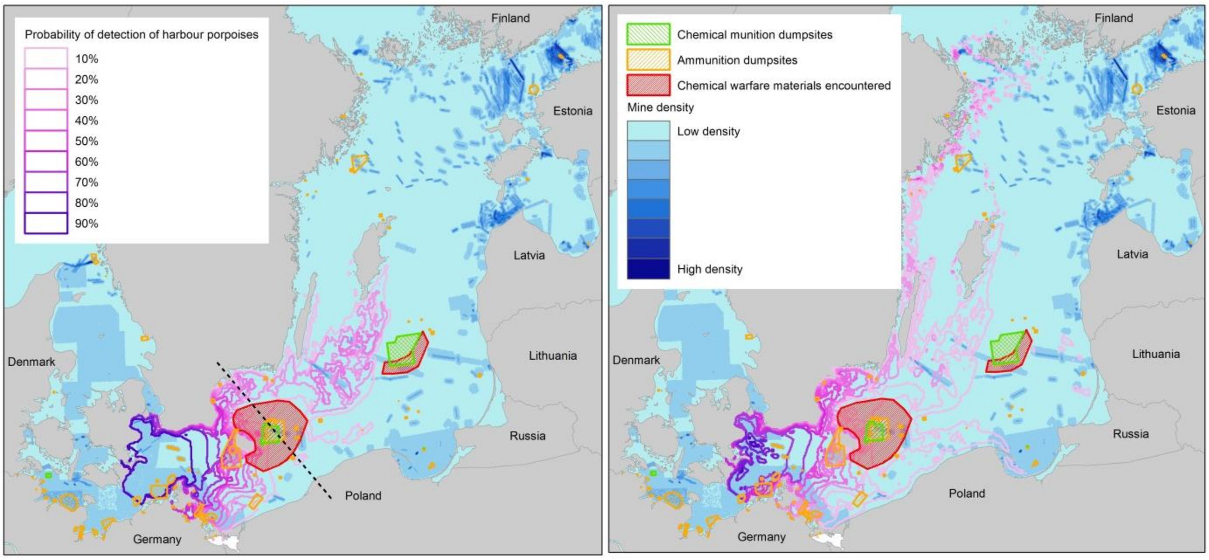

Figure 10. Monthly probability of detection of harbour porpoises within the SAMBAH area during May – October (left) and November – April (right) 2011 – 2013 (data from SAMBAH, 2016a), together with mines and dumped ammunition (courtesy HELCOM data and map service, and Swedish Armed Forces). The dotted line indicates the border used for abundance estimates of the Baltic harbour porpoise population in SAMBAH.

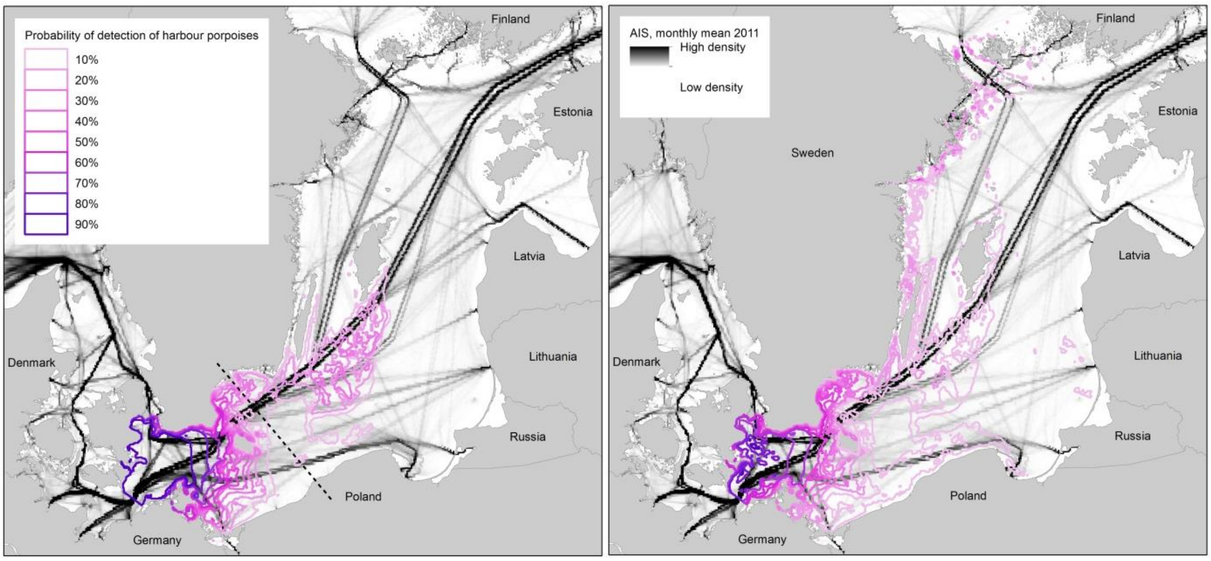

Figure 11. Monthly probability of detection of harbour porpoises within the SAMBAH area during May – October (left) and November – April (right) 2011 – 2013 (data from SAMBAH, 2016a), together with AIS shipping in 2011 (courtesy HELCOM data and map service). The dotted line indicates the border used for abundance estimation of the Baltic harbour porpoise population in SAMBAH.

5.1.4. Reduced prey quality

For the harbour porpoises in inner Danish waters, individual-based modelling has shown that next to bycatch, food depletion is the most serious threat to the population (see *5.1. Identification of* Threats; Nabe-Nielsen et al., 2014). Further, harbour porpoise distribution has been found to correlate to fine-scale oceanographic features aggregating prey in the Bay of Fundy (Johnston et al., 2005) and to large-scale patterns of herring distribution in the Sound (Sveegaard et al., 2012b). No such data are available for the Baltic harbour porpoise population, although there is extensive information on changes in herring and sprat condition and density from acoustic surveys in ICES statistical areas 25 – 29 (Baltic Proper) during 1978 – 2008. Generalized additive models show that the main driver of observed spatio-temporal changes in the condition of both clupeid species is sprat density. During 1984 – 1991, the body condition was high and similar in all areas of the Baltic Proper for both species. However during 1992 – 2008, sprat abundance increased and the body condition of both species dropped. A clear south-north pattern occurred with strongest effects in the northern part of the Baltic Proper (Casini et al., 2011). The increased sprat density is suggested to be a consequence of high fishing pressure on the predator cod, which led to an almost total disappearance of the species at that time (Casini et al., 2011, 2008; Österblom et al., 2007).

Given the very low population estimate for the Baltic harbour porpoise population, it is unlikely that there is strong competition for food. However reduced prey quality may have a negative impact on harbour porpoises' body condition and spatio-temporal changes may affect the species' distribution. In a study of 11 species of cetaceans in the North Atlantic, including the harbour porpoise, prey quality was found to be tightly coupled to metabolic costs. The relationship appeared to be independent of phylogeny and body size, suggesting that quality rather than quantity of food is a major determinant of foraging strategies. The dependence is pointed out as having implications for risk assessment of changing prey quality and quantity for marine top predators (Spitz et al., 2012).

5.1.5.Summary of threats

A summary of the threats described above is given in Table 5.

Table 5. Summary of actual and potential threats to the population. The action numbers refer to those described under "*6. Actions*". The priority for all actions listed is high, but for RES-02, MIT-04 and RES-09 where it is medium.

Actual/ potential threat	Cause or related activity	Evidence	Possible impact	Directly relevant actions
Direct lethal threats				
Bycatch in gillnets	Gillnet fishing	Strong in active nets, weak in derelict nets	Mortality	COOP-01—02; PACB-01; RES-03—06, 08; MON-03—04; MIT-01—04, 06
Physical injury from underwater noise	Clearance of underwater ordnance and other underwater explosions, use of active military sonar	Strong	Hearing damage and mortality	COOP-02; PACB-01; RES-07—08; MON-04; MIT-05—06
Sub-lethal threats				
Contaminants	Chemical use in the society	Strong	Immunosuppression, increased disease risk and reproductive failure	COOP-02, PACB-01, RES-08, MON-04
Behavioural impact from impulsive noise	Pile driving, use of active military sonar	Strong	Behavioural avoidance	COOP-02, RES-07—08, MIT-05—06
Masking and behavioural impact from continuous noise	Shipping	Moderate	Masking of echolocation and environmental signals, behavioural disruption and avoidance	COOP-02, RES-07—08, MIT-05—06
Reduced prey quality	Commercial fishing	Weak	Reduced nutritional status	COOP-02, PACB-01, RES-08—09, MON-04, MIT-06

5.2. Mitigation measures and monitoring

In the improvement of assessment approaches and methods, account shall be taken of the needs for monitoring programmes specified in MSFD Annex V. These include the needs to provide information on:

- the assessment of status in relation to GES,
- the identification of suitable indicators, and
- the assessment of the impact of the measures.

Further, there are needs to:

- aggregate the information on the basis of marine regions or sub-regions, and
- ensure the comparability within and between marine regions and/or sub-regions.

The improvement shall also take account of the following key principles for collection, management and use of data given in CFP Article 25(2):

- accuracy
- reliability and timeliness
- avoidance of duplication through improved coordination
- safe storage in database systems
- improved availability of data
- compliance with laws on personal data protection
- access for the European Commission, enabling it to check the availability and quality of data and the methodology used to collect them.

Regarding determination of GES, MSFD Article 3 set out that this shall be determined at the level of marine regions.

5.2.1.Monitor and estimate abundance and distribution

Acoustic monitoring of distribution and abundance shall be carried out both as continual long-term monitoring in selected areas, and as full-scale surveys regularly and with time intervals suitable in synchrony with the reporting cycles of the Habitats Directive and the MSFD. The methods shall build upon those developed in national monitoring programmes and in the SAMBAH project. For improvement of full-scale surveys, the methods for determining the detection function of acoustic harbour porpoise loggers in the Baltic Sea need to be improved.

Relevant Actions:

- Action MON-01: Implement and harmonize long-term continual acoustic harbour porpoise monitoring
- Action RES-02: Improve methods for estimation of absolute density and abundance of the Baltic harbour porpoise
- Action MON-02: Carry out full-scale surveys of harbour porpoise abundance and distribution

5.2.2.Monitor, estimate and reduce bycatch in gillnets

Bycatch can be independently monitored by on-board observers or remote electronic monitoring (REM) systems. Remote electronic systems have been successfully used on Danish commercial gillnetters of 10 – 15 m in length (Kindt-Larsen et al., 2012). Compared to on-board observers, REM systems can yield higher coverage at lower costs, they can be used on smaller vessels, and their data can be evaluated more than once by multiple persons. Among the challenges are data storage limitations, the limitations of vessels that can be covered, getting the fishermen to accept the REM system on-board, data confidentiality issues, and limited manufacturers of REM systems (Kindt-Larsen et al., 2012). In areas with very low bycatch risk of harbour porpoises, the use of REM systems is likely not highly prioritized. In those areas, reporting schemes, interview surveys etc. may be the most realistic options. The rate of success of such methods is highly dependent on respectful communication and long-term engagement in bycatch issues, taking socioeconomic aspects into account, by relevant partners. In addition to monitor harbour porpoise bycatch, REM systems can also be used for monitoring of pinger use, although not of their functioning.

Relevant Actions:

- Action RES-03: Improve methods for monitoring and estimation and harbour porpoise bycatch

- Action MON-03: Monitor and estimate harbour porpoise bycatch rates and estimate total annual bycatch

For efficient bycatch mitigation, the actions should be based on a spatio-temporal bycatch risk assessment (Kindt-Larsen et al., in press). The principle of such an analysis is to multiply spatio-temporal data on fishing effort for relevant gear types with harbour porpoise density. In order to get absolute estimates, data on bycatch rate is also needed. The spatio-temporal resolution of the data shall be of sufficient resolution for management purposes. To avoid moving the bycatch risk in time or space, the bycatch risk assessment should preferably include scenario analyses building on estimated responses by the fisheries to the considered management actions.

Relevant Action:

- Action RES-04: Carry out a spatio-temporal risk assessment of harbour porpoise bycatch

There are three main methods for reduction bycatch of harbour porpoises in active gillnets: replacement of gillnets by fishing gear with no harbour porpoise bycatch, use of acoustic deterrence devices (ADDs, generally called “pingers”) or acoustic alerting devices (AADs), or just reduction of fishing effort with relevant gillnets. To mitigate potential bycatch in ghost nets, the derelict fishing gear needs to be retrieved.

Examples of fishing gear with no harbour porpoise bycatch are traps, pots, hooks and seine nets. In the Baltic Sea, these gear types have often been developed and tested with the aim of reducing seal damage to fishing gear and catch in the fisheries of Atlantic cod, salmon (*Salmo salar*), sea-trout (*Salmo trutta*) and whitefish (*Coregonus* spp.) (Hemmingsson et al., 2008; Lunneryd et al., 2003; Suuronen et al., 2006; Westerberg et al., 2008). In areas where the use of these gear types overlaps with the distribution range of harbour porpoises, the elimination of harbour porpoise bycatch is an added value. Similar to gillnets, pots and traps are relatively cheap, do not cause physical damage of the sea floor, use less energy than trawls, and can have high catch selectivity. In a study carried out in the commercial cod fishery in Hanö Bight and a nearby archipelago area (Karlskrona skärgård) in 2009 – 2011, the catches of cod pots were evaluated in relation to gillnets and longlines (Königson et al., 2015). A comparison could be made of mean daily weight of cod per fishing vessel (WPUE) between the cod pots and the combined catches in gillnets and longlines for the time period of February – December 2009. Based on data on catch effort and assumed total gear capacity per vessel, no difference was found in daily WPUE between the cod pots and the traditional gillnets and longlines over the year. However the pot WPUE was markedly more variable between seasons with on average 52 per cent lower WPUE during April – June and 54 per cent higher during August – November, in relation to the traditional gear types. The pot WPUE of legal-sized cod was found to be significantly affected by water depth, time of year (month), and soak time. In one of the areas, the pot WPUE was also affected by the direction of the water current in relation to the orientation of the string of pots. Yet other studies in the Baltic Sea have shown that escape windows increase the size selectivity (Ovegård et al., 2011), and that green light stimuli increases the catch in numbers and biomass for cod above 38 cm (Bryhn et al., 2014). For flat fish there are currently no commercially useful pots available, however the development of small-scale seine nets are ongoing (Sara Königson, 26 May 2016, pers. comm.).

Relevant Actions:

- Action RES-05: Further develop and improve fishing gear that is commercially viable with no harbour porpoise bycatch
- Action MIT-01: Implement the use of fishing gear that is commercially viable with no harbour porpoise bycatch

As explained above, if reduction or elimination of fishing effort is used as a bycatch mitigation measure for harbour porpoises, the action should be based on a bycatch risk assessment to ensure a realized decrease of the bycatch risk. From 2005 to 2014, the overall fishing effort (hours) with gillnets of mesh size ≥ 90 mm was reduced by 77 per cent in the Baltic Sea (STECF, 2015; data downloaded from the European Commission DCF – Data dissemination database on 13 April 2016, https://datacollection.jrc.ec.europa.eu/dd/effort/maps). However this decrease is a result of fisheries regulations for other reasons together with changes in profitability, and not a result of strategic bycatch mitigation for harbour porpoises. Without a spatio-temporal bycatch risk assessment, it is not possible to estimate how the overall reduction in fishing effort may have affected the bycatch risk of harbour porpoises in the Baltic Sea.

Relevant Action:

- Action MIT-02: Reduce or eliminate fishing effort with gillnets or other gear known to cause porpoise bycatch in areas with higher harbour porpoise density or occurrence, and/ or in areas with higher risk of harbour porpoise bycatch, according to spatio-temporal risk assessments

The efficiency of pingers as a method to reduce bycatch of harbour porpoises has been evaluated in a number of studies. The general conclusion from 16 controlled experiments in North America and Europe is that harbour porpoises seem to avoid the area ensonified by pingers (review by Dawson et al., 2013; Kyhn et al., 2015; Larsen and Eigaard, 2014). Elements of habituation, measured as decreasing deterrence distance over time, have been found in experiments using pingers emitting sounds of constant frequencies and repetition rate (Carlström et al., 2009; Cox et al., 2001; Gearin et al., 2000; Kyhn et al., 2015). This has not been observed in experiments using pingers with more varied sounds (Kyhn et al., 2015). As the sound of commercially used pingers typically deterred harbour porpoises by a few hundred metres (Carlström et al., 2009; Culik et al., 2001), concern has been raised that substantial use of pingers in areas that are critical to harbour porpoises, such as reproduction areas, migration routes or SACs, may have negative impact on the population level. To evaluate this, further information is needed on how harbour porpoises react to pingers, for example how far they relocate, if the sensitivity varies for different sub-groups, such as mother-calf pairs, and how this may vary over time. Until adequate information is available, pingers should be used with caution. Regarding the implementation of pinger use, Dawson et al. (2013) conclude that effective implementation is difficult, and to this end education, outreach and enforcement are all critical components of effective implementation plans. Further, post-implementation monitoring is critical in assessing temporal trends in compliance and efficacy. In an operational gillnet fishery, bycatch rates of observed hauls with an incomplete set of pingers have been higher than in observed hauls with pingers (Palka et al., 2008). To be practical in areas where harbour porpoises and seals co-exist, seals cannot learn to associate the sound of pingers to food resources, the so called “dinner bell” effect. This has been observed for example for harbour seals (*Phoca vitulina*) in an experiment in a salmon fishery in northern Washington State, US, (Gearin et al., 2000), and for California sea lions (*Zalophus californianus*) during practical use of pingers in swordfish and thresher shark drift gillnet fishery in California (Carretta and Barlow, 2011). A possible solution to this is to use pingers that are audible to harbour porpoises, but not to seals.

Relevant Actions:

- Action RES-06: Improve the knowledge on potential population-level effects of the use of pingers, and develop acoustic devices for bycatch mitigation further
- Action MIT-03: Continue or implement the use of acoustic deterrent devices (“pingers”) and acoustic alerting devices proven to be successful when and where deemed appropriate

To reduce the risk of bycatch in ghost nets, actions shall be taken on the prevention, retrieval and safe handling of derelict fishing gear. The retrieval includes both identification of accumulation areas for derelict fishing gear, and the removal of the gear. A report on practical guidance on preventing and mitigating the significant adverse impacts of marine debris on marine and coastal biodiversity and habitats is given by CBD (2014), a toolkit for marine litter retention is available from the MARELITT project (Pilot project: Removal of marine litter from Europe's four regional seas, (http://www.marelitt.eu), and Baltic regional and national actions are outlined in the HELCOM Marine litter action plan (HELCOM, 2015).

Relevant Action:

- Action MIT-04: Prevent, retrieve and recycle derelict (“ghost”) fishing gear, with focus on high-density areas of harbour porpoises

5.2.3.Monitor and mitigate impact of underwater noise

The current situation in the Baltic Sea with extensive plans for construction of offshore windfarms, intense shipping and the critical conservation status of the Baltic harbour porpoise calls for urgent action both for further research and for the development and implementation of regionally harmonized national guidelines and thresholds. Important research topics are population level effects of impulsive noise, individual level and population level effects of continuous noise, and the development of indictors relevant for monitoring of environmental status with regard to underwater noise.

Impulsive underwater noise

Guidelines and thresholds to avoid, minimize or reduce the impacts on marine mammals by impulsive underwater noise are fundamental tools for transparent and consistent management of anthropogenic activities that generate underwater noise. Similarly, environmental impact assessment (EIA) guidelines are as fundamental for monitoring and evaluating their potential impact. In the Baltic region, guidelines or threshold values are available for Danish and German waters.

In Denmark, a model for calculating the cumulative underwater noise impact from construction of offshore wind farms, together with recommended threshold values for sound exposure levels generating PTS and TTS for harbour porpoises and harbour and grey seals, and behavioural changes on harbour porpoises, are presented in a memo from Energinet.dk (Energinet.dk 2015). Minimum requirements are given for calculations of project specific sound attenuation, for control measurements for determination of SEL of the pile installation, and for reporting. The model has been developed for Horns Rev 3 Offshore Windfarm in the North Sea, future offshore wind farms at Kriegers Flak in the Baltic Sea, and six nearshore windfarms. It is important to note that the recommended thresholds only reflect the onset of certain effects. As they do not take into consideration the conservation status of the population in question, this has to be done in the application of the threshold values. Areas where information is either sparse or missing, and are critical for evaluation of the effects of noise on marine mammals, are listed in the memo. For harbour porpoises, these concern information on verification of frequency weighting, whether the energy content of the signal determines the TTS threshold (“the equal energy hypothesis”), the effective deterring range of seal scarers, how individual behavioural responses translate to potential population effects on long-term survival and reproduction, and potential habituation to the noise emitted by pingers and seal scarers.

In Germany, thresholds for TTS in harbour porpoises, which is regarded as injury by national law (BNatSchG), have been established for the German North Sea (BMU, 2013). The thresholds consist of a dual criteria for SEL and peak-to-peak SPL. Regarding behavioural disturbance, only significant disturbance is prohibited, which is defined differently depending on the season. May – August is defined as a particularly sensitive period for harbour porpoises in the German North Sea, and outside this period, significant disturbance is defined by a maximum percentage of the marine area that falls within the disturbance radii of offshore windfarms under construction. For the sensitive period, and also in areas with high harbour porpoise densities such as northwest of the island of Sylt, it is noted that there is a greater potential to cause population-relevant disturbance. Given that the German thresholds take the harbour porpoise conservation status into account and are legally binding, they cannot be directly applied on the harbour porpoise population in the Baltic Sea. In addition to the thresholds, Germany has also developed a standard for investigation of the impacts of offshore wind turbines on the marine environment on features of conservation interest, including harbour porpoises (StUK4) (BSH, 2013). The objectives of the standard is to determine the spatial distribution and temporal variability of impacts in the pre-construction phase (baseline survey), to monitor the effects of construction, operation and decommissioning, and to establish a basis for evaluating the monitoring results.

Regarding marine mammal guidelines and thresholds for impacts on marine mammals by underwater noise in other countries, a brief global overview is given by Erbe (2013). Examples of national documents published after this overview are a Dutch framework for assessing ecological and cumulative effects of offshore wind farms (Heinis et al., 2015), guidance on how to manage the risk to marine mammals from man-made sound sources in Irish waters (NPWS, 2014), and the US draft guidance for assessing the effects of anthropogenic sound on marine mammals’ hearing (NOAA, 2015).

The mitigation methods for reduction of impact on harbour porpoises by impulsive underwater noise can generally be carried out on the following three different levels, in descending order of suitability regarding ecological impact of underwater noise:

1. reduction of the generation of underwater noise,
2. reduction of the spreading of underwater noise, or
3. reduction of the exposure to underwater noise.

The first two kinds of measures are dependent on the anthropogenic activity. For constructions of offshore windfarms, the most important measure for reducing the noise levels generated is the selection of foundation type. Reviews of alternatives and modifications of monopile foundations for noise mitigation are given by BMU (2013), OSPAR (2014) and Saleem (2011). For reduction of spreading of underwater noise, dampening constructions such as bubble curtains or cofferdams (noise isolation chambers) may be used (BMU, 2013; OSPAR, 2014). Bubble curtains may also be used to reduce the spreading of underwater noise from underwater explosions (Koschinski, 2011). For most kinds of noise generating activities, the exposure to underwater noise can be reduced by the following measures:

1. spatial and seasonal planning to avoid high risk areas and seasons,
2. visual and acoustic monitoring combined with stopping procedures, or
3. use of pingers and/or seal scarers to deter harbour porpoises from the zone of physical injury.

