

Harbour seal distribution

INDICATOR TYPE: Core
 INDICATOR CATEGORY: State
 BSAP SEGMENT: Biodiversity
 MSFD CRITERIA: D1C4

Distribution of Baltic Harbour seals

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1 Key message

This core indicator evaluates the state of the marine environment based on the distribution of harbour seals that occur in the Baltic Sea. The core indicator has three components: Breeding distribution, Moulting distribution and Area of occupancy (i.e. at-sea distribution). Good status is achieved when the distribution of seals is close to pristine conditions (i.e. 100 years ago), or where appropriate when currently available haul-out sites are occupied (modern baseline), and when no decrease in area of occupation occurs. The current evaluation covers the assessment period 2016-2021. For the distribution indicator, the subpopulations Kalmarsund, and the group consisting of the SW Baltic, Kattegat and Limfjord are assessed independently.

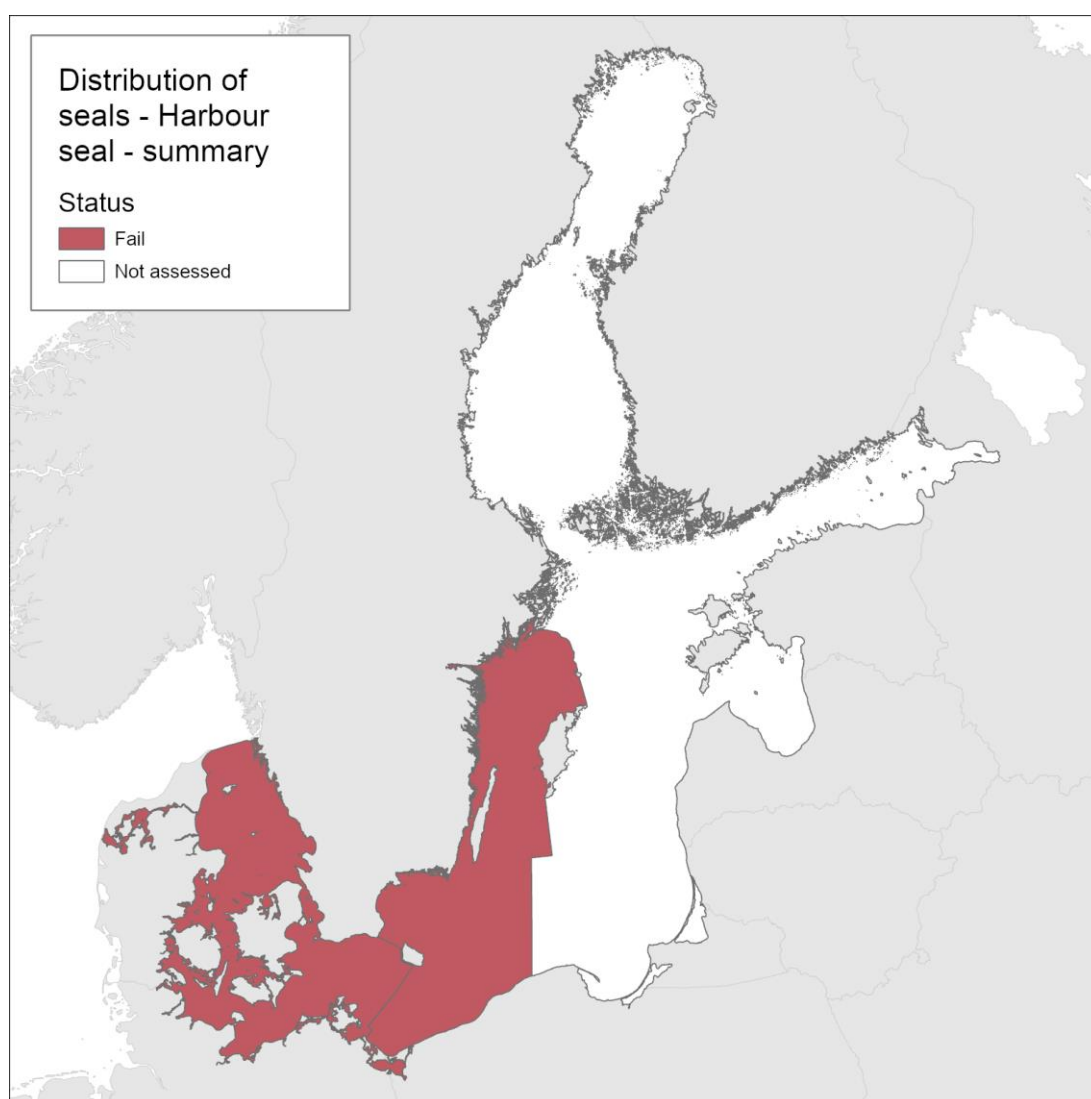


Figure 1. Status evaluation results based on evaluation of the indicator 'distribution of Baltic Seals' –Harbour seal. The evaluation is carried out using grouping of scale 2 HELCOM assessment units (defined in the [HELCOM Monitoring and Assessment Strategy Annex 4](#)), aggregated to relevant agreed management areas. **See 'data chapter' for interactive maps and data at the HELCOM Map and Data Service.**

State of harbour seals: The state of distribution of harbour seals achieves the threshold value for good status in the Kattegat and Limfjord where the breeding and moulting distribution as well as area of occupancy are at pristine levels. However, good status is not achieved for the SW Baltic, therefore when combined as one management area (HELCOM Recommendation 27/28-2) overall good status is not achieved. The Kalmarsund sub-population fails to achieve good status, since although the area of occupancy (i.e. at-sea distribution) is at pristine levels, not all suitable land sites are used. (Figure 1).

1.1 Citation

The data and resulting data products (e.g. tables, figures and maps) available on the indicator web page can be used freely given that it is used appropriately and the source is cited. The indicator should be cited as follows:

HELCOM (2023) Distribution of Baltic seals – harbour seals. HELCOM core indicator report. Online. [Date Viewed], [Web link].

ISSN 2343-2543

2 Relevance of the indicator

2.1 Ecological relevance

