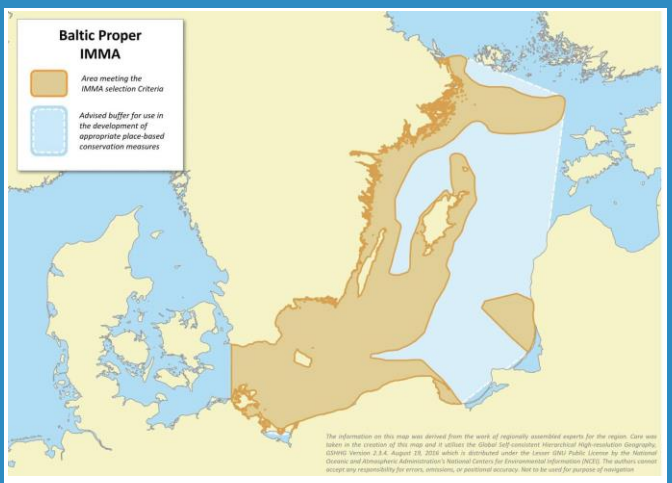

Area Size

109 324 km²

Qualifying Species and Criteria

Harbour porpoise – *Phocoena phocoena*

Criterion A; B (1); D (1)

Harbour seal – *Phoca vitulina*

Criterion B (1); D (1)

Summary

This IMMA encompasses the portion of the Baltic Sea (Baltic Proper) that encompasses the main distribution of the genetically and morphometrically distinct Baltic Proper harbour porpoise (*Phocoena phocoena*) population, as well as the full distribution range of the geographically isolated and genetically distinct Kalmarsund population of harbour seals (*Phoca vitulina)*. The harbour porpoise is the only cetacean species resident in the Baltic. With an estimated population size of a few hundred individuals (95% CI 71-1105 individuals, point estimate 491), the Baltic Proper population is listed as Critically Endangered by IUCN. Breeding is thought to take place on and around the offshore banks in the central Baltic Proper. The IMMA also includes the main winter distribution areas of the population. The Kalmarsund harbour seal population is a distinct population of the

Baltic Proper IMMA

Summary, continued.

Atlantic harbour seal which has been isolated in the Baltic Proper for approximately 8000 years. This population went through a bottleneck in the 1970s but has since increased to just over 2000 individuals.

Description:

The Baltic Sea consists of a series of basins separated by shallow underwater ridges from 18 to 50 m in depth. The deepest point in the Inner Baltic Sea is 459 m deep. There is limited inflow of saline water over these underwater ridges and there is considerable freshwater input to the sea from the catchment area. Hence, a salinity gradient is created going from fully marine conditions in the Skagerrak, through brackish in the Baltic Proper where there is a surface salinity of about 6-8‰, through to almost fresh water with a surface salinity of approximately 1‰ in the northern parts of the Bothnian Bay. There are virtually no tides in the Baltic Sea (Lass & Matthäus 2008), however, there are currents and upwelling induced by wind, which occurs predominantly on the western and eastern shores during the prevailing winds. In the Baltic Sea, a thermocline forms in spring at about 25-30 m depth and is present until late autumn. Eddies have been observed in the deeper basins of the Baltic, forming during the winter and early spring when the thermocline is prominent (Lass & Matthäus 2008). There is also a permanent halocline in the Baltic. It is situated at approximately 40 m depth in the Arkona basin and increases to 60-80 m depth in the Eastern Gotland basin (Conley et al., 2009; Lass & Matthäus, 2008). This discontinuity layer prevents mixing of and input of oxygen to deeper waters, which has created hypoxia and even anoxia in deeper areas of the Baltic

Proper (Conley et al., 2009). In combination with the eutrophication of the Baltic Sea, hypoxia has worsened during the last decades. The oxygen levels in the Baltic are also affected by saltwater inflow through the Danish straits which occurs mainly during winter (October – February). There is evidence of an at least a semi-permanent gyre southwest of the Southern Midsea bank in the Baltic Proper (Naturvårdsverket, 2006; Voss et al., 1999), to which cod larvae from the Bornholm deep spawning ground are transported by currents (Voss et al., 1999). It is likely that this gyre also gathers other organisms such as zooplankton and thereby herring and sprat, which would make it a potential feeding ground for porpoises.

A very important species in the Baltic Sea ecosystem is the herring (*Clupea harengus*), which together with sprat (*Sprattus sprattus*) and cod (*Gadus morhua*) is one of the most important prey species for Baltic Proper harbour porpoises. The summer distribution of harbour porpoises around the offshore banks has been hypothesised to be at least partly due to aggregations of prey around the banks in combination with the shallower depth which would allow a mother and calf to stay within hearing distance even when the female is diving to the sea floor in pursuit of benthic prey.

There are several Natura 2000 areas within the IMMA that are either designated for harbour porpoises or with the harbour porpoise on the list of species present, perhaps most notably the large Swedish Natura 2000 area 'Hoburgs bank och Midsjöbankarna'. Some of the haul-out sites of the Kalmarsund harbour seal population are included in the Natura 2000 site 'Ottenby NR', which is designated partly for the harbour seal.