It should be noted that the last measurement may even increase the zone of behavioural disturbance.

Continuous underwater noise
For continuous underwater noise, the knowledge gaps on potential impacts are even greater than for impulsive noise, and no national guidelines or threshold values are available. The *International Maritime Organization (IMO)* has developed voluntary guidelines for the reduction of underwater noise from commercial shipping to address adverse impacts on marine life (IMO, 2014). These include methods for predicting underwater noise levels, standards and references for underwater noise measurements, design considerations for the propeller and hull, aspects on on-board machinery, and operational and maintenance considerations, such as propeller cleaning, maintenance of a smooth hull surface, selection of ship speed, and rerouting and operational decisions to reduce adverse impacts on marine life.

Relevant Actions for both impulsive and continuous underwater noise:

- Action RES-07: Improve the knowledge on impact of impulsive and continuous anthropogenic underwater noise on harbour porpoises, and development of threshold limits of significant disturbance and GES indicators
- Action MIT-05: Implement regionally harmonized national threshold limits and guidelines for regulation of underwater noise

5.2.4.Monitor and assess population status

The assessment of population status is dependent on the collection of dead specimens (bycatch and strandings) and results from the monitoring of distribution and abundance throughout the distribution range of the Baltic harbour porpoise population. Methods of estimating mortality limits include Potential Biological Removal (PBR) (Wade, 1998) and Catch Limit Algorithm (CLA) (Winship, 2009).

Relevant Actions:

- Action MON-04: Collect dead specimens and assess health status, contaminant levels, cause of mortality and life-history parameters of harbour porpoises
- Action RES-01: Improve knowledge on harbour porpoise population structure in the Baltic region
- Action RES-08: Estimate mortality limits and assess population viability for the Baltic harbour porpoise

5.2.5.Investigate habitat use and protect important areas

The development of acoustic and digital imaging monitoring methods and analysis tools opens up for new research and improved monitoring of harbour porpoise habitat use. The information is of high importance for the designation of protected areas, and the development of management plans including monitoring schemes of these.

Relevant Actions:

- Action RES-09: Develop and improve methods for and investigate spatio-temporal patterns of habitat use by harbour porpoises
- Action MIT-06: Expand the network of protected areas for harbour porpoises, improve its connectivity, and develop and implement appropriate management plans including monitoring schemes for these areas

6. Actions

The Actions in this section are organized in a logical order in broad terms. They are not in the order of implementation timeline or priority, but these are specified under each Action. A summary of all Actions and their relations to the objectives of the Jastarnia Plan are given in section "*6.7 Summary and implementation of actions*".

Actions are categorized as follows:

- COOP = cooperation
- MIT = mitigation measures
- MON = monitoring
- PACB = public awareness and capacity building
- RES = research essential for providing adequate management advice or filling in knowledge gaps.

The underlying rationale for all Actions is to reach the ultimate goal of ASCOBANS, i.e. to reach and maintain a favourable conservation status of the Baltic harbour porpoise population. In addition to this, the Actions are also relevant, in general, to the fulfilment of the following HELCOM objectives, Ministerial Declarations and Recommendations:

- The HELCOM Baltic Sea Action Plan ecological objective on viable populations of species (HELCOM, 2007)
- The HELCOM ministerial declaration of 2010 acknowledging:
  - the step towards the implementation of an ecosystem based approach, and insofar the beginning of the development of the Baltic Sea as a model of good management of human activities, and
  - the ambitious ongoing work to produce red lists on species and habitats.
- The HELCOM ministerial declaration of 2013 deciding to:
  - implement a regional Strategic Plan for Biodiversity for the 2011- 2020 period of the UN Convention of Biological Diversity, including the Aichi Biodiversity Targets, bearing in mind that the implementation of the Plan in the EU and its Member States is carried out through the EU Biodiversity Strategy, and more specifically
  - take decisive action to work towards a favourable conservation status of the harbour porpoise based on implementation of the ASCOBANS Jastarnia Plan for the harbour porpoise in the Baltic Sea, in particular by addressing the pressing problem of bycatch.
- HELCOM Recommendation 37/2 (2016) concerning the conservation of Baltic Sea species categorized as threatened according to the 2013 HELCOM Red List.

6.1. Increase involvement, awareness and cooperation

6.1.1. Action COOP-01: Involve stakeholders in the work of reducing bycatch of harbour porpoises

Description

Objectives:

- Reduction of bycatch by enhanced cooperation among relevant stakeholders.
- Increased involvement of fishermen throughout the process of bycatch mitigation, from planning to implementation.

Threats: Bycatch

Rationale:
By involvement of all relevant stakeholders in the development of bycatch mitigation measures, the rate of success in finding solutions that are practicable, equitable and meet with the acceptance of fishermen will most likely increase. Acceptance by fishermen is needed to ensure consistent and efficient implementation of mitigation measures.

This Action improves the following Actions:

- PACB-01: Improve communication and education for increased public awareness and collection of live observations and dead specimens of the Baltic harbour porpoise
- RES-03: Improve methods for monitoring and estimation and harbour porpoise bycatch
- MON-03: Monitor and estimate harbour porpoise bycatch rates and estimate total annual bycatch
- RES-05: Further develop and improve fishing gear that is commercially viable with no harbour porpoise bycatch
- MIT-02: Reduce or eliminate fishing effort with gillnets or other gear known to cause porpoise bycatch in areas with high harbour porpoise density or occurrence, and/ or in areas with high risk of harbour porpoise bycatch
- MIT-03: Continue or implement the use of acoustic deterrent devices (“pingers”) and acoustic alerting devices proven to be successful when and where deemed appropriate
- MIT-04: Prevent, retrieve and recycle derelict (“ghost”) fishing gear, with focus on high-density areas of harbour porpoises
- MON-04: Collect dead specimens and assess health status, contaminant levels, cause of mortality and life-history parameters of harbour porpoises

Activity or method:

- Establish working groups consisting of fishermen, scientists, competent authorities, and fisheries and environmental organizations to develop guidelines and methods for reducing and monitoring bycatch in relevant fisheries. Working groups can be established nationally and/or locally, with priority of areas with identified high risk of harbour porpoise bycatch (RES-04).
- Facilitate environmental certification of fisheries.

Implementation timeline: Continued

Actors
Responsible for implementation: Baltic Parties and Range States, including national armed forces

Relevant stakeholders: Professional and recreational fishermen, scientists, relevant authorities, fisheries and environmental NGOs, HELCOM Fish Group, HELCOM Seal Expert Group

Responsible for evaluation: Baltic Parties and Range States, including national armed forces

Priority
High

6.1.2. Action PACB-01: Improve communication and education for increased public awareness and collection of live observations and dead specimens of the Baltic harbour porpoise

Description
Objectives:

- Increased awareness among the general public and people with jobs related to the sea, in particular fishermen, of the threats faced by Baltic harbour porpoises, the need to take action to conserve the species and the options for action.
- Increased amount and harmonized quality of information collected, compiled and presented on harbour porpoise observations throughout the distribution range of the Baltic harbour porpoise population.

Threats: Bycatch, contaminants, underwater noise, reduced prey quality

Rationale:
Public awareness plays an essential part in supporting any recovery plan. People need to be aware that harbour porpoises are an integral part of the fauna of their local waters, that they are worth saving, what actions that can be undertaken to improve their survival, and what to do if an animal is encountered. The key target groups are Baltic fishermen and others working or recreating at or by the Baltic Sea. Fishermen are most likely to interact directly with harbour porpoises, and members of all groups working at or by the Baltic Sea are most likely to encounter harbour porpoises due to their long time spent at or by the sea. Further, due to their high numbers, the general public spending time by or at the Baltic Sea is also a key target group for information on harbour porpoise observations. The general public are also consumers of fishery products and the ultimate arbiters of public policy.

This Action improves the following ones:

- MON-04: Collect dead specimens and assess health status, contaminant levels, cause of mortality and life-history parameters of harbour porpoises

Activity or method:

- Continue the development and promotion of a regional approach to Baltic harbour porpoise conservation.
- Further develop and harmonize the means of reporting and presenting observational data, such as mobile apps and interactive web sites.
- Establish direct communication links between ASCOBANS and Baltic fishermen and fisheries organizations, and seek their assistance in determining how to reach fishing communities more effectively.
- Enlist the support of the general public and people related to the sea in obtaining reports of live harbour porpoise observations and collection of dead specimens.
- Cooperate internationally for further harmonizsation of data standards and improved uploading of national data to the HELCOM data and map service.
- Designate national contact points for continual cooperation on public awareness activities within the Baltic Parties/Range States.

In the realization of this Action, attention should be paid to the fact that public awareness work has to be objective, attendant to and respectful towards cultural and linguistic differences, and candid about scientific uncertainty.

Implementation timeline: Continued

Actors
Responsible for implementation: Baltic Parties and Range States, ASCOBANS Secretariat

Relevant stakeholders: Professionals working at or by the Baltic Sea (including fishermen), the general public, national authorities, scientists and scientific institutions, fisheries and environmental NGOs, media, HELCOM Secretariat

Responsible for evaluation: Baltic Parties and Range States, ASCOBANS Advisory Committee

Priority
High

6.1.3. Action COOP-02: Strive for close cooperation between ASCOBANS and other international bodies

Description
Objectives:

- Informed actions and recommendations by ASCOBANS and cooperating partners.
- Ensuring that ASCOBANS positions are known and taken into account in relevant processes (including legislation) at the international and EU levels.
- Leveraging of synergies between competent international organizations, avoidance of duplication of effort.

Threats: Bycatch, contaminants, underwater noise, reduced prey quality

Rationale:
Cooperation between ASCOBANS and other relevant regional and international players will contribute to achieving synergies, avoiding duplication of effort and promoting more efficient and result-oriented use of available resources. It is also in line with the MSFD, stating that Member States shall:

- take due account of the fact that the marine waters of the Baltic Sea form an integral marine region (Article 4(1)),
- cooperate to ensure that the measures required to achieve the MSFD objectives are coherent and coordinated across the marine region (Article 5(2)), and,
- in order to achieve coordination, use existing relevant regional institutional cooperation structures, including Regional Sea Conventions (Article 6(1)).

Activity or method:

- Send the revised Jastarnia Plan to the national governments of the Baltic Parties and Range States, as well as to the European Commission, HELCOM, ICES and other relevant bodies, including NGOs. An appropriate cover letter informing them of the revision of the Plan and outlining what is expected of them should be included.
- Have regular consultations between ASCOBANS Secretariat and Secretariats of other relevant organizations, mutual representation at meetings, and continual exchange of information.

Implementation timeline: Continued

Actors
Responsible for implementation: ASCOBANS Secretariat, Baltic Parties

Relevant stakeholders: European, regional and international organizations and bodies, such as the EU, HELCOM including relevant working groups, and international conventions

Responsible for evaluation: ASCOBANS Advisory Committee

Priority
High

6.2. Monitor and estimate abundance and distribution

6.2.1. Action RES-01: Improve knowledge on harbour porpoise population structure in the Baltic region

Description
Objective:

- More thoroughly defined populations and their distribution throughout the year in the Baltic region.

Threats: n/a

Rationale:
A good knowledge of population structure and population distribution throughout the year is fundamental for determining the population status and carrying out necessary conservation actions. Current knowledge of the population structure of the harbour porpoise in the Baltic region shows that this population should be managed separately. However, there are uncertainties as to how strong the separation is and as to the spatio-temporal distribution of the Baltic harbour porpoise population.

This Action improves all Actions with a spatio-temporal component, including:

- MON-03: Monitor and estimate harbour porpoise bycatch rates and estimate total annual bycatch
- RES-04: Carry out a spatio-temporal risk assessment of harbour porpoise bycatch
- MIT-05: Implement regionally harmonized national threshold limits and guidelines for regulation of underwater noise

- MIT-06: Expand the network of protected areas for harbour porpoises, improve its connectivity, and develop and implement appropriate management plans including monitoring schemes for these areas
- MON-01: Implement and harmonize long-term continual acoustic harbour porpoise monitoring
- MON-02: Carry out full-scale surveys of harbour porpoise abundance and distribution

This Action is directly related to the implementation of the following Articles of EU directives or regulations:
- Habitats Directive Article 11 concerning the surveillance of the conservation status of relevant species covered.
- MSFD Article 11(1) concerning the establishment and implementation of coordinated monitoring programmes for the assessment of the environmental status, including a description of the population dynamics of species of marine mammals (Annex III, Table 1).

This Action is directly related to the fulfilment of HELCOM Recommendation 17/2(b) (2013) concerning close co-operation with ASCOBANS and ICES for collection and analysis of additional data on, among other things, population distribution and abundance and stock identities.

Activity or method:
- Integrated analysis of available genetic and morphological evidence, taking account of new acoustic, tracking, and genetic data.
- Broad initiative to obtain and analyse additional tissue samples from the Baltic Proper.
- Enhancement of efforts to locate stranded and bycaught animals and to obtain samples from these individuals (PACB-01).

Implementation timeline: Continued

Actors
Responsible for implementation: National authorities, scientists

Relevant stakeholders: HELCOM Seal Expert Group

Responsible for evaluation: National authorities, based on appropriate scientific expertise and advice

Priority
High

6.2.2. Action MON-01: Implement and harmonize long-term continual acoustic harbour porpoise monitoring

Description
Objective:
- Sufficient monitoring for providing input to assessment of trends in population abundance and distribution between full-scale surveys.

Threats: n/a

Rationale:
For assessment of trends or detecting early warnings in changes in population abundance and distribution, continual monitoring is needed between full-scale surveys. The cost-effectiveness of continual monitoring can be increased if combined with monitoring of protected areas for harbour porpoises and potentially also monitoring of underwater noise in accordance with the MSFD.

This Action improves the following Actions:
- RES-08: Estimate mortality limits and assess population viability for the Baltic harbour porpoise

Activity or method:
- Build upon the methodology for acoustic monitoring developed in national monitoring schemes and the SAMBAH project.

- Harmonize the continual acoustic monitoring across the Baltic Sea by cooperation with national monitoring schemes in protected areas for harbour porpoises and monitoring of underwater noise in accordance with the MSFD.
- Develop a methodology for evaluation of the results from continual monitoring in relation to those from full-scale surveys of harbour porpoise distribution and abundance.
- Collaborate with HELCOM in the development of core indicators.

This Action is directly related to the implementation of the following Articles of EU directives or regulations:

- Habitats Directive Article 11 concerning the surveillance of the conservation status of listed habitats and species, including the harbour porpoise.
- Habitats Directive Article 17 concerning the reporting of, among other things, the main results of the surveillance of the conservation status of those habitats and species.
- MSFD Article 11(1) concerning the establishment and implementation of coordinated monitoring programmes for the ongoing assessment of the environmental status of their waters by reference to the established environmental targets.
- MSFD Article 17(2) concerning the coordinated review of the marine strategies, including the monitoring programmes.

This Action is directly related to the fulfilment of following HELCOM Recommendation 35/1(k) (2014) concerning the assessment of the effectiveness of the management plans or measures of HELCOM MPAs by conducting monitoring, including the placement of monitoring stations inside the MPAs.

Implementation timeline: Immediate

Actors
Responsible for implementation: National authorities, scientists

Relevant stakeholders: Relevant European, regional and international organizations and bodies, relevant international conventions, HELCOM Seal Expert Group, HELCOM Gear group

Responsible for evaluation: National authorities, based on appropriate scientific expertise and advice

Priority
High

6.2.3. Action RES-02: Improve methods for estimation of absolute density and abundance of the Baltic harbour porpoise

Description
Objective:

- Improved methods for determining the detection function of acoustic harbour porpoise loggers in low-density areas.

Threats: n/a

Rationale:
Practical and reliable methods for determining the detection function for acoustic loggers are essential for estimating absolute density and abundance of harbour porpoises by acoustic surveys. Ideally, the detection function should be determined throughout the survey area both in time and space to capture the actual environmental conditions and harbour porpoise behaviour. The low density of harbour porpoises in the Baltic Sea calls for further development of such methods and up until now their application in the Baltic Sea has been very limited.

This Action improves the following Actions:

- MON-02: Carry out full-scale surveys of harbour porpoise abundance and distribution

This Action is directly related to the implementation of the following Articles of EU directives or regulations:

- Habitats Directive Article 18(1) encouraging the necessary research and scientific work regarding the monitoring obligation referred to in Article 11. For the purpose of proper coordination of research, information shall be exchanged at Member State and Community Level.

Activity or method:

- Develop acoustic methods for determining the detection function of harbour porpoise loggers in the Baltic Sea, such as spatially explicit capture recapture (SECR) techniques, "stereo" or "ranging" devices, or improved methods for measuring and modelling the sound propagation of harbour porpoise echolocation signals.

Implementation timeline: Continued

Actors
Responsible for implementation: National authorities, scientists

Relevant stakeholders: The industry of relevant underwater acoustic recording or logging devices, HELCOM Seal Expert Group

Responsible for evaluation: National authorities, based on appropriate scientific expertise and advice

Priority
Medium

6.2.4. Action MON-02: Carry out full-scale surveys of harbour porpoise abundance and distribution

Description
Objective:

- Updated abundance estimates and distribution maps of the Baltic harbour porpoise provided in synchrony with the requirements on reporting by the Habitats Directive and the MSFD.

Threats: n/a

Rationale:
Regular full-scale surveys are essential for the assessment of population status and trends.

This Action improves the following Actions:

- RES-08: Estimate mortality limits and assess population viability for the Baltic harbour porpoise

This Action is directly related to the implementation of the following Articles of EU directives or regulations:

- Habitats Directive Article 11 concerning the surveillance of the conservation status of listed habitats and species, including the harbour porpoise.
- Habitats Directive Article 17 concerning the reporting of, among other things, the main results of the surveillance of the conservation status of those habitats and species.
- MSFD Article 11(1) concerning the establishment and implementation of coordinated monitoring programmes for the ongoing assessment of the environmental status of their waters by reference to the established environmental targets.
- MSFD Article 17(2) concerning the coordinated review of the marine strategies, including the monitoring programmes.

Activity or method:

- Build upon the methodology developed by the SAMBAH project, taking account for improved methods of estimating the harbour porpoise detection function (RES-02).
- Collaborate with HELCOM in the development of core indicators.
- Carry out full-scale surveys of harbour porpoise abundance and distribution on a regular basis and with time intervals suitable for detecting trends and in synchrony with the reporting cycles of the Habitats Directive and the MSFD.

Implementation timeline: Intermediate

Actors
Responsible for implementation: National authorities, scientists

Relevant stakeholders: Relevant European, regional and international organizations and bodies, relevant international conventions, HELCOM Seal Expert Group, HELCOM Gear group

Responsible for evaluation: National authorities, based on appropriate scientific expertise and advice

Priority
High for each reporting period of the Habitats Directive and the MSFD

6.3. Monitor, estimate and reduce bycatch

6.3.1. Action RES-03: Improve methods for monitoring and estimation of harbour porpoise bycatch

Description
Objective:

- Accurate, practical and cost-efficient methods for estimating bycatch rates of Baltic harbour porpoises for all vessel sizes/types within the geographical scope of the Jastarnia Plan.

Threats: Bycatch

Rationale:
Very limited information on bycatch rates is available for the Baltic harbour porpoise population. The relatively low harbour porpoise density, the population's wide distribution range, and the high proportion of small fishing vessels call for improved methods of bycatch monitoring and estimation. Accurate bycatch rates are essential for assessing the effectiveness of bycatch mitigation measures, and to carry out the following Actions with high precision:

- MON-03: Monitor and estimate harbour porpoise bycatch rates and estimate total annual bycatch
- RES-04: Carry out a spatio-temporal risk assessment of harbour porpoise bycatch

Further, improvement of collection of bycaught specimens, as a part of bycatch monitoring, also provides essential information to the following Action:

- MON-04: Collect dead specimens and assess health status, contaminant levels, cause of mortality and life-history parameters of harbour porpoises

This Action is directly related to the fulfilment of HELCOM Recommendation 17/2(b) (2013) concerning close co-operation with ASCOBANS and ICES for collection and analysis of additional data on, among other things, threats such as bycatch mortality.

Activity or method:

- Adapt existing surveillance methods (remote electronic monitoring systems, on-board observers, carcass collection programmes, reporting schemes, and interview surveys) to local fishing conditions (vessel size, gear type, professional or recreational fishery etc.) as well as harbour porpoise density and bycatch risk (Action RES-04), to make them practical and efficient.
- Collaborate with HELCOM in the development of core indicators and coordinated monitoring programmes
- Involve fishermen and fisheries organizations for increased success and reliability of results (COOP-01).
- For remote electronic monitoring systems, further develop digital tools for data analyses.
- Facilitate landings of harbour porpoises (MON-04). This may require changes in national and/or international legislation.

Implementation timeline: Immediate

Actors
Responsible for implementation: National authorities, scientist, fisheries

Relevant stakeholders: Professional and recreational fishermen, fisheries and environmental NGOs, the industry relevant for development of bycatch monitoring methods, relevant HELCOM working groups such as HELCOM Gear and HELCOM Seal Expert Group

Responsible for evaluation: National authorities, based on appropriate scientific expertise and advice

Priority
High

6.3.2. Action MON-03: Monitor and estimate harbour porpoise bycatch rates and estimate total annual bycatch

Description
Objective:

- Bycatch rates and total annual bycatch of Baltic harbour porpoises estimated with high precision for all vessel sizes/types within the geographical scope of the Jastarnia Plan.

Threats: Bycatch

Rationale:
Very limited information on bycatch rate and no reliable estimate of total annual bycatch are available for the Baltic harbour porpoise population. Regardless of vessel size, vessel type, type of fishery or gear type, accurate bycatch rates are essential for assessing the effectiveness of bycatch mitigation measures, and to carry out the following Action with high precision:

- RES-08: Estimate mortality limits and assess population viability for the Baltic harbour porpoise

Further, the collection of bycaught specimens, as a part of bycatch monitoring, also provides material the following Action:

- MON-04: Collect dead specimens and assess health status, contaminant levels, cause of mortality and life-history parameters of harbour porpoises

This Action is directly related to the implementation of the following Articles of EU directives:

- Habitats Directive Article 12(4) concerning the establishment of a system to monitor the incidental capture and killing.
- MSFD Article 10(1) referring to the establishment of environmental targets and associated indicators to guide progress towards achieving GES.
- MSFD Article 11(1) concerning the establishment monitoring programmes of, among other elements, the selective extraction of species, including incidental non-target catches (e.g. by commercial and recreational fishing).

This Action is directly related to the fulfilment of HELCOM Recommendation 17/2(b) (2013) concerning close co-operation with ASCOBANS and ICES for collection and analysis of additional data on, among other things, threats such as bycatch mortality.

Activity or method:

- Apply existing and improved methods for monitoring and estimating bycatch (RES-03).
- Collect and compile data on total fishing effort with relevant gear types for estimation of total bycatch numbers.
- Collaborate with HELCOM in the development of core indicators and coordinated monitoring programmes.
- Involve fishermen and fisheries organizations for increased success and reliability of results (COOP-01).