The distribution of seals reflect changes in the number of marine top predators in the Baltic Sea. Being top predators of the marine ecosystem, marine mammals are good indicators of the state of food webs, levels of hazardous substances and direct human disturbance. Seals are exposed to bottom-up effects of ecosystem changes at lower trophic levels, but also to variations in climate (length of seasons and ice conditions) and human impacts. These pressures can affect seals indirectly through e.g., decline of fish stocks, levels of harmful substances, reproductive success in addition to causing direct mortality by hunting or by-catch. The vulnerability of seals to these pressures make them good indicators for measuring the environmental status of ecosystems.

The distribution is affected by availability of suitable habitats, food and other resources, as well as anthropogenic disturbance. It is also affected by the abundance of seals. After a low phase in abundance levels recolonization of depleted areas can take time.

Regarding harbour seal, this indicator is applicable over the southwestern parts from Kattegat to Western Gotland basin.

2.2 Policy relevance

The core indicator(s) on the population trends and abundance of Baltic seals addresses the Baltic Sea Action Plan (BSAP 2021) Biodiversity segment goal of a “Baltic Sea ecosystem [that] is healthy and resilient”. The ecological objectives under this goal are also clearly relevant: ‘Viable populations of all native species’, ‘Natural distribution, occurrence and quality of habitats and associated communities’, and ‘Functional, healthy and resilient food webs’.

The [HELCOM Recommendation 27/28-2 Conservation of seals in the Baltic Sea area](#) outlines the conservation goals of seals agreed on at HELCOM. The recommendation is implemented to reach the BSAP goals. The recommendation conservation goals are used as the basis for defining this indicator's threshold value.

The indicator also has clear relevance for the EU Marine Strategy Framework Directive (MSFD), for those Contracting Parties that are also EU Member States. In particular the relevance is high for MSFD Descriptor 1 that addresses species and habitats and also for Descriptor 4 that addresses ecosystems, including food webs.

A summary overview of policy linkages is provided in Table 1, below.

In some Contracting Parties, the indicator also has potential relevance for implementation of the EU Water Framework Directive (WFD) and Habitats Directive. The WFD includes status categories for coastal waters as well as environmental and ecological objectives. The EU Habitats Directive (European Commission 1992) specifically states that long-term management objectives should not be influenced by socio-economic considerations,

although they may be considered during the implementation of management programmes provided the long-term objectives are not compromised. All seals in Europe are also listed under the EU Habitats Directive Annex II, and member countries are obliged to monitor the status of seal populations.