Criterion A: Species or Population Vulnerability

The harbour porpoise (*Phocoena phocoena phocoena*) in the Baltic Proper is considered a separate sub-population by IUCN and is listed on the IUCN red list as critically endangered (Carlström et al., 2023). It is also listed as Critically Endangered by HELCOM (HELCOM, 2013) (https://helcom.fi/wp-content/uploads/2019/08/HELCOM-Red-List-Phocoena-phocoena.pdf). There are several threats to the population, the main ones likely being bycatch in static fishing gear and the effect of environmental contaminants, but it is likely that prey quantity and quality as well as disturbance from various sources of underwater noise also has an impact on the population status.

Figure 1: Netmarks on a dead harbour porpoise (*Phocoena phocoena*) from Belt Sea.
Photo credits: Michael Dähne / Deutsches Meeresmuseum

Figure 2: Bycaught neonate harbour porpoise (*Phocoena phocoena*) from Belt Sea. Photo credit: Michael Dähne / Deutsches Meeresmuseum

Criterion B: Distribution and Abundance Sub-criterion B1: Small and Resident Populations

The Baltic Proper harbour porpoise population is estimated at 71-1,105 individuals (95% CI, point estimate 491) (Amundin et al., 2022) within the range in the Baltic Proper defined by Carlén et al. (2018). The main range of the Baltic Proper harbour porpoise population is clearly separate from that of the neighbouring Belt Sea population which resides in the southwestern Baltic, the Sound, the Belt Sea and the southern Kattegat Sea (Sveegaard et al., 2015). This spatial separation is especially clear during the summer breeding period (Carlén et al., 2018), when the Baltic Proper population gathers around the offshore banks in the middle of the Baltic Proper, south of the island of Gotland. The Baltic Proper population is genetically divergent from the Belt Sea population and the North Sea populations of harbour porpoises (Lah et al., 2016).

Harbour porpoises in the Baltic Sea region give birth in the summer, with the main peak in June-August (Siebert et al., 2006; Sørensen & Kinze, 1994; Börjesson & Read, 2003). Mating takes place at the same time of year as calves are born. Harbour porpoises seem to be philopatric (Kinze, 1990), meaning they return to their place of birth to breed, and based on the seasonal distribution of animals in the Baltic Proper (Carlén et al., 2018), the main breeding area of the Baltic Proper population is situated around the offshore banks Hoburgs bank and the Northern and Southern Midsea banks in the central Baltic Proper, all areas within the candidate IMMA.

Harbour porpoises need to eat very regularly to sustain their high metabolic rate and as a result spend a considerable amount of their time foraging (Wisniewska et al., 2016) resulting in high energy demands (Kastelein et al., 2018; Koopman, 1998; Read, 1990; Rojano-Doñate et al., 2018). This means that they forage wherever they are, and that any area frequented by harbour porpoises is, in effect, a feeding area.

Figure 3: Harbour porpoises (*Phocoena phocoena*) mother and calf from Belt Sea.
Photo credit: Sophie Tuchscherer, University Greifswald

The Kalmarsund harbour seal (*Phoca vitulina vitulina*) is an isolated population of the Atlantic harbour seal (Härkönen et al., 2005; Goodman, 1998). This population is resident around the southern tip of Öland island and in the narrow sound between Öland and the Swedish mainland in the Baltic Proper. Harbour seals generally have small home ranges (Dietz et al., 2013, 2015), which is also true for the Kalmarsund population. The population has increased by approximately 9% per year since around 1975, and was estimated at just over 2000 individuals in 2021 (ICES, 2022).

Criterion D: Special Attributes
Sub-criterion D1: Distinctiveness

Harbour porpoises entered what is now the Baltic Sea approximately 9000 years ago, and the Baltic Proper population is now genetically (Lah et al., 2016; Wiemann et al., 2010) and morphometrically (Galatius et al., 2012) differentiated from the neighbouring population in the Belt Sea, which is supported by results on spatiotemporal distribution (Carlén et al., 2018). There is limited interbreeding with the neighbouring Belt Sea population.

The Kalmarsund harbour seal (*Phoca vitulina vitulina*) is an isolated population of the Atlantic harbour seal (Härkönen et al., 2005; Goodman, 1998). The population was founded approximately 8000 years ago, and adjacent populations were very small or went extinct, which meant the Kalmarsund population has been isolated ever since. Genetic diversity is very low due to a severe bottleneck with only approximately 30 individuals counted in the 1970's (Härkönen et al., 2005). The usual small home range of harbour seals (Dietz et al., 2013, 2015) means that they still have very little genetic exchange with the neighbouring population in the southwestern Baltic Sea and the Belt Sea.

Supporting Information

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Acknowledgements

We would like to thank the participants of the 2023 IMMA Regional Expert Workshop for the identification of IMMAs in the North East Atlantic Ocean. Funding for the identification of this IMMA was provided by the Water Revolution Foundation. Other sponsors for the workshop included OceanCare and ORCA (orca.org.uk), and substantial administrative support to the IMMA Secretariat was provided by the Tethys Research Institute and Whale and Dolphin Conservation.

Suggested Citation: IUCN-MMPATF (2024) Baltic Proper IMMA Factsheet. IUCN Joint SSC/WCPA Marine Mammal Protected Areas Task Force, 2024.

PDF made available for download at ***https://www.marinemammalhabitat.org/factsheets/baltic-proper-imma/***