Implementation timeline: Immediate

Actors
Responsible for implementation: National authorities

Relevant stakeholders: Relevant European, regional and international organizations and bodies, relevant regional conventions, relevant HELCOM working groups such as HELCOM Gear and HELCOM Seal Expert Groups, scientists, professional and recreational fishermen, fisheries and environmental NGOs

Responsible for evaluation: National authorities

Priority
High

6.3.3. Action RES-04: Carry out a spatio-temporal risk assessment of harbour porpoise bycatch

Description
Objective:

- Estimated spatio-temporal bycatch risk throughout the population's distribution range.

Threats: Bycatch

Rationale:
A bycatch risk assessment can be carried out with two different purposes:

- Based on current data, it is a powerful tool to identify where and when bycatch mitigation measures are most efficient, and where and when they are not needed.
- By adjusting the theoretical fishing effort, it can be used for scenario analyses, investigating predicted changes in bycatch numbers due to changes in fishing effort as a result of e.g. changes in fishing regulations.

This Action improves the following ones:

- MIT-02: Reduce or eliminate fishing effort with gillnets or other gear known to cause porpoise bycatch in areas with higher harbour porpoise density or occurrence, and/ or in areas with higher risk of harbour porpoise bycatch, according to spatio-temporal risk assessments
- MIT-03: Continue or implement the use of acoustic deterrent devices ("pingers") and acoustic alerting devices proven to be successful when and where deemed appropriate
- MIT-06: Expand the network of protected areas for harbour porpoises, improve its connectivity, and develop and implement appropriate management plans including monitoring schemes for these areas

This Action is directly related to the implementation of the following Articles of EU directives or regulations:

- Habitats Directive Article 12 concerning the implementation of a strict system of protection within the natural range of the harbour porpoise.
- MSFD Article 1(1) referring to that necessary measures shall be taken to achieve or maintain GES by 2020 at the latest, especially with regard to descriptors 1 (marine biological diversity) and 4 (marine food web).
- MSFD Article 11(1) referring Annex V stating, among other things, that monitoring programmes shall include activities to confirm that the corrective measures deliver the desired changes and not any unwanted side effects.
- CFP Article 2(3) referring to the implementation of the eco-system based approach to fisheries management as to ensure minimized negative impacts of fishing activities on the marine ecosystem.
- CFP Article 2(5j) referring to that the CFP shall be coherent with the EU environmental legislation, in particular the objective of achieving GES by 2020 as set out in MSFD Article 1(1).

This Action is directly related to the fulfilment of HELCOM Recommendation 17/2(b) (2013) concerning close co-operation with ASCOBANS and ICES for collection and analysis of additional data on, among other things, threats such as bycatch mortality.

Activity or method:

- Collate data or carry out expert judgement based on available information on gear-specific bycatch rates (MON-03), spatio-temporal distribution of harbour porpoises (MON-02), and spatio-temporal information on fishing effort.
- Carry out a spatio-temporal bycatch risk assessment for as large proportion as possible of the distribution range of the Baltic harbour porpoise population.
- Improve the level of accuracy and/or size of the geographical area when further data of improved quality or quantity becomes available.
- Carry out scenario analyses of potential effects on total bycatch numbers due to potential changes in fishing effort, especially in the case of proposed changes in fishing regulations.

Implementation timeline: Immediate

Actors
Responsible for implementation: National authorities, scientists

Relevant stakeholders: Fishermen, fisheries NGOs, HELCOM Seal Expert Group

Responsible for evaluation: National authorities, based on appropriate scientific expertise and advice

Priority
High

6.3.4. Action RES-05: Further develop and improve fishing gear that is commercially viable with no harbour porpoise bycatch

Description
Objective:

- Locally adopted, commercially viable coastal fishing methods with no harbour porpoise bycatch.

Threats: Bycatch

Rationale:
Fishing gear with no harbour porpoise bycatch, such as traps, pots, hooks and seine nets, have in some instances been shown to be an economically profitable alternative to gillnets, including in the Baltic Sea. As local conditions vary, further development is needed to increase the applicability of such gear types to include additional geographical areas, target species etc. It may also be desirable to improve the economic profitability, handling aspects etc. in areas or fisheries where these gear types already have been shown to be successful.

This Action improves the following ones:

- MIT-01: Implement the use of fishing gear that is commercially viable with no harbour porpoise bycatch
- MIT-02: Reduce or eliminate fishing effort with gillnets or other gear known to cause porpoise bycatch in areas with higher harbour porpoise density or occurrence, and/ or in areas with higher risk of harbour porpoise bycatch, according to spatio-temporal risk assessments

This Action is directly related to the fulfilment or implementation of following the HELCOM BSAP actions of the biodiversity and nature conservation segment (HELCOM 2007) or HELCOM Recommendations:

- Development and implementation of fisheries management based on the ecosystem approach in order to enhance the balance between sustainable use and protection of marine natural resources.
- Cooperation between competent authorities and fisheries organizations for evaluation of the effectiveness of existing technical measures to minimize bycatch of harbour porpoises, and to introduce adequate new technologies and measures.
- HELCOM Recommendation 17/2(a) (2013) giving highest priority to avoiding bycatch of harbour porpoises, particularly following the recommendations of ASCOBANS and the ASCOBANS Jastarnia Plan, in order to achieve the ecological objective of reaching bycatch rates close to zero.

Activity or method:

- Develop and evaluate alternative fishing gear and/or practices, building upon existing experiences and devices and paying attention to the ecosystem approach.
- Investigate suitable ways of implementing fishing gear with no harbour porpoise bycatch
- Focus on fisheries with high risk of harbour porpoise bycatch (RES-04).
- Involve fishermen and fisheries organizations for increased success and reliability of results (COOP-01).

Implementation timeline: Immediate/continued

Actors
Responsible for implementation: National authorities, scientists, fisheries

Relevant stakeholders: Professional and recreational fishermen, fisheries and environmental NGOs, eco-labelling organizations, the fishing gear industry, HELCOM Fish Group

Responsible for evaluation: National authorities, based on appropriate scientific expertise and advice, and fisheries

Priority
High

6.3.5. Action MIT-01: Implement the use of fishing gear that is commercially viable with no harbour porpoise bycatch

Description
Objective:

- Significant contribution to reaching bycatch levels at or below sustainable mortality limits with sustained viable fisheries.

Threats: Bycatch

Rationale:
In order to maintain viable fisheries while reducing or eliminating the fishing effort with gillnets or other gear known to cause porpoise bycatch (MIT-02), implementation of fishing gear with no harbour porpoise bycatch is fundamental.

This Action is directly related to the following Articles of EU directives or regulations:

- Habitats Directive Article 12(4) concerning the establishment of a system of strict protection within the harbour porpoise’s natural range.
- Habitats Directive Article 12(1b) concerning the establishment of a system of strict protection prohibiting all forms of deliberate capture or killing of Annex IV species within their natural range.
- Habitats Directive Article 12(4) concerning further conservation measures to ensure that incidental capture and killing do not have a significant negative impact on the Annex IV species.
- MSFD Article 1(1) referring to the need for measures to be taken to achieve or maintain GES by 2020 at the latest, especially with regard to descriptors 1 (marine biological diversity) and 4 (marine food web).
- CFP Article 2(3) referring to the implementation of the ecosystem-based approach to fisheries management as to ensure minimized negative impacts of fishing activities on the marine ecosystem.
- CFP Article 2(5j) referring to that the CFP shall be coherent with the EU environmental legislation, in particular the objective of achieving GES by 2020 as set out in MSFD Article 1(1).

This Action is directly related to the fulfilment or implementation of following the HELCOM BSAP actions of the biodiversity and nature conservation segment (HELCOM 2007) or HELCOM Recommendations:

- Development and implementation of fisheries management based on the ecosystem approach in order to enhance the balance between sustainable use and protection of marine natural resources.
- Cooperation between competent authorities and fisheries organizations for evaluation of the effectiveness of existing technical measures to minimize bycatch of harbour porpoises, and to introduce adequate new technologies and measures.

- HELCOM Recommendation 17/2(a) (2013) giving highest priority to avoiding bycatch of harbour porpoises, particularly following the recommendations of ASCOBANS and the ASCOBANS Jastarnia Plan, in order to achieve the ecological objective of reaching bycatch rates close to zero.

Activity or method:
- Implement existing and improved commercially viable fishing gear with no harbour porpoise bycatch (RES-05), such as traps, pots, hooks and seine nets.
- Focus on fisheries with high risk of harbour porpoise bycatch (RES-04).
- Involve fishermen and fisheries organizations for increased success and reliability of results (COOP-01).
- Find incentives for the fisheries, such as eco-labelling, to switch to fishing gear with no harbour porpoise bycatch.

Implementation timeline: Immediate

Actors
Responsible for implementation: National authorities, fisheries

Relevant stakeholders: Scientists, professional and recreational fishermen, fisheries and environmental NGOs, eco-labelling organizations, the fishing gear industry, HELCOM Fish Group

Responsible for evaluation: National authorities

Priority
High

6.3.6. Action MIT-02: Reduce or eliminate fishing effort with gillnets or other gear known to cause porpoise bycatch in areas with higher harbour porpoise density or occurrence, and/ or in areas with higher risk of harbour porpoise bycatch, according to spatio-temporal risk assessments

Description
Objective:
- To allow population recovery

Threats: Bycatch

Rationale:
As bycatch has been identified as the greatest source of mortality to harbour porpoises in the Baltic Sea, the fishing effort with gillnets and other gear types with high risk of harbour porpoise bycatch needs to be reduced or eliminated to reach bycatch levels at or below sustainable limits (RES-08). This applies to all vessels, regardless of size or type.

This Action is directly related to the implementation of the following Articles of EU directives or regulations:
- Habitats Directive Article 12(1b) concerning the establishment of a system of strict protection prohibiting all forms of deliberate capture or killing of Annex IV species within their natural range.
- Habitats Directive Article 12(4) concerning further conservation measures to ensure that incidental capture and killing do not have a significant negative impact on the Annex IV species.
- MSFD Article 1(1) referring to that necessary measures shall be taken to achieve or maintain GES by 2020 at the latest, especially with regard to descriptors 1 (marine biological diversity) and 4 (marine food web).
- CFP Article 2(3) referring to the implementation of the ecosystem-based approach to fisheries management as to ensure minimized negative impacts of fishing activities on the marine ecosystem.
- CFP Article 2(5j) referring to that the CFP shall be coherent with the EU environmental legislation, in particular the objective of achieving GES by 2020 as set out in MSFD Article 1(1).

This Action is directly related to the fulfilment or implementation of following the HELCOM BSAP actions of the biodiversity and nature conservation segment (HELCOM 2007) or HELCOM Recommendations:

- Development and implementation of fisheries management based on the ecosystem approach in order to enhance the balance between sustainable use and protection of marine natural resources.
- Cooperation between competent authorities and fisheries organizations for the designation of additional permanent closures of sufficient size for fisheries to prevent capture of non-target species to protect important reproduction and feeding areas and to protect ecosystems.
- HELCOM Recommendation 17/2(a) (2013) giving highest priority to avoiding bycatch of harbour porpoises, particularly following the recommendations of ASCOBANS and the ASCOBANS Jastarnia Plan, in order to achieve the ecological objective of reaching bycatch rates close to zero.

Activity or method:

- Reduce or eliminate fishing effort with gillnets or other gear known to cause porpoise bycatch, preferably in combination with the implementation of commercially viable fishing gear with no harbour porpoise bycatch (MIT-01) to maintain vital fisheries.
- Focus on fisheries with high risk of harbour porpoise bycatch (RES-04), using the most relevant and current data.
- Involve fishermen and fisheries organizations for increased success and reliability of results (COOP-01).

Implementation timeline: Immediate

Actors
Responsible for implementation: National authorities, fisheries

Relevant stakeholders: Scientists, professional and recreational fishermen, fisheries and environmental NGOs, HELCOM Seal Expert Group, HELCOM Fish Group

Responsible for evaluation: National authorities

Priority
High

6.3.7. Action RES-06: Improve the knowledge on potential population-level effects of the use of pingers, and develop acoustic devices for bycatch mitigation further

Description
Objectives

- Ensure that acoustic deterrent and alerting devices reduce harbour porpoise bycatch and have no negative effects on the population level.
- Ensure that acoustic deterrent and alerting devices are practical to use in relation to handling, battery lifetime and the presence of seals.

Threats: Bycatch

Rationale:
For vessels above a certain size, using certain fishing gear and fishing in certain areas, pinger use is mandatory under EU legislation. Pingers can also be required by national or local rules or regulations, and in other areas they can be used voluntarily. Pingers are often the bycatch mitigation measure preferred by gillnet fisheries, as they reduce harbour porpoise bycatch without altering the fishing gear. However, further knowledge is needed on habitat exclusion and habituation of harbour porpoises, and how this may transfer to the population level. Particular consideration needs to be taken to reproduction areas.

In areas where harbour porpoises and seals coexist, it is important that pingers do not act as “dinner bells” to the seals. Most commercially available pingers are not seal-safe, therefore further development of the design is needed.

Acoustic alerting devices are a potential alternative to acoustic deterrent devices. An alerting device is intended to emit signals that are not perceived as threatening by harbour porpoises, but rather cause them to increase their own echolocation activity and thereby increase their chances of detecting the fishing gear. Initial work has been carried out on this, but further studies are needed to improve and evaluate the method.

This Action improves the following ones:

- MIT-03: Continue or implement the use of acoustic deterrent devices ("pingers") and acoustic alerting devices proven to be successful when and where deemed appropriate

This Action is directly related to the fulfilment or implementation of following the HELCOM BSAP actions of the biodiversity and nature conservation segment (HELCOM 2007) or HELCOM Recommendations:

- Development and implementation of fisheries management based on the ecosystem approach in order to enhance the balance between sustainable use and protection of marine natural resources.
- Cooperation between competent authorities and fisheries organizations for evaluation of the effectiveness of existing technical measures to minimize bycatch of harbour porpoises, and to introduce adequate new technologies and measures.
- HELCOM Recommendation 17/2(a) (2013) giving highest priority to avoiding bycatch of harbour porpoises, particularly following the recommendations of ASCOBANS and the ASCOBANS Jastarnia Plan, in order to achieve the ecological objective of reaching bycatch rates close to zero.

Activity or method:

- Examine habitat exclusion and habituation of harbour porpoises, and how this may transfer to the population level.
- Develop and evaluate seal-safe pingers.
- Develop and evaluate acoustic alerting devices that are efficient in reducing harbour porpoise bycatch without causing negative effects on the population level.
- Involve fishermen and fisheries organizations for increased success and reliability of results (COOP-01).

Implementation timeline: Immediate/continued

Actors
Responsible for implementation: National authorities

Relevant stakeholders: Scientists, professional fishermen, fisheries and environmental NGOs, eco-labelling organizations, the industry of acoustic alerting or deterrence devices, HELCOM Seal Expert Group

Responsible for evaluation: National authorities

Priority
High

6.3.8. Action MIT-03: Continue or implement the use of acoustic deterrent devices ("pingers") and acoustic alerting devices proven to be successful when and where deemed appropriate

Description
Objective:

- Significant contribution to reaching bycatch levels at or below sustainable mortality limits with sustained viable fisheries.

Threats: Bycatch

Rationale:
In addition to the mandatory use of pingers under EU legislation, pingers may be a suitable bycatch mitigation measure in further areas, time periods and gear types. Seal-safe pingers may be needed,

and if proven successful regarding effectiveness, potential population effects and practical aspects, acoustic alerting devices may be a suitable alternative (RES-06).

This Action is directly related to the following Articles of EU directives or regulations:

- Habitats Directive Article 12(4) concerning the establishment of a system of strict protection within the harbour porpoise's natural range.
- MSFD Article 1(1) referring to the fact that necessary measures shall be taken to achieve or maintain GES by 2020 at the latest, especially with regard to descriptors 1 (marine biological diversity) and 4 (marine food web).
- CFP Article 2(3) referring to the implementation of the ecosystem-based approach to fisheries management as to ensure minimized negative impacts of fishing activities on the marine ecosystem.
- CFP Article 2(5j) referring to that the CFP shall be coherent with the EU environmental legislation, in particular the objective of achieving GES by 2020 as set out in MSFD Article 1(1).

This Action is directly related to the fulfilment or implementation of following the HELCOM BSAP actions of the biodiversity and nature conservation segment (HELCOM 2007) or HELCOM Recommendations:

- Development and implementation of fisheries management based on the ecosystem approach in order to enhance the balance between sustainable use and protection of marine natural resources.
- Cooperation between competent authorities and fisheries organizations for evaluation of the effectiveness of existing technical measures to minimize bycatch of harbour porpoises, and to introduce adequate new technologies and measures.
- HELCOM Recommendation 17/2(a) (2013) giving highest priority to avoiding bycatch of harbour porpoises, particularly following the recommendations of ASCOBANS and the ASCOBANS Jastarnia Plan, in order to achieve the ecological objective of reaching bycatch rates close to zero.

Activity or method:

- Where and when deemed appropriate, continue or initiate the use of pingers.
- Avoid negative effects on the population level, for example by causing considerable habitat exclusion and disturbance in reproduction areas (RES-06).
- Where and when implemented, monitor the use and functionality of pingers.
- Make sure to continue the development and further improvement of commercially viable fishing gear with no harbour porpoise bycatch (RES-05) as pingers shall be seen as an interim mitigation measure due to noise pollution.
- If proven successful regarding effectiveness, potential population effects and practical aspects, consider the use of seal-safe pingers or acoustic alerting devices (RES-06) as an alternative to traditional pingers.
- Involve fishermen and fisheries organizations for increased success and reliability of results (COOP-01).

Implementation timeline: Immediate/continued

Actors
Responsible for implementation: National authorities, fisheries

Relevant stakeholders: HELCOM Fish Group, scientists, professional and recreational fishermen, fisheries and environmental NGOs, eco-labelling organizations, the fishing gear industry

Responsible for evaluation: National authorities

Priority
High

6.3.9. Action MIT-04: Prevent, retrieve and recycle derelict ("ghost") fishing gear, with focus on high-density areas of harbour porpoises

Description

Objective:

- Reduce the risk of harbour porpoise bycatch in ghost nets.

Threats: Bycatch

Rationale:

Ghost nets contribute to effective fishing effort of fish, and most probably also to bycatch of harbour porpoises, in the Baltic Sea. The clearance of ghost nets constitutes a reduction in fishing effort without decreasing the fishing yield.

This Action is directly related to the implementation of the following Articles of EU directives or regulations:

- Habitats Directive Article 12(4) concerning further conservation measures to ensure that incidental capture and killing do not have a significant negative impact on the Annex IV species.
- MSFD Article 1(1) referring to the fact that necessary measures shall be taken to achieve or maintain GES by 2020 at the latest, especially with regard to descriptor 10 (marine litter).
- CFP Article 2(3) referring to the implementation of the ecosystem-based approach to fisheries management so as to ensure minimized negative impacts of fishing activities on the marine ecosystem.
- CFP Article 2(5j) referring to that the CFP shall be coherent with the EU environmental legislation, in particular the objective of achieving GES by 2020 as set out in MSFD Article 1(1).

This Action is directly related to the fulfilment or implementation of the following HELCOM Recommendations:

- HELCOM Recommendation 36/1 concerning regional (RS10 – RS12) and voluntary national actions (NS8 – NS10) addressing sea-based sources of marine litter including: mapping sites with high risk of ghost nets, removal of ghost nets, promotion of removal of lost fishing gear, safe management of ghost nets on land, and the establishment of partnerships for implementation of passive Fishing for Litter schemes.
- HELCOM Recommendation 36/1 concerning regional (RE1 – RE3) and voluntary national actions (NE1 – NE3, NE6) addressing education and outreach on marine litter including: assist in or develop educational programmes or activities for professional seafarers including fishermen, provide information on national marine litter management activities and update the HELCOM website with the information, develop a communication strategy for the HELCOM Marine litter action plan, and enhance cooperation and coordination with relevant global marine initiatives.
- HELCOM Recommendation 17/2(a) (2013) giving highest priority to avoiding bycatch of harbour porpoises, particularly following the recommendations of ASCOBANS and the ASCOBANS Jastarnia Plan, in order to achieve the ecological objective of reaching bycatch rates close to zero.
- HELCOM Recommendation 28E/10 'Application of the no-special fee system to ship-generated wastes and marine litter caught in fishing nets in the Baltic Sea area'.

Activity or method:

- Identify areas with high ghost net densities by, for example, semi-structured interviews and establishment of local and regional reporting systems. Further, to increase the likelihood of reducing harbour porpoise bycatch, priority should be given to areas with high density of harbour porpoises.
- Survey and remove ghost nets at sea in combination with capacity-building for prevention of fishing gear loss.
- Facilitate landings of ghost nets and other marine litter in fishing harbours.
- Improve reuse of old fishing gear.
- ID label fishing gear.
- Conduct further studies on the environmental impacts of derelict fishing gear.

- Involve fishermen and fisheries organizations for increased success (COOP-01).
- Pay attention to guidance given by for example CBD (2014), MARELITT toolkit (http://www.marelitt.eu), and HELCOM Marine Litter Action Plan (HELCOM Recommendation 36/1) (HELCOM 2015) (COOP-02).

Implementation timeline: Immediate/continued

Actors
Responsible for implementation: National authorities, fisheries

Relevant stakeholders: Relevant European, regional and international organizations and bodies, HELCOM, scientists, professional and recreational fishermen, fisheries and environmental NGOs, eco-labelling organizations, the fishing gear industry, HELCOM Expert Network on Marine Litter, HELCOM Fish Group, HELCOM Seal Expert Group

Responsible for evaluation: National authorities

Priority
Medium

6.4. Monitor and mitigate impact of underwater noise

6.4.1. Action RES-07: Improve knowledge on impact of impulsive and continuous anthropogenic underwater noise on harbour porpoises, and development of threshold limits of significant disturbance and GES indicators

Description
Objective:

- Improved knowledge on impact of impulsive and continuous anthropogenic underwater noise on individuals and at the population level of the Baltic harbour porpoise. The specific objectives are to:
    - Develop regionally harmonized threshold limits for significant disturbance of Baltic harbour porpoises by impulsive or continuous anthropogenic underwater noise; and
    - Develop regional environmental targets and indicators for monitoring the environmental status of the Baltic harbour porpoise in regard to impact of impulsive or continuous anthropogenic underwater noise.

Threats: Underwater noise

Rationale:
The harbour porpoise has acute hearing, a wide hearing range and a high responsiveness to sounds. At the same time the Baltic soundscape is heavily affected by anthropogenic activities, such as intense shipping, offshore wind farm construction, use of active sonars and seismic surveys. Yet our knowledge of the spatio-temporal distribution of anthropogenic underwater noise and its impact on the Baltic Sea harbour porpoise is insufficient for adequate management. Due to the environmental conditions affecting noise propagation in the Baltic Sea, and the critical conservation status of the Baltic harbour porpoise population, threshold limits for significant disturbance by anthropogenic noise developed elsewhere cannot be directly applied in the Baltic Sea. Further, data gaps are preventing the development of ecologically relevant GES indicators with regard to underwater noise.

This Action improves the following ones:

- MIT-05: Implement regionally harmonized national threshold limits and guidelines for regulation of underwater noise
- RES-08: Estimate mortality limits and assess population viability for the Baltic harbour porpoise
- MIT-06: Expand the network of protected areas for harbour porpoises, improve its connectivity, and develop and implement appropriate management plans including monitoring schemes for these areas

This Action is directly related to the implementation of the following Articles of EU directives:

- Habitats Directive Article 12(1b) concerning the establishment of a system of strict protection prohibiting deliberate disturbance of Annex IV species within their natural range.
- MSFD Article 10(2) referring to that environmental targets and associated indicators shall be established.

This Action is directly related to the fulfilment of the following HELCOM Ministerial Declarations and Recommendations:

- HELCOM Recommendation 17/2(b) (2013) concerning close co-operation with ASCOBANS and ICES for collection and analysis of additional data on, among other things, threats such as underwater noise, marine installations and construction.
- HELCOM Ministerial Declaration of 2013 agreeing that the level of ambient and distribution of impulsive sounds in the Baltic Sea should not have negative impact on marine life, and that human activities that are assessed to result in negative impacts on marine life should be carried out only if relevant mitigation measures are in place, and accordingly as soon as possible and by the end of 2016, using mainly already ongoing activities, to:
    - establish a set of indicators including technical standards which may be used for monitoring ambient and impulsive underwater noise in the Baltic Sea;
    - encourage research on the cause and effects of underwater noise on biota;
    - map the levels of ambient underwater noise across the Baltic Sea;
    - set up a register of the occurrence of impulsive sounds;
    - consider regular monitoring of ambient and impulsive underwater noise as well as possible options for mitigation measures related to noise taking into account the ongoing work in IMO on non-mandatory draft guidelines for reducing underwater noise from commercial ships and in CBD context.

Activity or method:

- Study behavioural and physiological responses of harbour porpoises to impulsive and continuous anthropogenic noise from various sources.
- Measure and model propagation of relevant impulsive and continuous noise for relevant and representative areas of the Baltic Sea.
- Map the spatio-temporal distribution of relevant impulsive and continuous noise in the Baltic Sea.
- Estimate population level impact of relevant impulsive and continuous noise in the Baltic Sea.

Implementation timeline: Continued

Actors
Responsible for implementation: National authorities, national armed forces, scientists, Joint Noise Working Group of CMS, ACCOBAMS and ASCOBANS

Relevant stakeholders: Relevant European, regional and international organizations and bodies, relevant regional conventions, the shipping sector, the offshore industry, marine geological surveyors, recreational seafarers, HELCOM Pressure group, HELCOM Expert Network on Underwater Noise

Responsible for evaluation: National authorities, national armed forces, scientists, Joint Noise Working Group of CMS, ACCOBAMS and ASCOBANS

Priority
High

6.4.2. Action MIT-05: Implement regionally harmonized national threshold limits and guidelines for regulation of underwater noise

Description
Objective:

- Harmonized national threshold limits and guidelines for transparent and reliable management of anthropogenic activities generating underwater noise across the Baltic Sea.

Threats: Underwater noise

Rationale:
Due to the critical conservation status of the Baltic harbour porpoise in combination with the species' acute hearing, wide hearing range and high responsiveness to sounds, national threshold limits and guidelines must be established to minimize the risk of significant disturbance. Due to the wide distribution range of the Baltic harbour porpoise and the transboundary nature of underwater noise, the threshold limits and guidelines need to be regionally harmonized to be effective.

This Action improves the following one:

- MIT-06: Expand the network of protected areas for harbour porpoises, improve its connectivity, and develop and implement appropriate management plans including monitoring schemes for these areas

This Action is directly related to the implementation of the following Articles of EU directives:

- Habitats Directive Article 6(2) referring to that steps shall be taken to avoid disturbance of the species in the SACs.
- Habitats Directive Article 12(1b) concerning the establishment of a system of strict protection prohibiting deliberate disturbance of Annex IV species within their natural range.
- MSFD Article 1(1) referring to that necessary measures shall be taken to achieve or maintain GES by 2020 at the latest, especially with regard to descriptors 1 (biological diversity) and 11 (underwater noise).

Activity or method:

- In anticipation of improved knowledge on the impact of anthropogenic underwater noise on the Baltic harbour porpoise (RES-07), implement interim threshold limits and guidelines based on the best available knowledge on impact of anthropogenic underwater noise and conditions for the propagation of sound in the Baltic Sea, taking the critical conservation status of the Baltic harbour porpoise into account.
- Establish regional working groups for harmonisation of threshold limits and guidelines across the Baltic Sea.
- Update established threshold limits and guidelines regularly, taking account of improved knowledge on the spatio-temporal distribution of anthropogenic noise and its impact on the Baltic harbour porpoise.
- Collaborate with current international and regional efforts on management of underwater noise.

Implementation timeline: Immediate, with regular revision

Actors
Responsible for implementation: National authorities, national armed forces, scientists

Relevant stakeholders: Relevant European, regional and international organizations and bodies, relevant regional conventions, the shipping sector, the offshore industry, marine geological surveyors, recreational seafarers, environmental NGOs, HELCOM Pressure group, HELCOM Expert Network on Underwater Noise

Responsible for evaluation: National authorities, national armed forces, scientists, Joint Noise Working Group of CMS, ACCOBAMS and ASCOBANS

Priority
High

6.5. Monitor and assess population status

6.5.1. Action MON-04: Collect dead specimens and assess health status, contaminant levels, cause of mortality and life-history parameters of harbour porpoises

Description

Objective:

- Knowledge on current status and trends in health status, contaminant levels, life-history parameters and cause of mortality for dead specimens.

Threats: Bycatch, contaminants, underwater noise, reduced prey quality

Rationale:
Due to the limited number of available samples and in some respects limited knowledge on biology and impacts of threats, it is of utmost importance that dead specimens be collected, necropsied and analysed. This can provide information on the population's exposure to pressures such as bycatch, contaminants, diseases, parasites, reduced prey availability or quality, and physical effects of underwater noise. It can also yield information on biological parameters such as growth, pregnancy rate, timing of reproduction, age distribution, genetics and morphometrics. The information is important for developing and implementing indicators for assessment and monitoring of the status of the Baltic harbour porpoise population, as well as for informed conservation measures.

This Action improves the following ones:

- MON-03: Monitor and estimate harbour porpoise bycatch rates and estimate total annual bycatch
- RES-01: Improve knowledge of harbour porpoise population structure in the Baltic region
- RES-08: Estimate mortality limits and assess population viability for the Baltic harbour porpoise

This Action is directly related to the implementation of the following Articles of EU directives or regulations:

- Habitats Directive Article 11 concerning the surveillance of the conservation status of relevant species covered.
- MSFD Article 11(1) concerning the establishment and implementation of coordinated monitoring programmes for the assessment of the environmental status, including a description of the population dynamics of species of marine mammals (Annex III, Table 1).

This Action is directly related to the fulfilment or implementation of following the HELCOM BSAP actions of the hazardous substances segment (HELCOM 2007) or HELCOM Recommendations:

- Screening and assessment of the occurrence and effects of hazardous substances.
- Cooperation between competent authorities and fisheries organizations for landing of all bycaught species that cannot be released alive or without injuries are landed and reported.
- HELCOM Recommendation 17/2(b) (2013) concerning close co-operation with ASCOBANS and ICES for collection and analysis of additional data on, population distribution and abundance, stock identities, behaviour and threats such as bycatch mortality, underwater noise, contaminant levels, ship strikes, changes in food base, epizooties, climate changes, marine installations and construction.

Activity or method:

- Establish or maintain networks for collection and transportation of encountered dead specimens (linked to PACB-01).
- Conduct necropsies and analyse samples to determine the cause of death, fitness, diseases, life-history parameters, consumed prey, contaminant levels, stable isotopes, age etc. using standardized protocols.
- Take samples for analyses of population structure etc.
- Collaborate with HELCOM in the development of core indicators.

Implementation timeline: Continued

Actors

Responsible for implementation: National authorities, scientific institutions

Relevant stakeholders: Scientists, professionals working by or at the Baltic Sea (including fishermen), the general public, fisheries and environmental NGOs, HELCOM Seal Expert Group, media

Responsible for evaluation: National authorities, based on appropriate scientific expertise and advice

Priority
High

6.5.2. Action RES-08: Estimate mortality limits and assess population viability for the Baltic harbour porpoise

Description
Objectives:
- Assessment of population viability, including impacts on this of relevant anthropogenic activities or mitigation measures.
- Estimates of mortality limits (environmental limits and triggers) for evaluation of current bycatch levels.

Threats: Bycatch, contaminants, underwater noise, reduced prey quality

Rationale:
A population viability assessment (PVA) takes the population characteristics, environmental variability and anthropogenic pressures into account to forecast population health and risk of extinction. By altering the input variables accordance to different scenarios of anthropogenic activities or mitigation measures, the impact or efficiency of those can be evaluated.

Estimates of mortality limits (environmental limits and triggers) are useful for quantifying bycatch mortality objectives, for evaluation of the sustainability of current mortality numbers and for assessment of the population's survival under different levels of mortality. An environmental limit is used as a 'critical' or 'unacceptable' point in the environment that should never be exceeded and above which defined conservation objectives would not be achieved. Triggers are lower than environmental limits and used as indicators of the success or lack thereof of measures taken to reduce bycatch and other anthropogenic causes of mortality of small cetaceans, and to signal the need for changes in management action.

This Action is directly related to the implementation of the following Articles of EU directives or regulations:
- Habitats Directive Article 2(2) concerning the designation of measures to maintain or restore species of Community interest at favourable conservation status, as defined in Article 1(i).
- Habitats Directive Article 17(1) concerning the reporting on, among other things, the evaluation of the impact of the conservation measures taken in accordance with Article 6, and the main results of the surveillance referred to in Article 11.
- MSFD Article 10(1) concerning the establishment of environmental targets and associated indicators, taking pressures and impacts such as underwater noise, marine litter, hazardous substances and bycatch into account (Annex III, Table 2).
- MSFD Article 13(2) concerning the identification of measures which need to be taken in order to achieve or maintain GES.
- MSFD Article 17(2) concerning the coordinated review of the marine strategies, including the environmental targets.

Activity or method:
Based on updated information on total annual bycatch (MON-03), health status and life-history parameters (MON-04), population structure (RES-01), and abundance and distribution (MON-01 and MON-02), carry out:
- PVA analyses, including scenario analyses to evaluate the risk or efficiency of various anthropogenic activities or mitigation measures.
- Analyses of mortality limits (environmental limits and triggers), such as analyses of potential biological removal (PBR; Wade, 1998) or catch limit algorithm (CLA; Winship, 2009), including analyses of scenarios to evaluate the effects of various mortality limits.

- Collaborate with HELCOM in the development of core indicators.

Implementation timeline: Immediate

Actors
Responsible for implementation: National authorities, scientists

Relevant stakeholders: HELCOM Seal Expert Group, fisheries and environmental NGOs, national armed forces, the offshore industry, the shipping sector

Responsible for evaluation: National authorities, based on appropriate scientific expertise and advice

Priority
High

6.6. Investigate habitat use and protect important areas

6.6.1. Action RES-09: Develop and improve methods for and investigate spatio-temporal patterns of habitat use by harbour porpoises

Description
Objectives:

- Reliable and cost-efficient methods for studies of habitat use of harbour porpoises, including foraging and calving.
- Predictions of spatio-temporal patterns in the use of habitat by harbour porpoises in the Baltic Sea, including foraging and calving.

Threats: Bycatch, underwater noise, reduced prey quality

Rationale:
Knowledge on the spatio-temporal habitat use of harbour porpoises is highly relevant for assessments of their sensitivity to various anthropogenic threats, improvement of mitigation measures, designation of protected areas, and development of management plans. The current knowledge on habitat use in the Baltic Sea is very limited, and methodological developments are likely to improve this.

This Action improves the following ones:

- RES-05: Further develop and improve fishing gear that is commercially viable with no harbour porpoise bycatch
- RES-01: Improve knowledge on harbour porpoise population structure in the Baltic region
- RES-08: Estimate mortality limits and assess population viability for the Baltic harbour porpoise
- MIT-06: Expand the network of protected areas for harbour porpoises, improve its connectivity, and develop and implement appropriate management plans including monitoring schemes for these areas

This Action is directly related to the implementation of the following Articles of EU directives or regulations:

- Habitats Directive Article 4(1) referring to that for aquatic species which range over wide areas, only clearly identifiable areas representing the physical and biological factors essential to the species' life and reproduction shall be proposed as SACs.
- Habitats Directive Article 18(2) referring to particular attention to scientific work necessary for the implementation of Article 4, among two Articles.

Activity or method:

- Improve acoustic methods for identification of harbour porpoise behaviour, such as foraging or, if possible, for acoustic determination of calves vs adults.
- For acoustic methods applicable on C-POD data, utilize the SAMBAH dataset for identification of spatio-temporal patterns.
- Improve visual methods for identification of calves regarding cost-efficiency and applicability in relevant areas.

- Survey the high-density areas of the Baltic Sea during summer to confirm calving grounds and determine the timing of calving.

Implementation timeline: Immediate/continued

Actors
Responsible for implementation: National authorities, scientists

Relevant stakeholders: n/a

Responsible for evaluation: National authorities, based on appropriate scientific expertise and advice

Priority
Medium

6.6.2. Action MIT-06: Expand the network of protected areas for harbour porpoises, improve its connectivity, and develop and implement appropriate management plans including monitoring schemes for these areas

Description
Objective:

- Designated protected areas with implemented management plans and monitoring schemes significantly contributing to documented favourable conservation status of the Baltic harbour porpoise population.

Threats: Bycatch, underwater noise, reduced prey quality

Rationale:
Areas identified as important for the reproduction and survival of the Baltic harbour porpoise shall be designated as protected areas for the population. To be efficient, the protected areas need to be of sufficient size and connected in a network, with implemented plans of efficient management of anthropogenic threats. Further, monitoring schemes shall be established for evaluation of the efficiency of mitigation measures taken and trends in harbour porpoise densities. Preferably monitoring schemes shall be regionally harmonized to serve as a basis for determining trends in population distribution and abundance.

This Action improves the following Actions:

- MON-01: Implement and harmonize long-term continual acoustic monitoring of harbour porpoises

This Action is directly related to the implementation of the following Articles of EU directives or regulations:

- Habitats Directive Article 3(1) concerning the establishment of a coherent European ecological network of SACs, composed of sites hosting listed habitat types or the habitats of listed species, such as the harbour porpoise, to enable the maintenance or restoration of the species at a favourable conservation status in their natural range.
- Habitats Directive Article 6(1) concerning the establishment the necessary conservation measures involving, if need be, appropriate management plans and appropriate statutory, administrative or contractual measures.
- Habitats Directive Article 11 concerning the surveillance of the conservation status of listed habitats and species.
- Habitats Directive Article 17 concerning the reporting of the implementation of conservation measures taken, evaluation of the impact of those measures on the conservation status of listed habitats and species, and the main results of the surveillance of the conservation status of those habitats and species.
- MSFD Article 13(4) referring to the fact that established programmes of measures shall include spatial protection measures, such as special areas of conservation pursuant to the Habitats Directive, and marine protected areas as concerned in the framework of international or regional agreements.

- MSFD Article 17(2) concerning the coordinated review of the marine strategies, including the programme of measures.

This Action is directly related to the fulfilment or implementation of the following HELCOM BSAP actions of the biodiversity and nature conservation segment (HELCOM 2007) or HELCOM Recommendations:

- Close cooperation between HELCOM Contracting Parties, competent authorities and fisheries organizations in developing and implementing management measures for fisheries inside marine protected areas in the Baltic Sea area in order to fulfil conservation targets.
- HELCOM Recommendation 17/2(c) (2013) concerning the establishment of marine protected areas for harbour porpoises.
- HELCOM Recommendation 35/1 (2014) concerning a system of coastal and marine Baltic Sea protected areas (HELCOM MPAs). Among others, the Recommendation specifies that management plans or measures for protected areas shall be developed, implemented and updated with a maximum interval of 12 years (h, i), and that monitoring shall be implemented to assess the effectiveness of the management plans or measures (k). When designating new areas, connectivity shall be taken into consideration (d), and in transboundary areas, the designation shall be harmonized and, where appropriate, neighbouring states shall join forces when setting up management plans or measures (j).

Activity or method:

- Expand the existing network of protected areas for harbour porpoises in the Baltic Sea by, where appropriate, increase the size existing protected areas and/or designate new protected areas.
- Base the expansion of existing protected areas on available and emerging information on harbour porpoise distribution and abundance and spatio-temporal patterns of habitat use.
- Develop and implement management plans based on the best available knowledge on mitigation measures, the spatio-temporal distribution of anthropogenic threats, and their impacts on harbour porpoises.
- Regularly update and improve implemented management plans to take account for new information on harbour porpoise habitat use and density, mitigation measures, and impacts of and changes in anthropogenic threats.
- Develop and implement monitoring schemes of the efficiency of taken mitigation measures and harbour porpoise density in the protected areas, taking account for the benefits of regional harmonization of long-term continual monitoring.

Implementation timeline: Continued

Actors
Responsible for implementation: National authorities in Baltic Parties and Range States where designation of protected areas is appropriate

Relevant stakeholders: Relevant European, regional and international organizations and bodies, relevant international conventions, scientist, professional and recreational fishermen, the shipping sector, the general public, fisheries and environmental NGOs, HELCOM State and Conservation Working Group

Responsible for evaluation: National authorities in Baltic Parties and Range States where designation of protected areas is appropriate, based on appropriate scientific expertise and advice

Priority
High

6.7. Summary and implementation of actions

In Table 6, the Actions described above are summarized with relevance to the relevant objectives of the Jastarnia Plan. The implementation of the Jastarnia Plan is described under “*3. Governance*”.

Table 6. Summary of all Jastarnia Plan Actions. Actions RES-02, MIT-04 and RES-09 are listed as being of medium priority, all others as high priority. The timelines for implementation are: Cont. = continued, Imm. = immediate, Interm. = intermediate.

Type	Action no. and name	Time-line	Relevant objectives
Increase involvement, awareness and cooperation			
COOP	COOP-01: Involve stakeholders in the work of reducing bycatch of harbour porpoises	Cont.	1. Involve stakeholders and reduce bycatch 7. Increase awareness and cooperation
PACB	PACB-01: Improve communication and education for increased public awareness and collection of live observations and dead specimens of Baltic harbour porpoise	Cont.	7. Increase awareness and cooperation
COOP	COOP-02: Strive for close cooperation between ASCOBANS and other international bodies	Cont.	7. Increase awareness and cooperation
Monitor and estimate abundance and distribution			
RES	RES-01: Improve knowledge on harbour porpoise population structure in the Baltic region	Cont.	2. Designate MPAs with management plans and monitoring 4. Improve knowledge on population structure and population assess status 8. Monitor abundance
MON	MON-01: Implement and harmonize long-term continual acoustic harbour porpoise monitoring	Imm.	2. Designate MPAs with management plans and monitoring 8. Monitor abundance
RES	RES-02: Improve methods for estimation of absolute density and abundance of the Baltic harbour porpoise	Cont.	8. Monitor abundance
MON	MON-02: Carry out full-scale surveys of harbour porpoise abundance and distribution	Interm.	8. Monitor abundance
Monitor, estimate and reduce bycatch			
RES	RES-03: Improve methods for monitoring and estimation and harbour porpoise bycatch	Imm.	1. Involve stakeholders and reduce bycatch 6. Improve bycatch monitoring methods and estimate bycatch
MON	MON-03: Monitor and estimate harbour porpoise bycatch rates and estimate total annual bycatch	Imm.	4. Improve knowledge of population structure and population assess status 6. Improve bycatch monitoring methods and estimate bycatch
RES	RES-04: Carry out a spatio-temporal risk assessment of harbour porpoise bycatch	Imm.	4. Improve knowledge on population structure and population assess status 6. Improve bycatch monitoring methods and estimate bycatch
RES	RES-05: Further develop and improve fishing gear that is commercially viable with no harbour porpoise bycatch	Imm./ cont.	1. Involve stakeholders and reduce bycatch
MIT	MIT-01: Implement the use of fishing gear that is commercially viable with no harbour porpoise bycatch	Imm.	1. Involve stakeholders and reduce bycatch 2. Designate MPAs with management plans and monitoring

Table 6. Continued

Type	**Action no. and name**	**Time-line**	**Relevant objectives**
MIT	MIT-02: Reduce or eliminate fishing effort with gillnets or other gear known to cause porpoise bycatch in areas with higher harbour porpoise density or occurrence, and/ or in areas with higher risk of harbour porpoise bycatch, according to spatio-temporal risk assessments	Imm.	1. Involve stakeholders and reduce bycatch 2. Designate MPAs with management plans and monitoring
RES	RES-06: Improve the knowledge on potential population-level effects of the use of pingers, and develop acoustic devices for bycatch mitigation further	Imm./ cont.	1. Involve stakeholders and reduce bycatch
MIT	MIT-03: Continue or implement the use of acoustic deterrent devices ("pingers") and acoustic alerting devices proven to be successful when and where deemed appropriate	Imm./ cont.	1. Involve stakeholders and reduce bycatch 2. Designate MPAs with management plans and monitoring
MIT	MIT-04: Prevent, retrieve and recycle derelict ("ghost") fishing gear, with focus on high-density areas of harbour porpoises	Imm./ cont.	1. Involve stakeholders and reduce bycatch 2. Designate MPAs with management plans and monitoring
Monitor and mitigate impact of underwater noise			
RES	RES-07: Improve the knowledge on impact of impulsive and continuous anthropogenic underwater noise on harbour porpoises, and development of threshold limits of significant disturbance and GES indicators	Cont.	2. Designate MPAs with management plans and monitoring 3. Implement threshold limits and guidelines for underwater noise 5. Improve knowledge on habitat degradation
MIT	MIT-05: Implement regionally harmonized national threshold limits and guidelines for regulation of underwater noise	Imm. w/ regular rev.	3. Implement threshold limits and guidelines for underwater noise
Monitor and assess population status			
MON	MON-04: Collect dead specimens and assess health status, contaminant levels, cause of mortality and life-history parameters of harbour porpoises	Cont.	4. Improve knowledge on population structure and population assess status 5. Improve knowledge on habitat degradation
RES	RES-08: Estimate mortality limits and assess population viability for the Baltic harbour porpoise	Imm.	4. Improve knowledge on population structure and population assess status 8. Monitor abundance
Protected areas			
RES	RES-09: Develop and improve methods for and investigate spatio-temporal patterns of habitat use by harbour porpoises	Imm./ cont.	2. Designate MPAs with management plans and monitoring
MIT	MIT-06: Expand the network of protected areas for harbour porpoises, improve its connectivity, and develop and implement appropriate management plans including monitoring schemes for these areas	Cont.	2. Designate MPAs with management plans and monitoring

6.8. Stakeholder engagement, public awareness and education

Public awareness is an essential element in gaining support for a recovery plan. People need to be aware that harbour porpoises are an integral part of the fauna of their local waters and are worth saving. Whereas other elements of the plan depend largely on the decision-making processes of national or intergovernmental agencies and international and supra-national regulatory bodies, public awareness is an area in which ASCOBANS has an autonomous role to play. Parties to ASCOBANS have ongoing responsibilities and commitments to disseminate reliable information about Baltic harbour porpoises, to further and maintain the favourable conservation status of the species and to actively promote its protection and recovery.

In general, work relating to stakeholder engagement, public awareness and education has to be objective, attendant to and respectful towards cultural and linguistic differences, and candid about scientific uncertainty. In the Actions of the Jastarnia Plan, a wide range of responsible and/or relevant stakeholders have been identified. Some stakeholders are relevant for several actions, these include relevant authorities, professional and recreational fishermen, scientists, and fisheries and environmental NGOs. The fishermen are a key target group as they are among those people most likely to interact most directly and most frequently with harbour porpoises. Other stakeholders are primarily relevant for specific actions or specific threats, where they may have a very important role to play. Such stakeholders are the general public, European, regional and international organizations and bodies, international conventions, specific industry sectors and national armed forces.

6.9. Reporting process

It is suggested that Baltic Range States (ASCOBANS members and non-members alike) be asked to supply ASCOBANS with updated information at the meetings of the Jastarnia Group regarding progress in implementation.

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8. Annex I

This Annex contains a map showing some of the geographical terms used in the Jastarnia Plan (Figure 1), seasonal probability of detection of harbour porpoises (Figure 2a – 2b), estimated density of harbour porpoises per SAMBAH station and month (Figures 3a – 3l), estimated seasonal density of harbour porpoises (Figures 4a – 4b), high-density areas of harbour porpoises (Figures 5a – 5f), seasonal fishing effort together with probability of detection of harbour porpoises (Figures 6a – 6b), offshore windfarms together with seasonal probability of detection of harbour porpoises (Figures 7a – 7b), mines and ammunition together with seasonal probability of detection of harbour porpoises (Figures 8a – 8b), and AIS traffic together with seasonal probability of detection of harbour porpoises (Figures 9a – 9b). All figures but Figure 1 and Figures 3a – 3l are also shown in the Jastarnia Plan, but in smaller size.

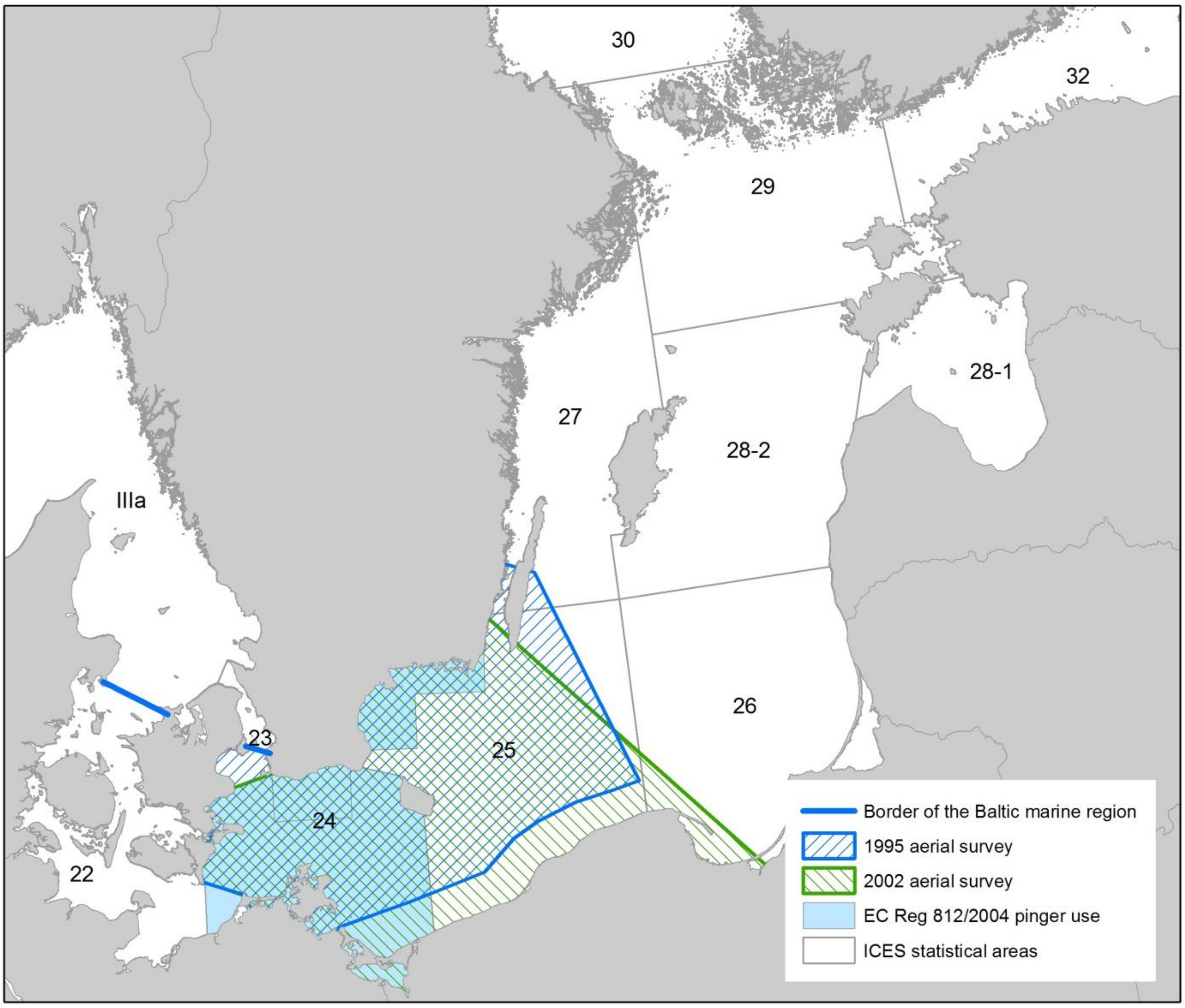

Figure 1. Map showing the border of the Baltic marine region, the 1995 and 2002 aerial survey areas, the areas of mandatory pinger use stated by Regulation EC 812/2004, and the ICES statistical areas.

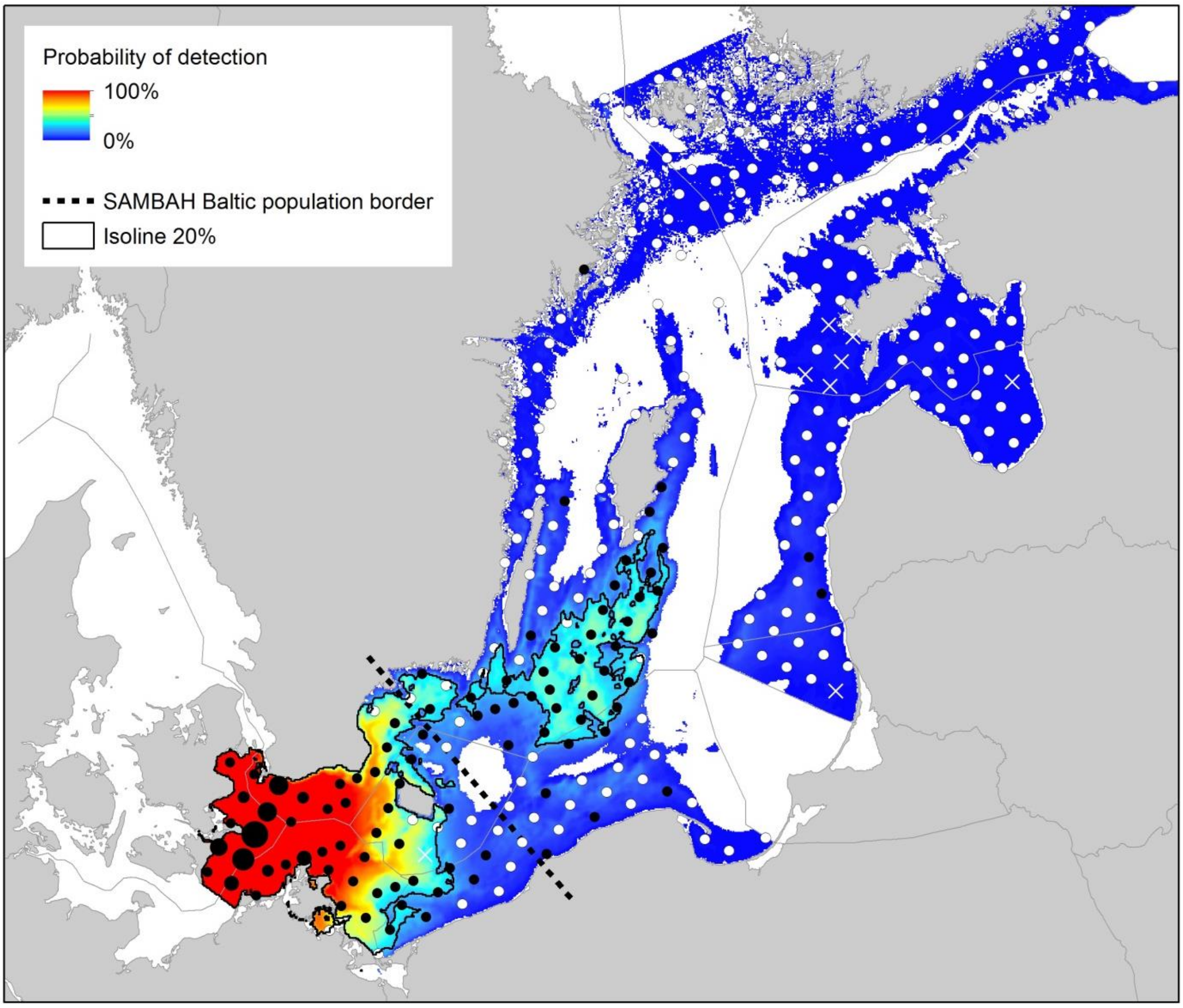

Figure 2a. Predicted probability of detection of harbour porpoises per month in the SAMBAH project area during May – October. The black line indicates 20% probability of detection, approximately equivalent to the area encompassing 30% of the population, often used to define high-density areas. The dots or crosses show the probability of detection at the SAMBAH survey stations. The border indicates the spatial separation between the Belt Sea and Baltic harbour porpoise populations during May – October according to SAMBAH (2016).

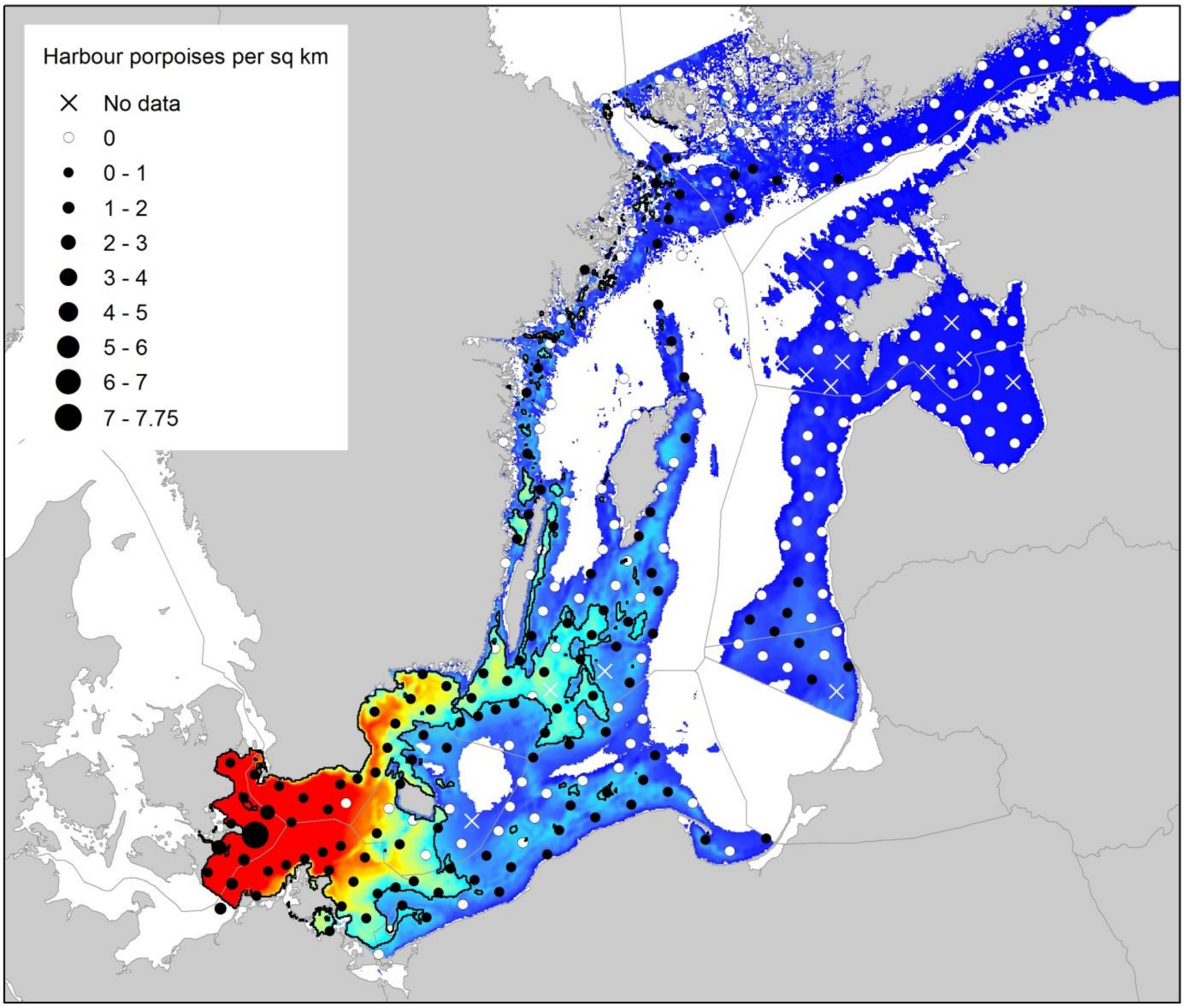

Figure 2b. Predicted probability of detection of harbour porpoises per month in the SAMBAH project area during November – April. The black line indicates 20% probability of detection, approximately equivalent to the area encompassing 30% of the population, often used to define high-density areas. The dots or crosses show the probability of detection at the SAMBAH survey stations.

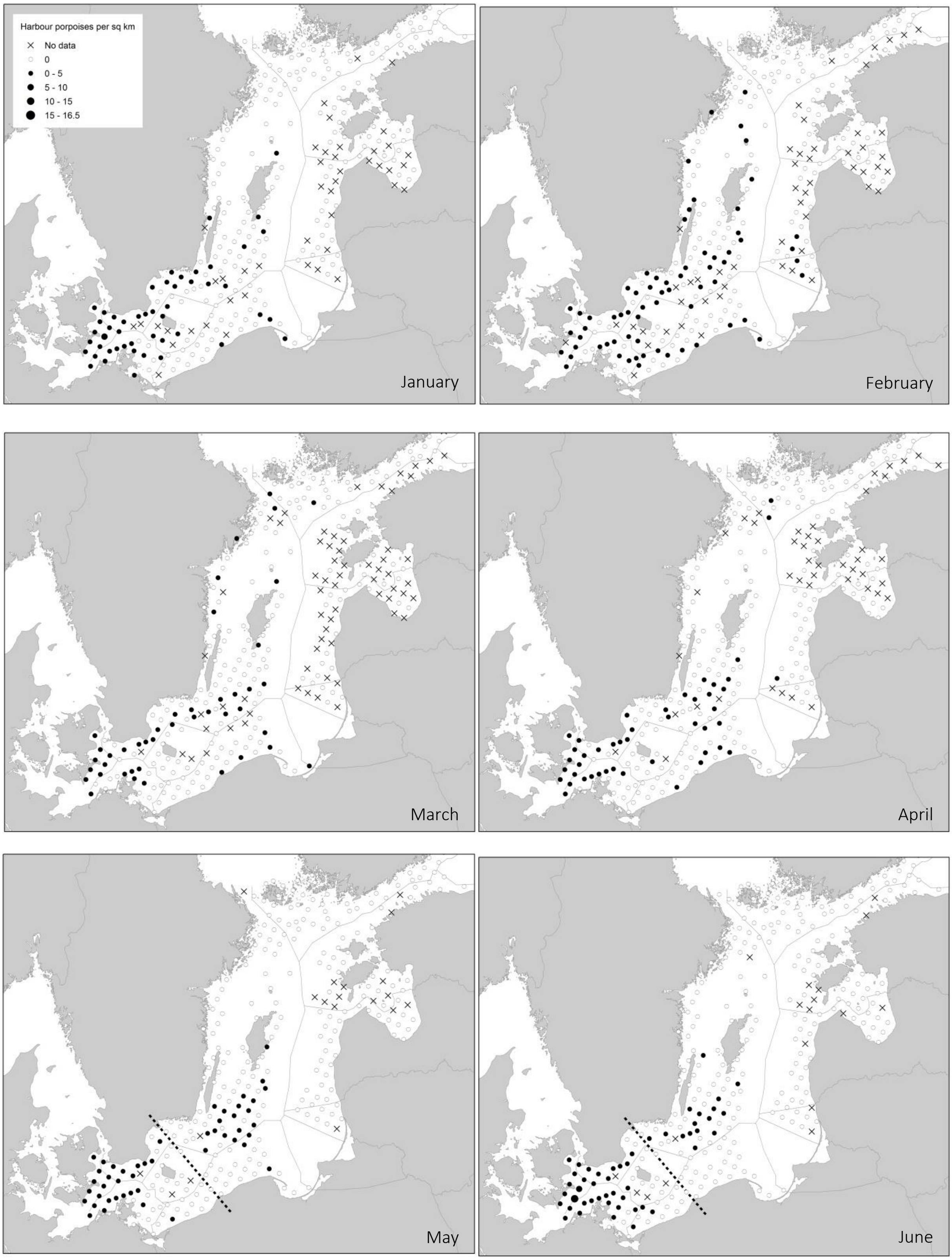

Figure 3a. Estimated number of harbour porpoises per square kilometre estimated at each SAMBAH station during January – April, combined for 2012 and 2013, and May – June, combined for 2011 and 2012. The dotted black line indicates the spatial separation between the Belt Sea and Baltic harbour porpoise populations during May – October according to SAMBAH (2016).

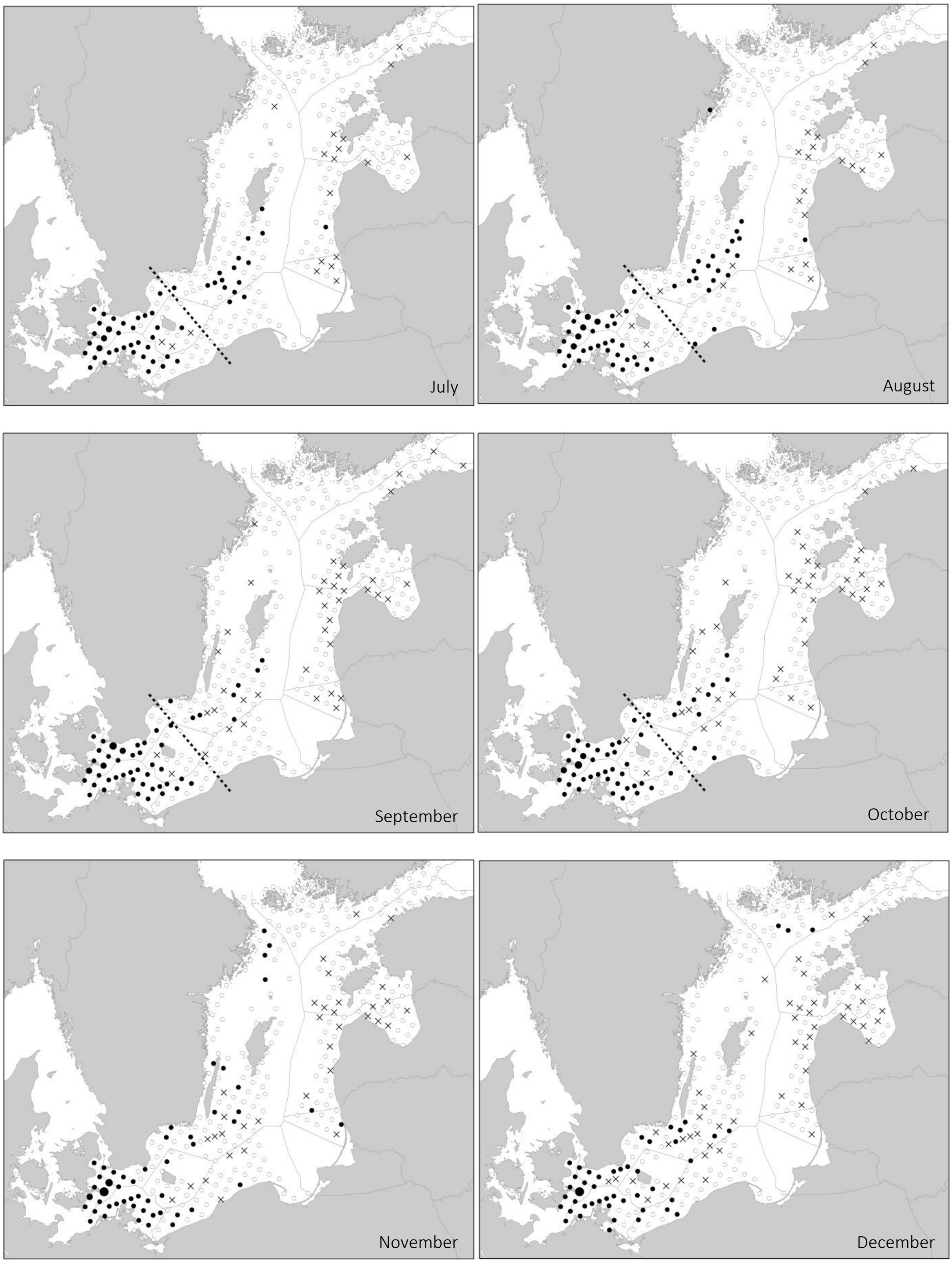

Figure 3b. Estimated number of harbour porpoises per square kilometre estimated at each SAMBAH station during July – December, combined for 2011 and 2012. The dotted black line indicates the spatial separation between the Belt Sea and Baltic harbour porpoise populations during May – October according to SAMBAH (2016). The legend is shown in Figure 3a.

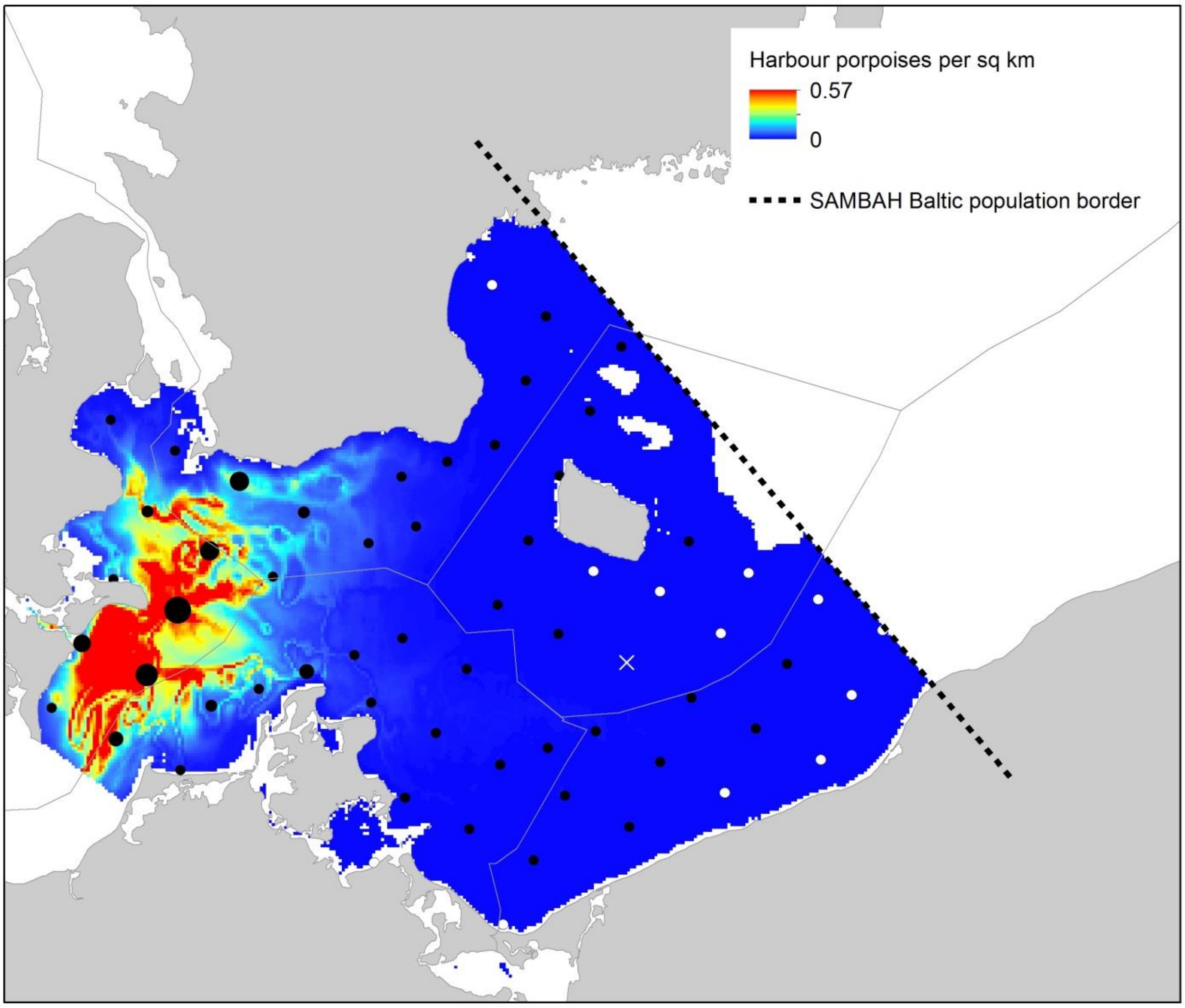

Figure 4a. Predicted density of harbour porpoises in the southwestern part of the SAMBAH project area during May – October. The border indicates the spatial separation between the Belt Sea and Baltic populations during May – October according to SAMBAH (2016). The legend for the density estimations at the SAMBAH positions is given in Figure 4c.

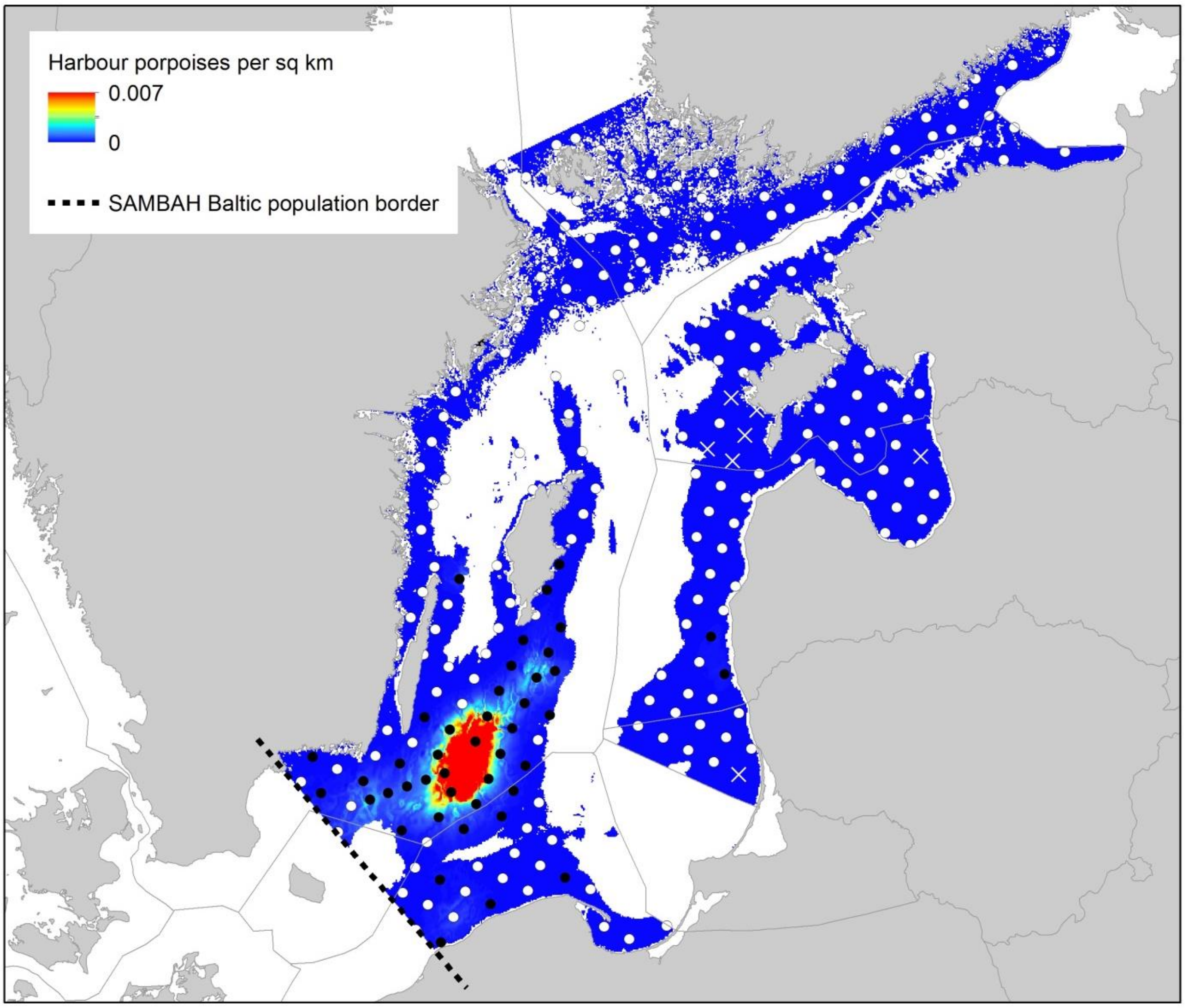

Figure 4b. Predicted density of harbour porpoises in the northeastern part of the SAMBAH project area during May – October. The border indicates the spatial separation between the Belt Sea and Baltic populations during May – October according to SAMBAH (2016). The legend for the density estimations at the SAMBAH positions is given in Figure 4d.

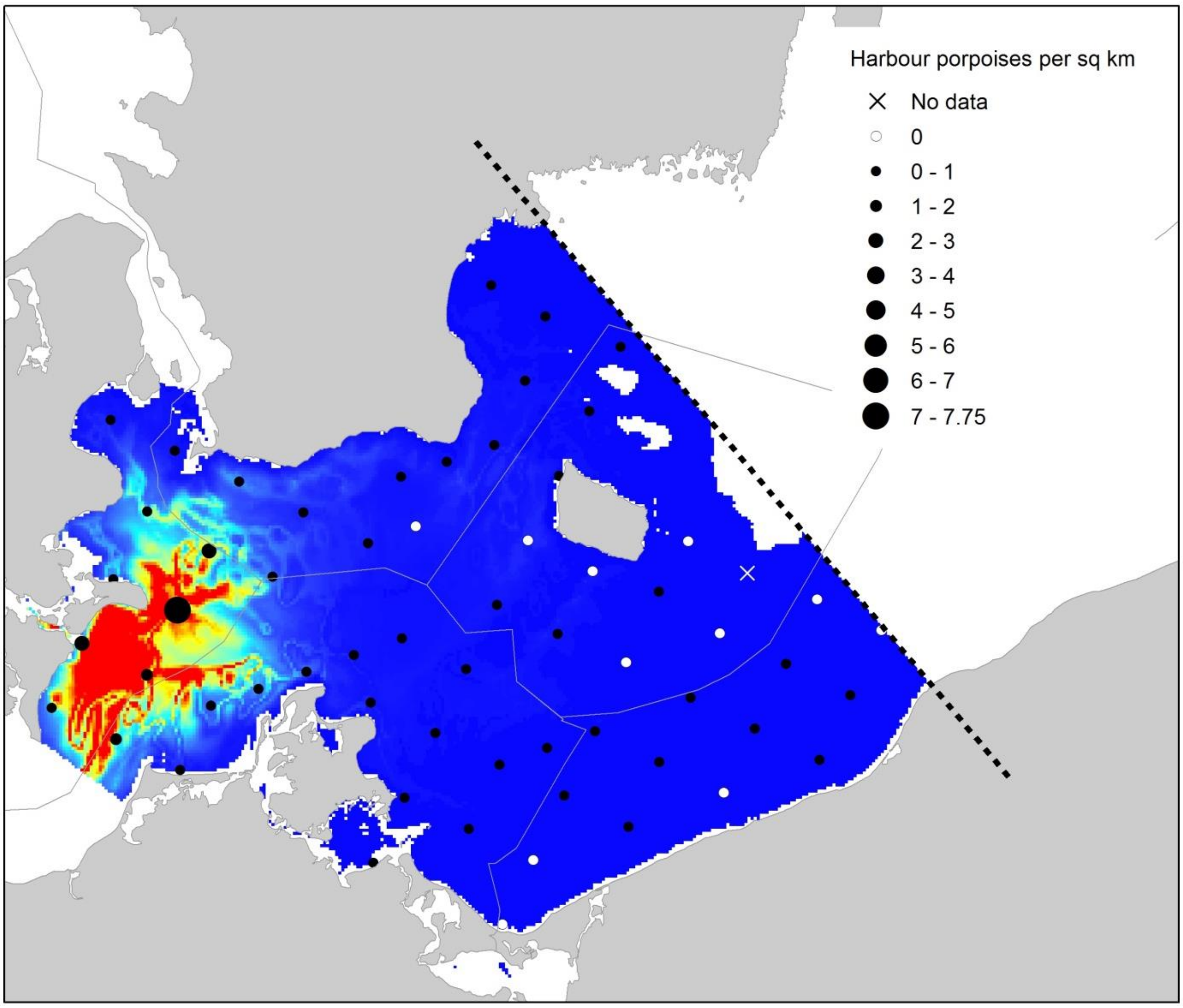

Figure 4c. Predicted density of harbour porpoises in the southwestern part of the SAMBAH project area during November – April. The border indicates the spatial separation between the Belt Sea and Baltic populations during May – October according to SAMBAH (2016). The legend for the spatial prediction is given in Figure 4a.

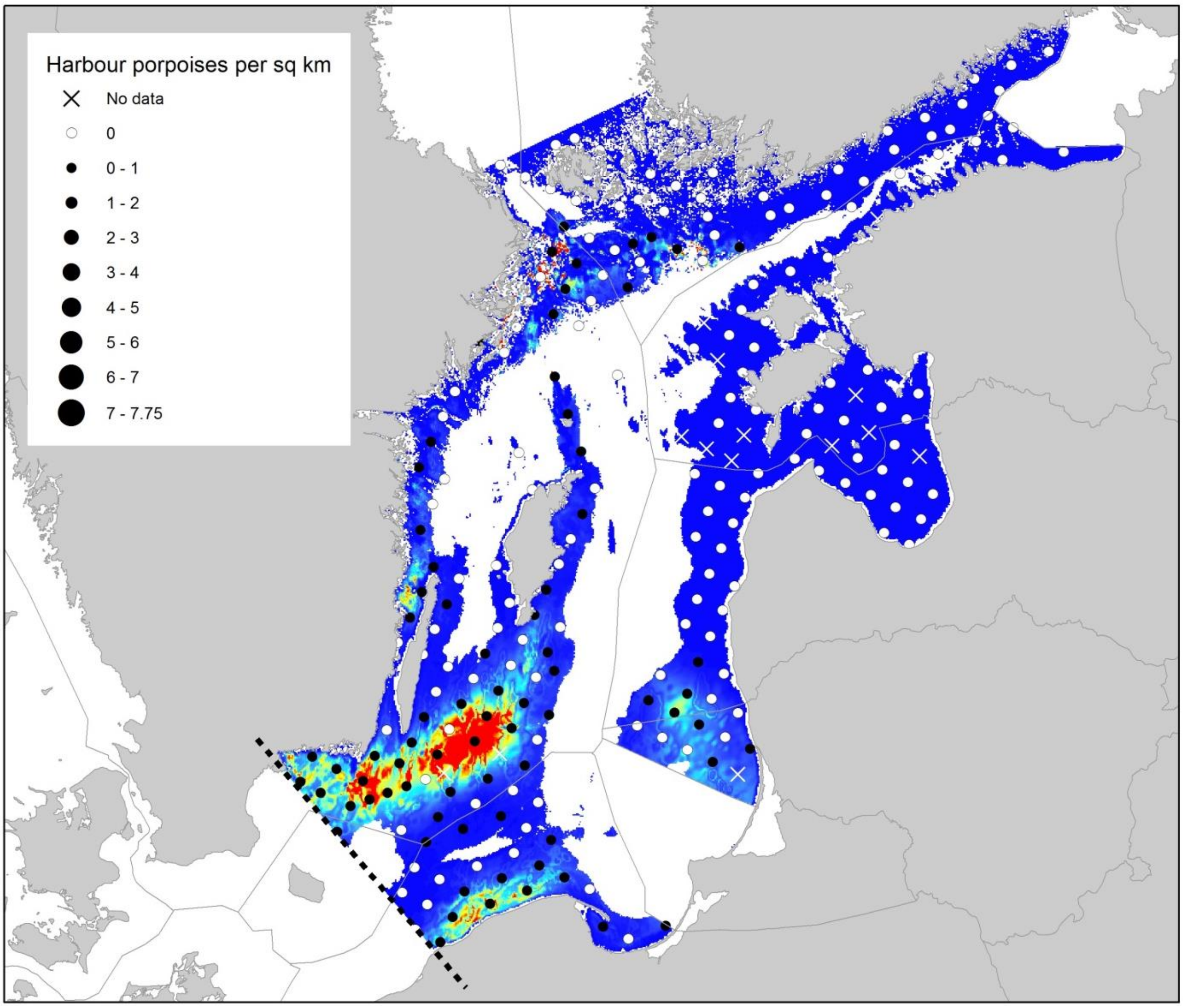

Figure 4d. Predicted density of harbour porpoises in the northeastern part of the SAMBAH project area during November – April. The border indicates the spatial separation between the Belt Sea and Baltic populations during May – October according to SAMBAH (2016). The legend for the spatial prediction is given in Figure 4b.

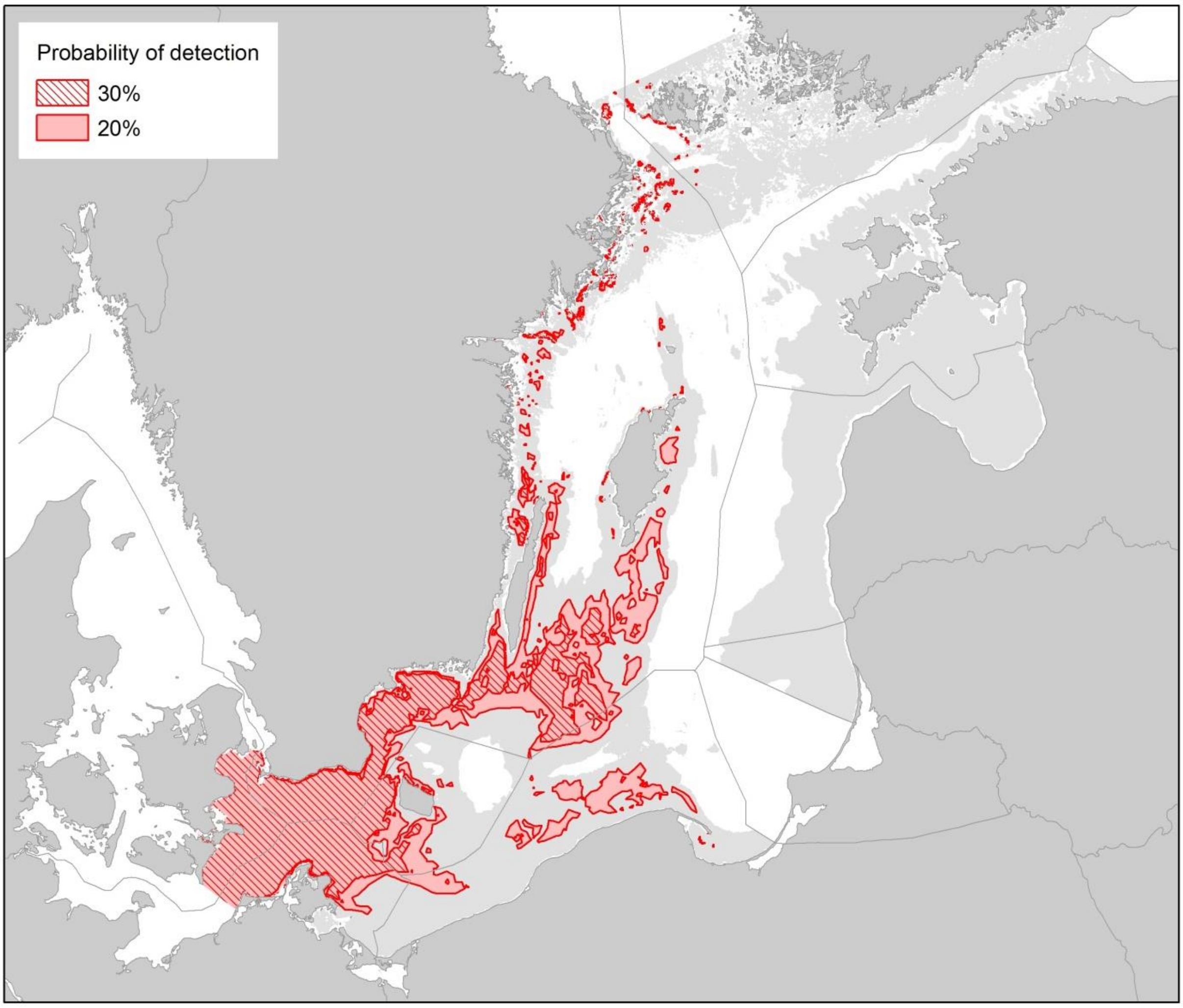

Figure 5a. High-density areas for harbour porpoises in the SAMBAH area (shaded) during February – April based on predictions of probability of detection. During May – October, the isoline of 20% probability of detection encompasses approximately 30% of the Baltic harbour porpoise population, while the isoline of 30% probability of detection encompasses approximately 7.8% of the Baltic harbour porpoise population. The same isolines have been applied for February – April without correlating them to the proportions of the population. During November – April, there is no clear spatial separation between harbour porpoises from the Baltic and the Belt Sea population.

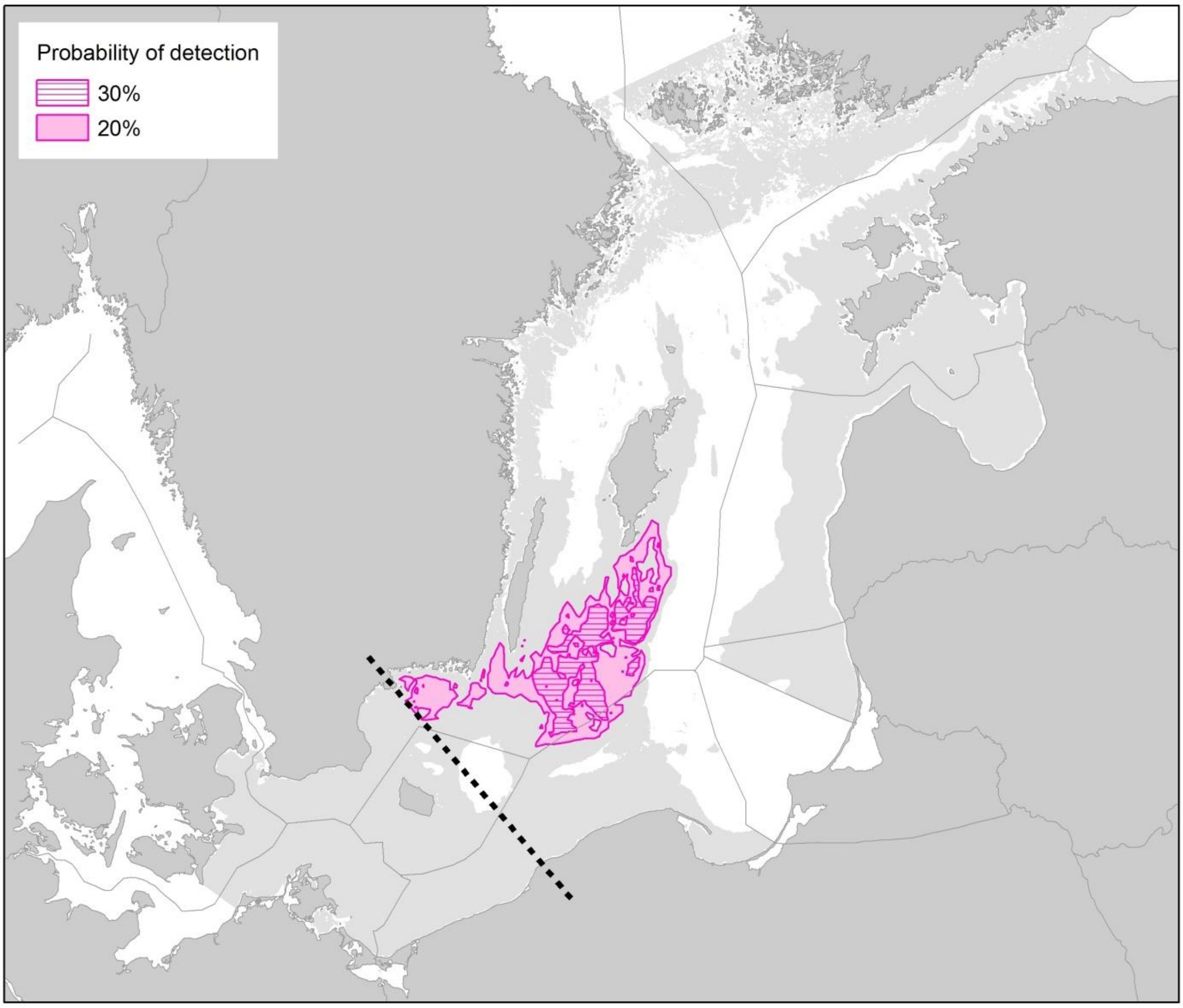

Figure 5b. High-density areas for harbour porpoises in the SAMBAH area (shaded) during May – July based on predictions of probability of detection. During May – October, the isoline of 20% probability of detection encompasses approximately 30% of the Baltic harbour porpoise population, while the isoline of 30% probability of detection encompasses approximately 7.8% of the Baltic harbour porpoise population.

Figure 5c. High-density areas for harbour porpoises in the SAMBAH area (shaded) during August – October based on predictions of probability of detection. During May – October, the isoline of 20% probability of detection encompasses approximately 30% of the Baltic harbour porpoise population, while the isoline of 30% probability of detection encompasses approximately 7.8% of the Baltic harbour porpoise population.

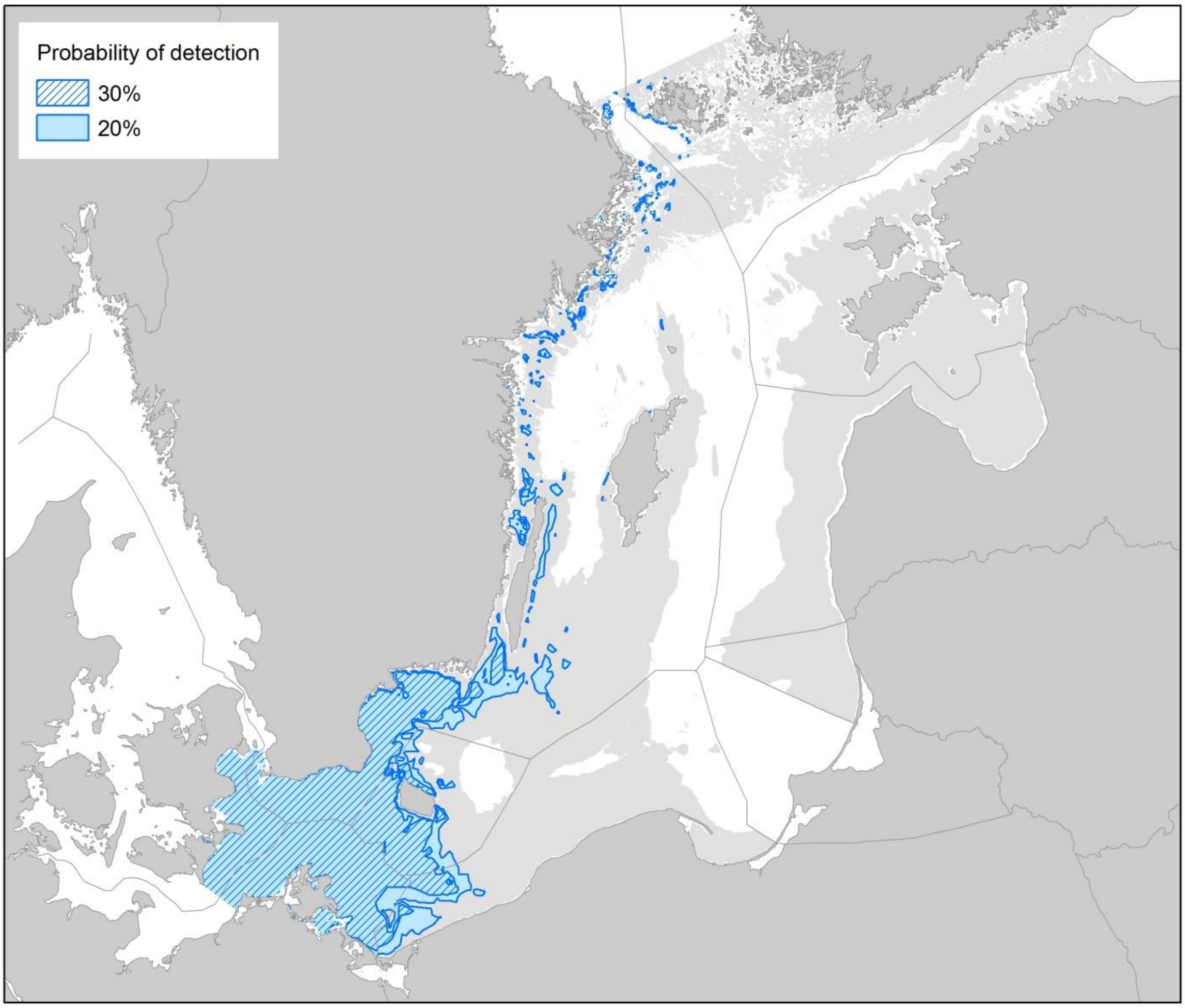

Figure 5d. High-density areas for harbour porpoises in the SAMBAH area (shaded) during November – January based on predictions of probability of detection. During May – October, the isoline of 20% probability of detection encompasses approximately 30% of the Baltic harbour porpoise population, while the isoline of 30% probability of detection encompasses approximately 7.8% of the Baltic harbour porpoise population. The same isolines have been applied for November – January without correlating them to the proportions of the population. During November – April, there is no clear spatial separation between harbour porpoises from the Baltic and the Belt Sea population.

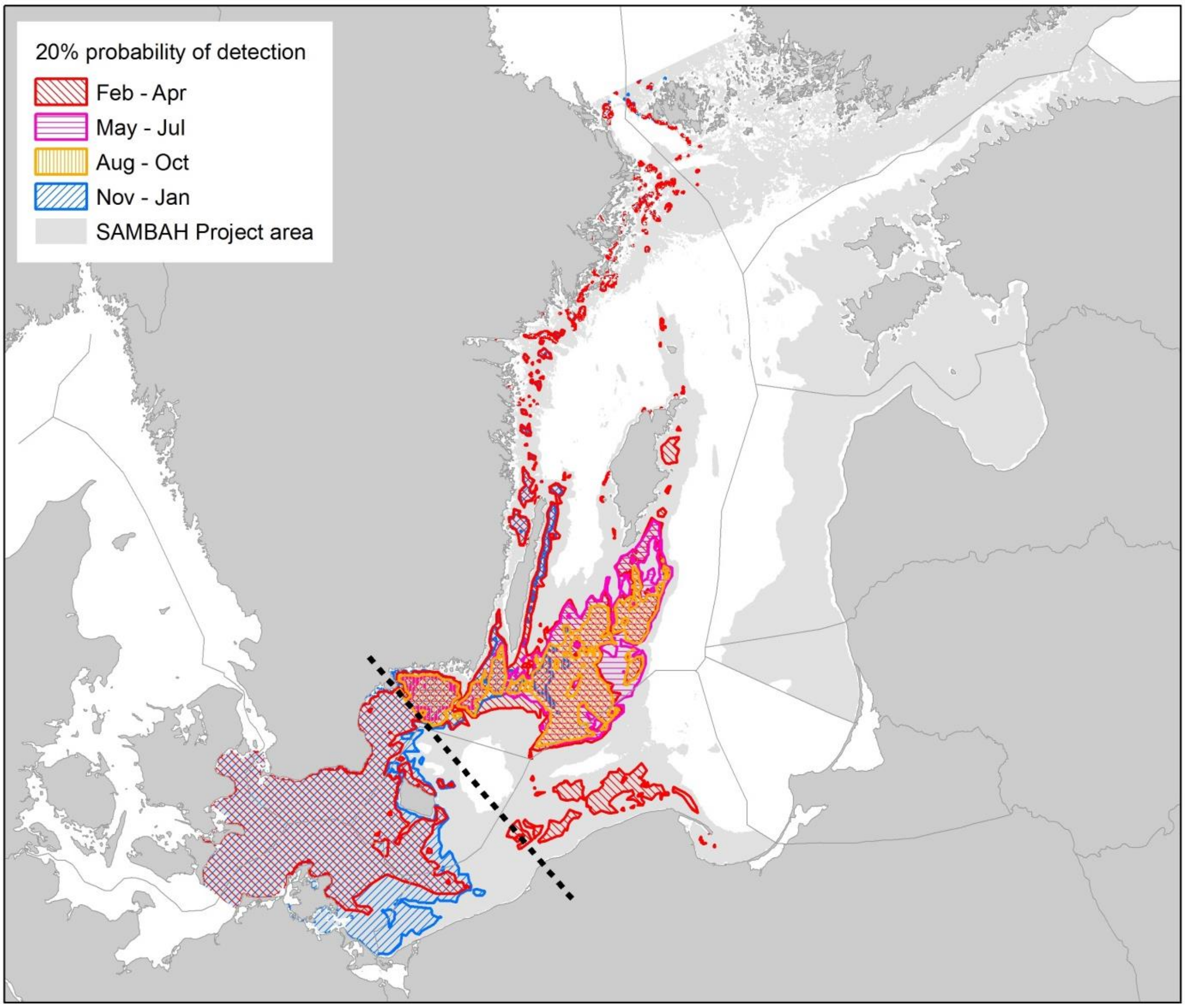

Figure 5e. High-density areas for harbour porpoises in the SAMBAH area (shaded) based on predictions of probability of detection. During May – October, the isoline of 20% probability of detection encompasses approximately 30% of the Baltic harbour porpoise population. During November – April, the same isolines for probability of detection are shown without correlating them to the proportions of the population. Southwest of the SAMBAH population border, the high-density areas are inhabited by animals from both the Baltic and the Belt Sea populations during November – April.

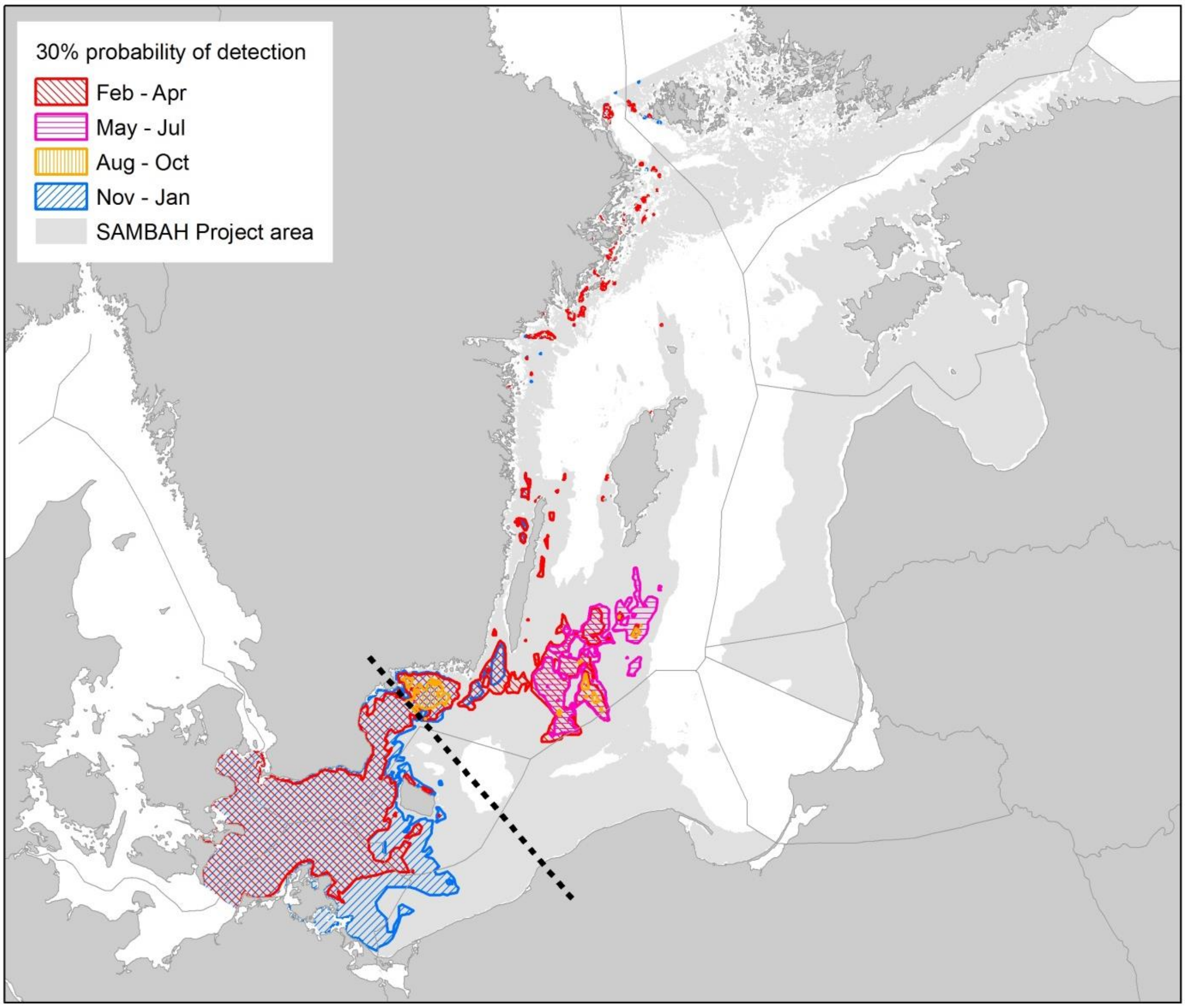

Figure 5f. High-density areas for harbour porpoises in the SAMBAH area (shaded) based on predictions of probability of detection. During May – October, the isoline of 30% probability of detection encompasses approximately 7.8% of the Baltic harbour porpoise population. During November – April, the same isolines for probability of detection are shown without correlating them to the proportions of the population. Southwest of the SAMBAH population border, the high-density areas are inhabited by animals from both the Baltic and the Belt Sea populations during November – April.

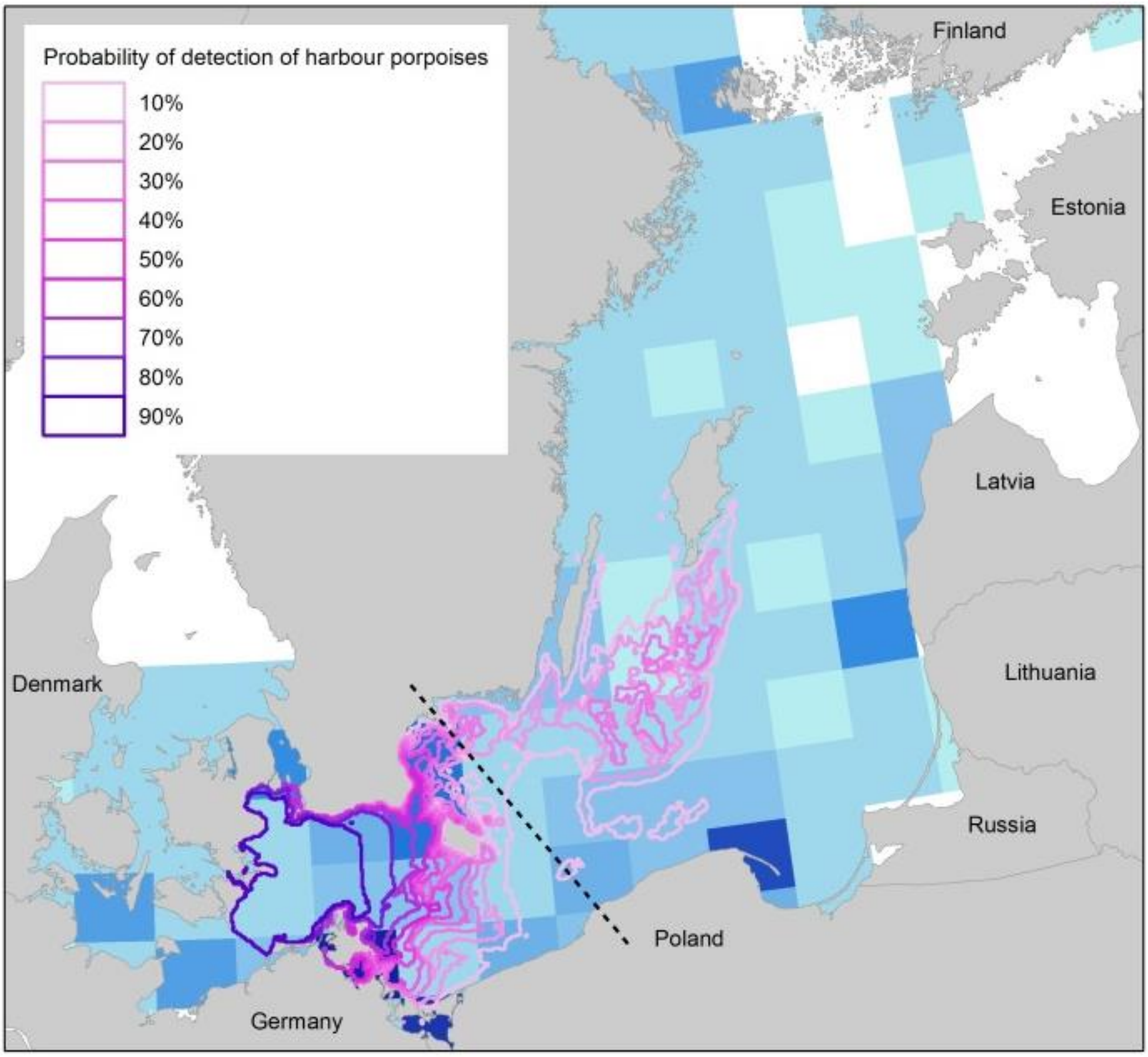

Figure 6a. Monthly probability of detection of harbour porpoises during May – October 2011 – 2013 within the SAMBAH area (data from SAMBAH, 2016), together with total hours fished per ICES rectangle with gillnets of a mesh size of ≥ 90 mm during April – September 2014 (STECF, 2015; data downloaded from the European Commission DCF – Data dissemination database https://datacollection.jrc.ec.europa.eu/dd/effort/maps). The legend for the fishing effort is shown in Figure 6b. The dotted line indicates the border used for abundance estimation of the Baltic harbour porpoise population in SAMBAH.

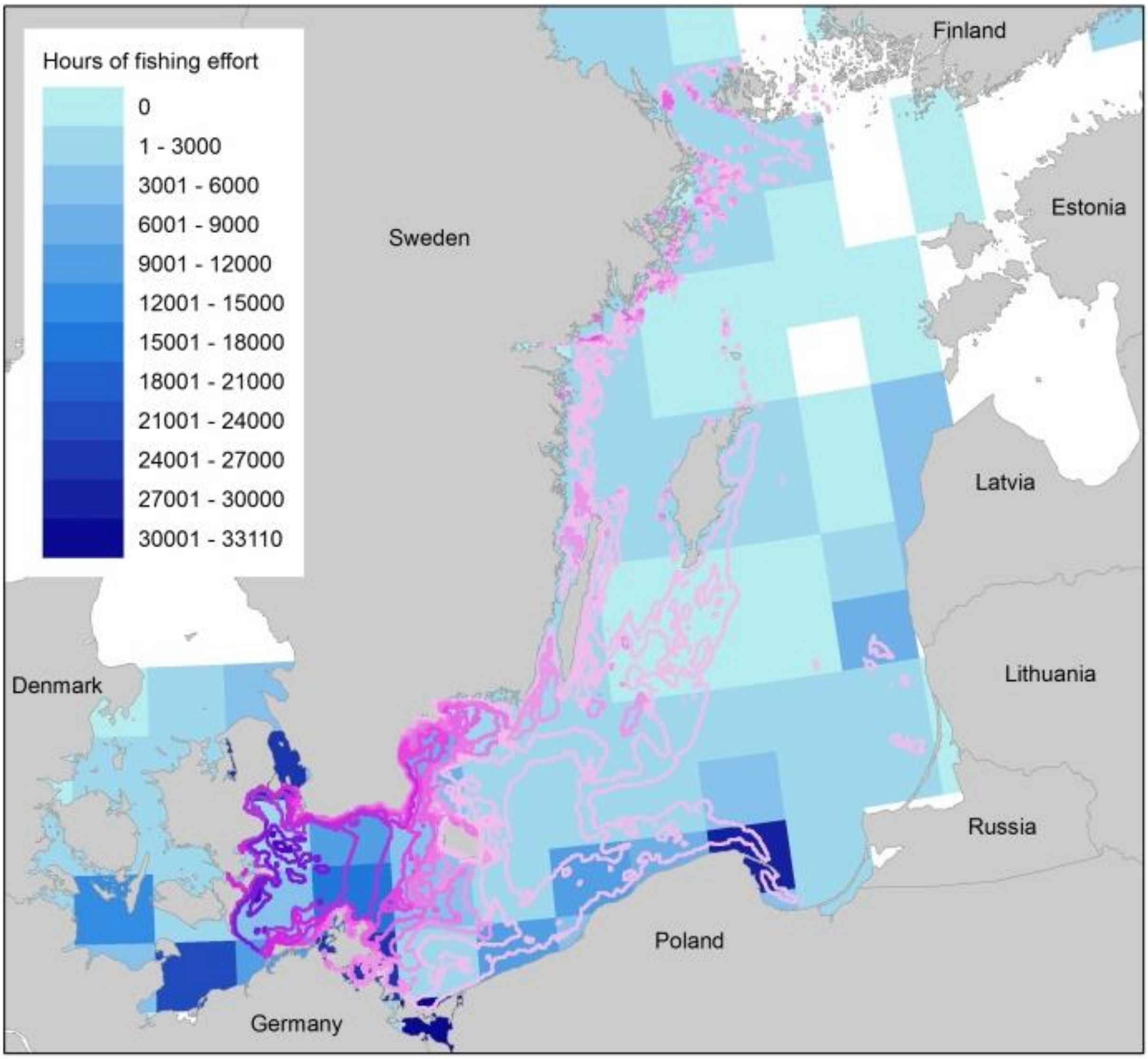

Figure 6b. Monthly probability of detection of harbour porpoises during November – April 2011 – 2013 within the SAMBAH area (data from SAMBAH, 2016), together with total hours fished per ICES rectangle with gillnets of a mesh size of ≥ 90 mm during April – September and October – May 2014, respectively (STECF, 2015; data downloaded from the European Commission DCF – Data dissemination database https://datacollection.jrc.ec.europa.eu/dd/effort/maps). The legend for the probability of detection of harbour porpoises is shown in Figure 6a.

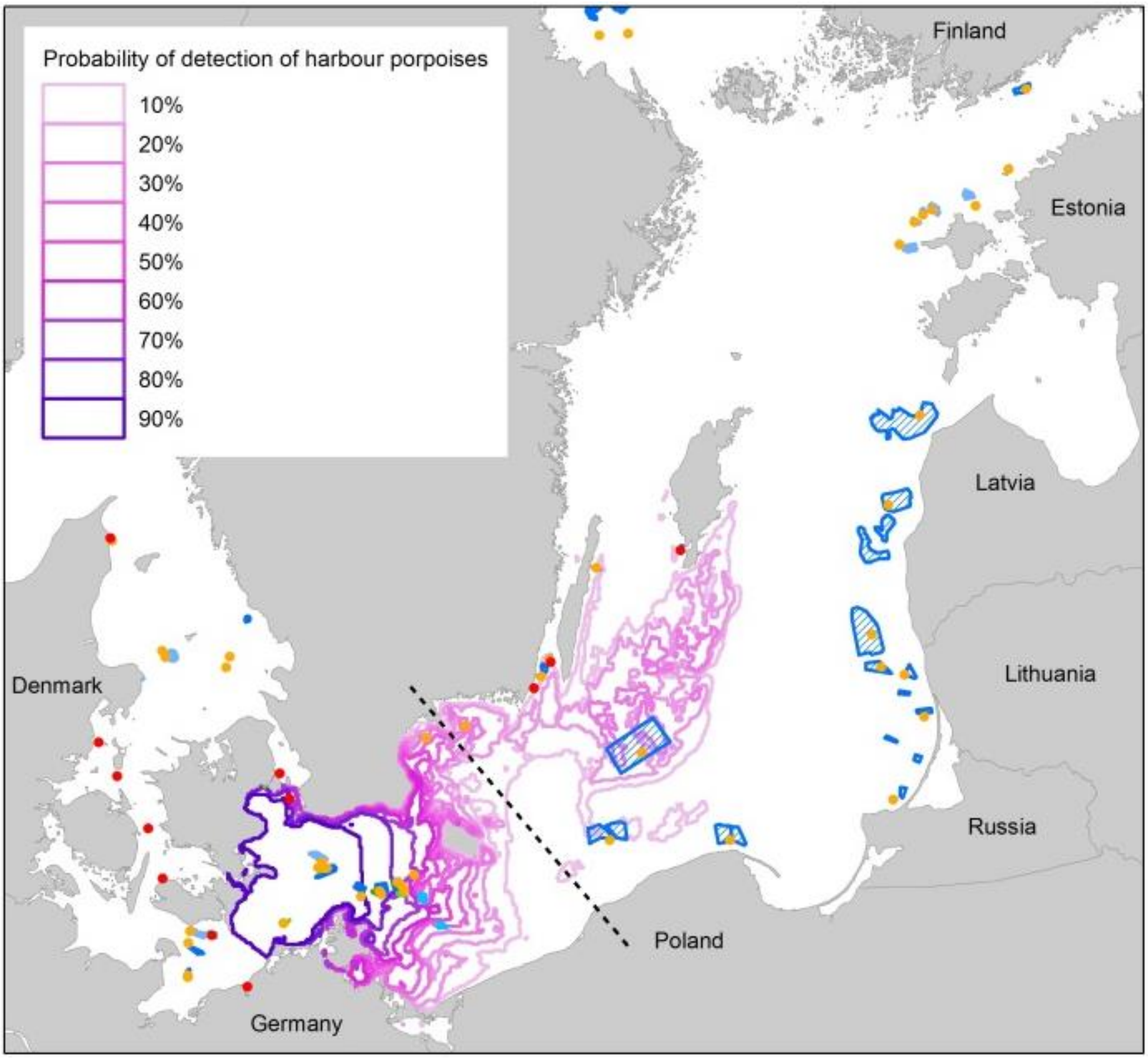

Figure 7a. Monthly probability of detection of harbour porpoises within the SAMBAH area during May – October 2011 – 2013 (data from SAMBAH, 2016), together with present and planned offshore windfarms in 2009 (Swedish Environmental Protection Agency, 2010). The dotted line indicates the border used for abundance estimation of the Baltic harbour porpoise population in SAMBAH. The legend for the offshore windfarms is shown in Figure 7b.

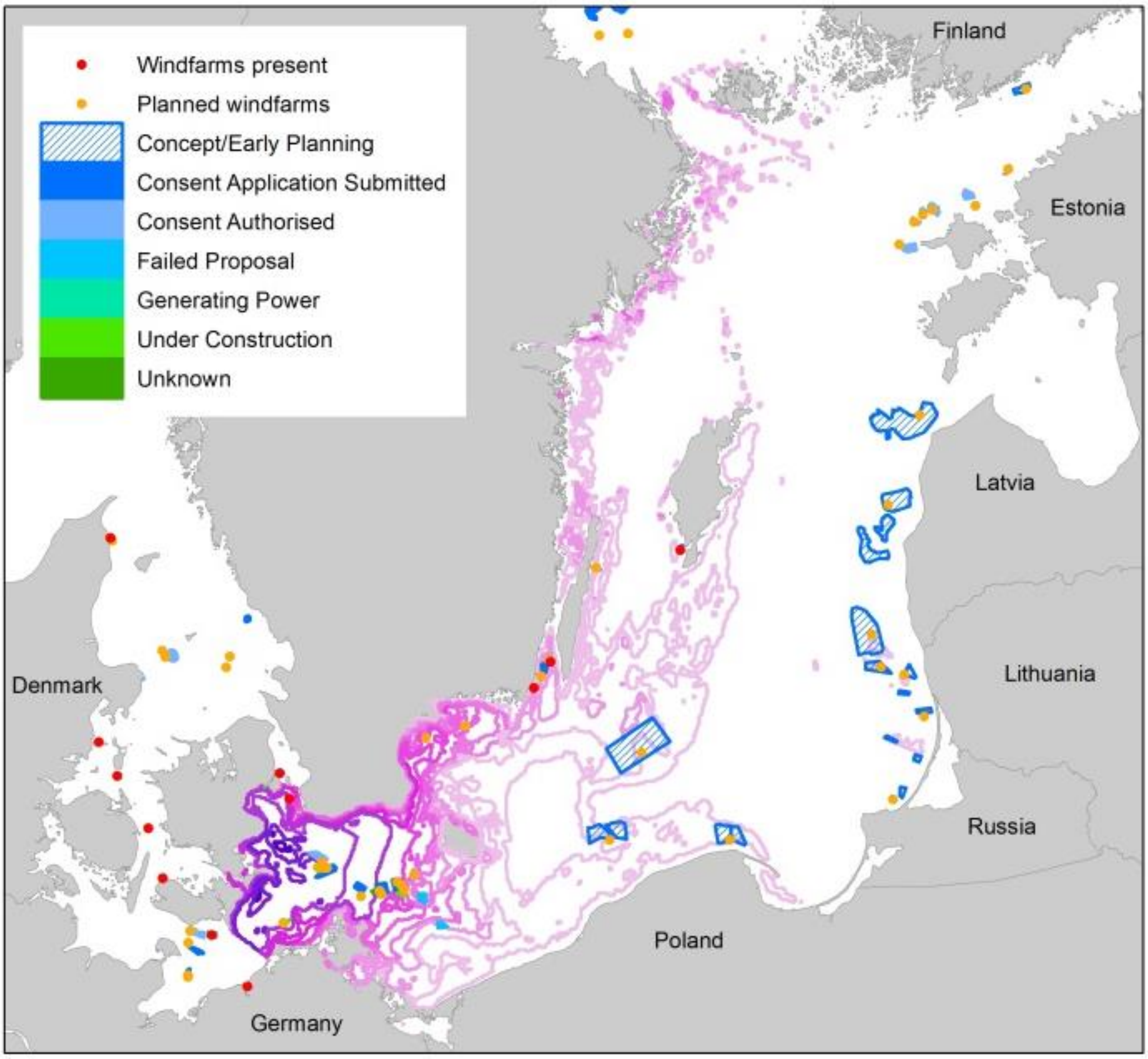

Figure 7b. Monthly probability of detection of harbour porpoises within the SAMBAH area during November – April 2011 – 2013 (data from SAMBAH, 2016), together with present and planned offshore windfarms in 2009 (Swedish Environmental Protection Agency, 2010). The legend for probability of detection of harbour porpoises is shown in Figure 7a.

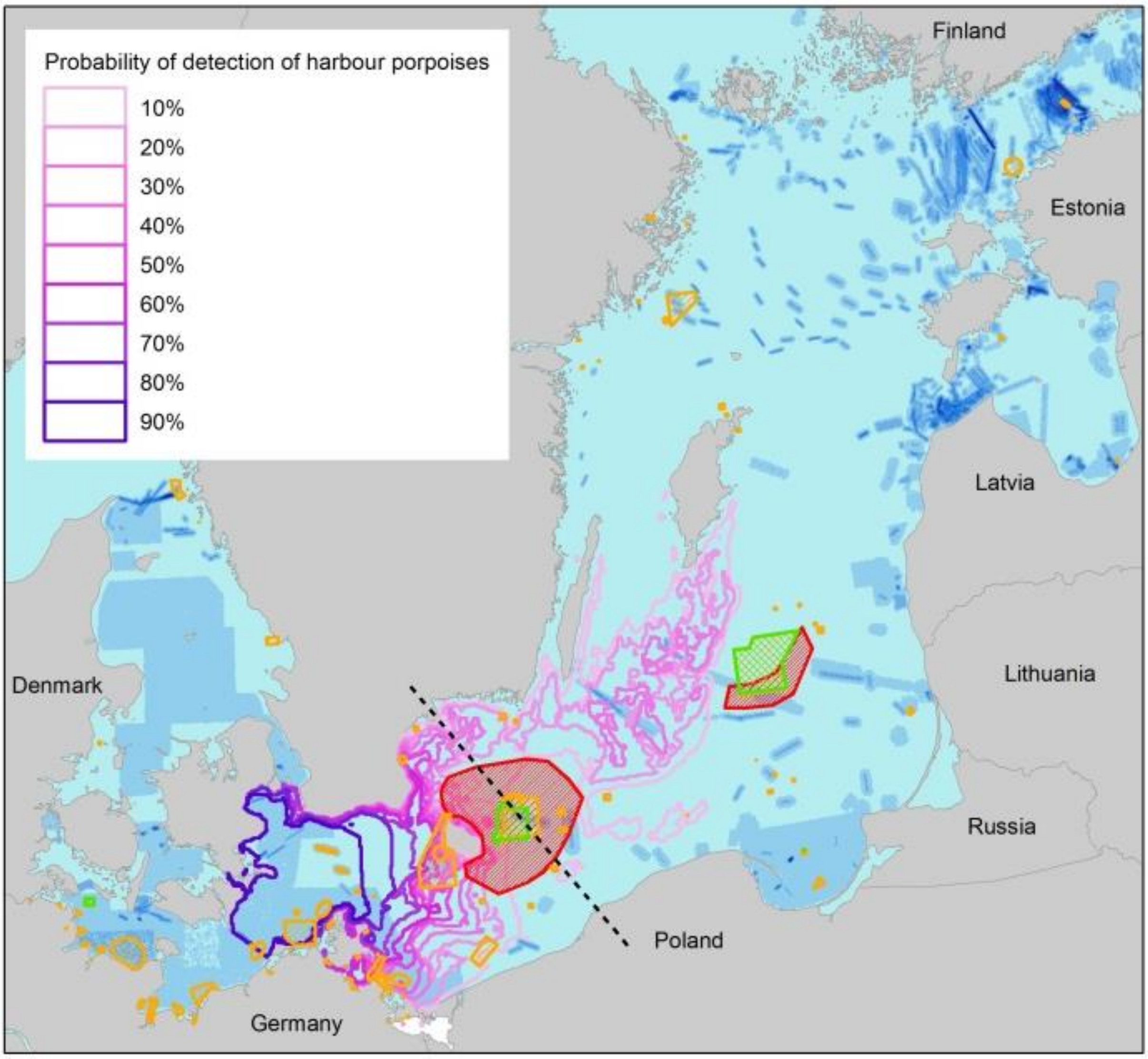

Figure 8a. Monthly probability of detection of harbour porpoises within the SAMBAH area during May – October 2011 – 2013 (data from SAMBAH, 2016), together with mines and dumped ammunition (courtesy HELCOM data and map service, and Swedish Armed Forces). The dotted line indicates the border used for abundance estimation of the Baltic harbour porpoise population in SAMBAH. The legend for mines and dumped ammunition is shown in Figure 8b.

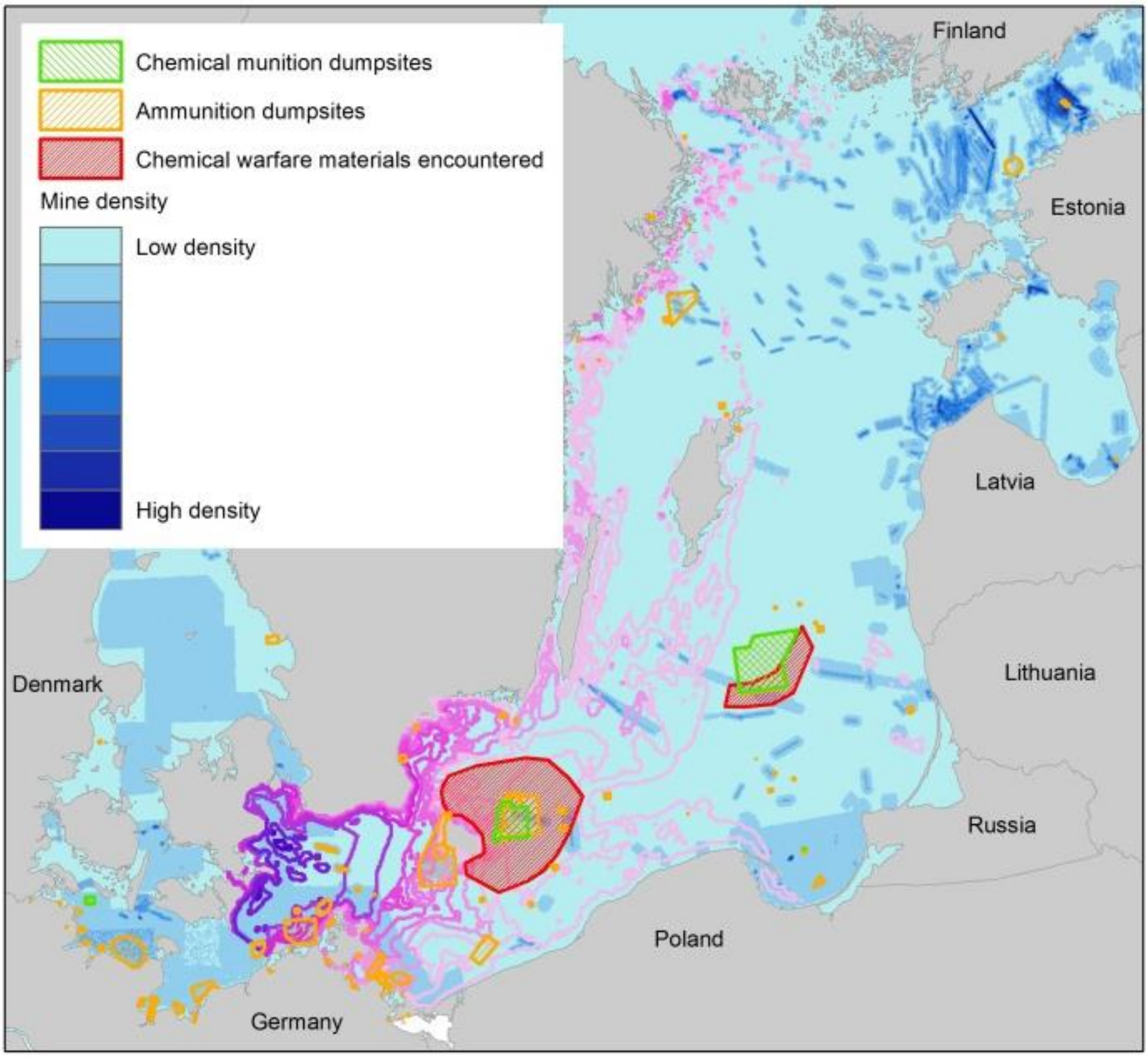

Figure 8b. Monthly probability of detection of harbour porpoises within the SAMBAH area during November – April 2011 – 2013 (data from SAMBAH, 2016), together with mines and dumped ammunition (courtesy HELCOM data and map service, and Swedish Armed Forces). The legend for probability of detection of harbour porpoises is shown in Figure 8a.

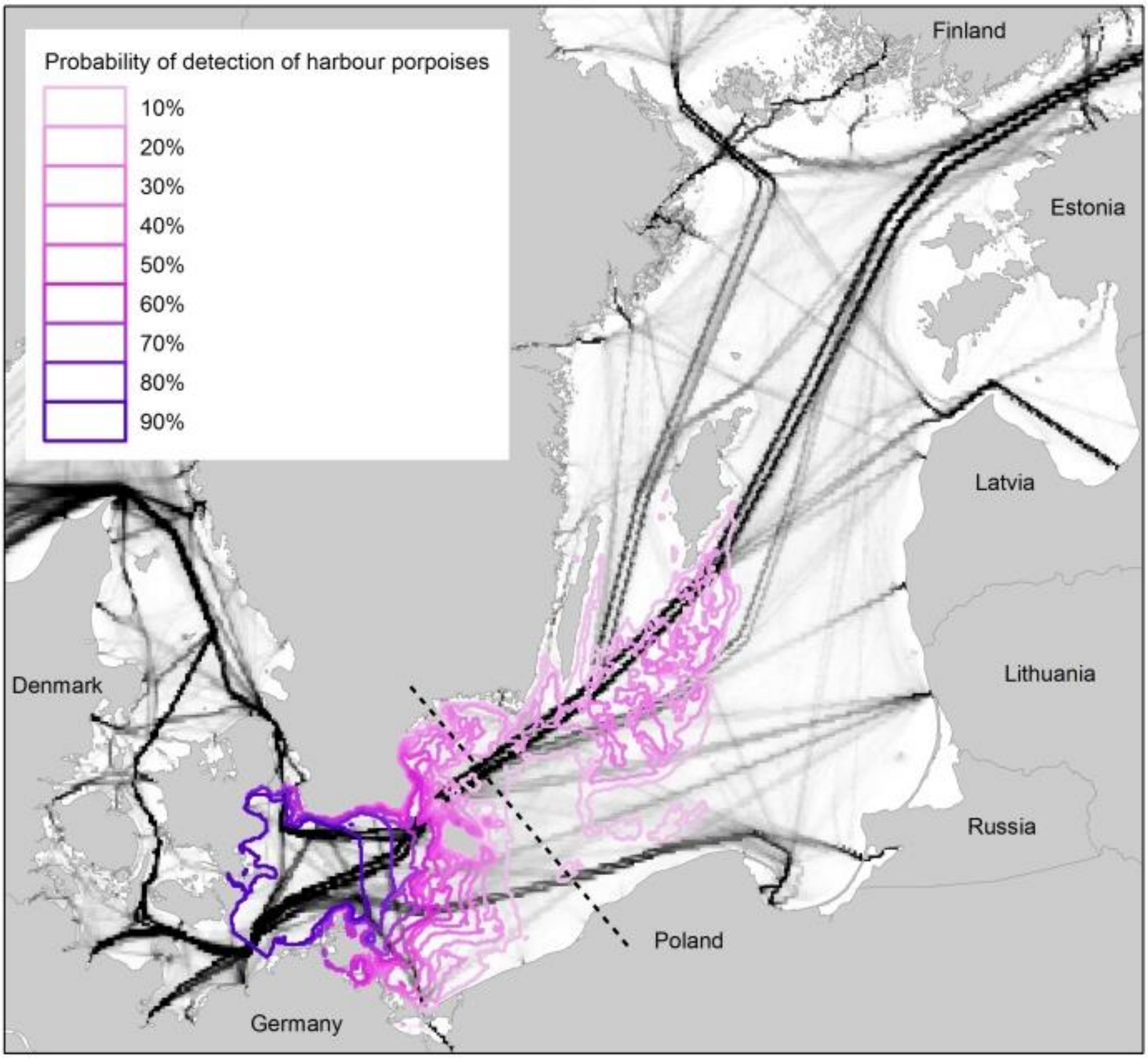

Figure 9a. Monthly probability of detection of harbour porpoises within the SAMBAH area during May – October 2011 – 2013 (data from SAMBAH, 2016), together with AIS shipping in 2011 (courtesy HELCOM data and map service). The dotted line indicates the border used for abundance estimation of the Baltic harbour porpoise population in SAMBAH. The legend for AIS shipping is shown in Figure 9b.

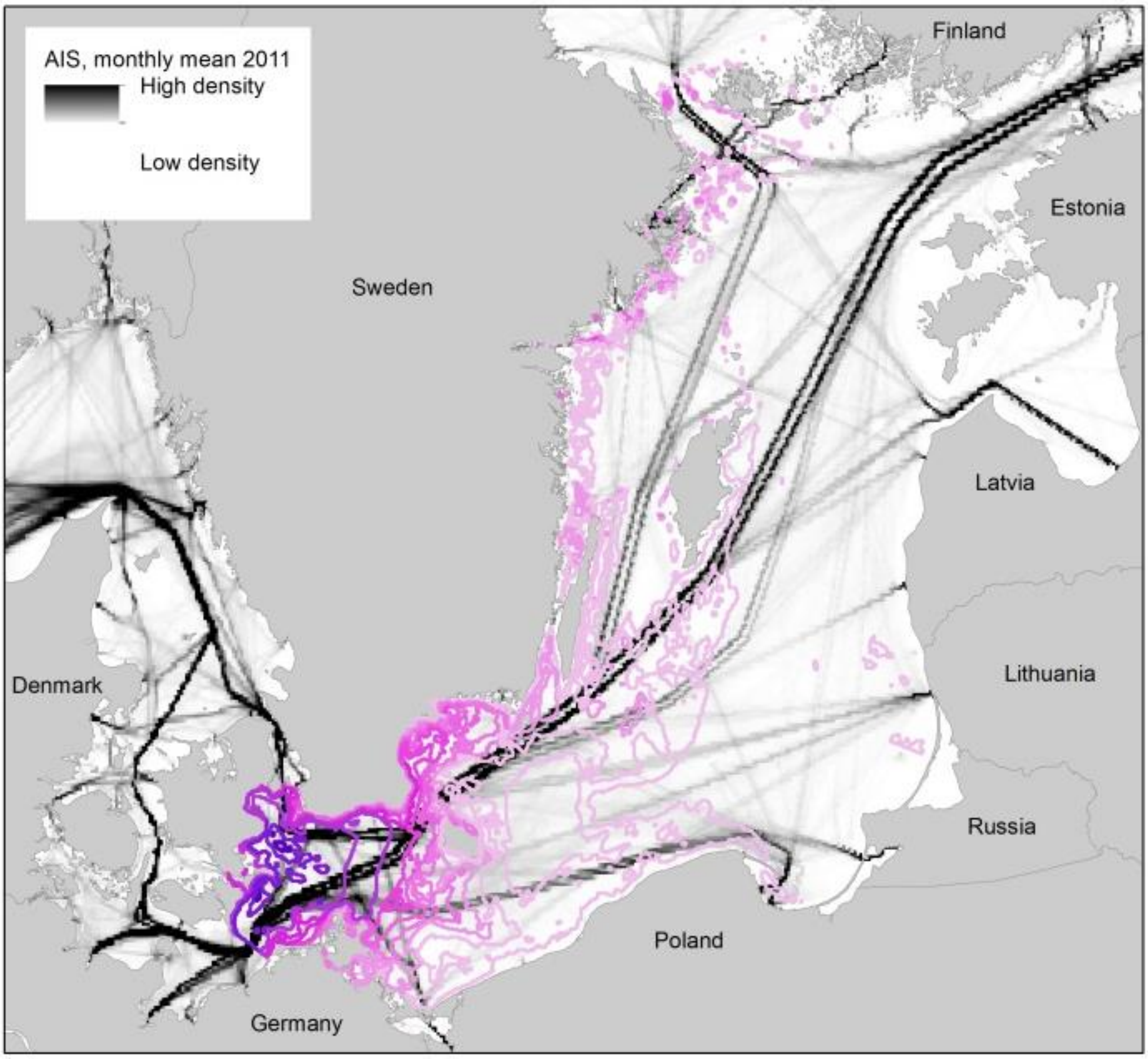

Figure 9b. Monthly probability of detection of harbour porpoises within the SAMBAH area during November – April 2011 – 2013 (data from SAMBAH, 2016), together with AIS shipping in 2011 (courtesy HELCOM data and map service). The legend for probability of detection of harbour porpoises is shown in Figure 9a.