Table 1. Overview of policy relevance for this indicator.

	Baltic Sea Action Plan (BSAP)	Marine Strategy Framework Directive (MSFD)
Fundamental link	<p>Segment: Biodiversity</p> <p>Goal: “Baltic Sea ecosystem is healthy and resilient”</p> <ul style="list-style-type: none"> • Ecological objective: “Viable populations of all native species “, and “Natural distribution, occurrence and quality of habitats and associated communities”. • Management objective: “Effectively managed and ecologically coherent network of marine protected areas “, “Minimize disturbance of species, their habitats and migration routes from human activities”; “Effective and coordinated conservation plans and measures for threatened species, habitats, biotopes, and biotope complexes”. 	<p>Descriptor 1 Species groups of birds, mammals, reptiles, fish and cephalopods.</p> <ul style="list-style-type: none"> • Criteria 4 The species distributional range and, where relevant, pattern is in line with prevailing physiographic, geographic and climatic conditions. • Feature – Species groups (seals). • Element of the feature assessed – Species lists (grey seals).
Complementary link	<p>Segment: Biodiversity</p> <p>Goal: “Baltic Sea ecosystem is healthy and resilient”</p> <ul style="list-style-type: none"> • Ecological objective: “Functional, healthy and resilient food webs”. • Management objective: “Reduce or prevent human pressures that lead to imbalance in the foodweb”. <p>Segment: Hazardous substances and litter goal</p> <p>Goal: “Baltic Sea unaffected by hazardous substances and litter”</p>	<p>Descriptor 1 Species groups of birds, mammals, reptiles, fish and cephalopods.</p> <ul style="list-style-type: none"> • Criteria 2 The population abundance of the species is not adversely affected due to anthropogenic pressures, such that its long-term viability is ensured. • Feature – Species groups (seals). • Element of the feature assessed – Species lists (grey seals). <p>Descriptor 4 Ecosystems, including food webs.</p> <ul style="list-style-type: none"> • Criteria 4 Productivity of the trophic guild is not adversely affected due to anthropogenic pressures. • Feature – Species groups (seals). • Element of the feature assessed – Trophic guilds. <p>Descriptor 8 Concentrations of contaminants are at levels not giving rise to pollution effects.</p>

	<ul style="list-style-type: none"> • Ecological objective: “Marine life is healthy”. • Management objective: “Minimize input and impact of hazardous substances from human activities”. 	<ul style="list-style-type: none"> • Criteria 2 The health of species and the condition of habitats (such as their species composition and relative abundance at locations of chronic pollution) are not adversely affected due to contaminants including cumulative and synergetic effects. • Feature – Species (seals). • Element of the feature assessed – Species lists (seals).
<p>Other relevant legislation:</p>	<ul style="list-style-type: none"> • In some Contracting Parties also EU Water Framework Directive – Chemical quality, Habitats Directive • UN Sustainable Development Goal 14 (Conserve and sustainably use the oceans, seas and marine resources for sustainable development) is most clearly relevant, though SDG 12 (Ensure sustainable consumption and production patterns) and 13 (Take urgent action to combat climate change and its impacts) also have relevance. 	

3 Threshold values

Good status reflected through the distribution of seals in the Baltic Sea is based on concepts developed for the conservation of seals. The concept for defining threshold values to indicate good status is derived from the general management principle in the [HELCOM Recommendation 27/28-2](#), which states the aim to allow breeding seals to expand to suitable breeding distribution in all regions of the Baltic Sea.

Good status is achieved when the threshold values for all considered parameters are achieved (Breeding distribution, Moulting distribution and Area of occupancy). Good status is achieved when the distributions of seals are close to pristine conditions (e.g. 100 years ago), or where appropriate when all currently available haul-out sites are occupied (modern baseline), and when no decrease in area of occupation occurs (Figure 2). Three different parameters of distribution are given for all species of seals: 1) Breeding distribution on land or ice, 2) Moulting distribution on land or ice, which refers to haulouts used for moulting and resting and 3) Area of occupancy, which includes sea areas used for transport and foraging.

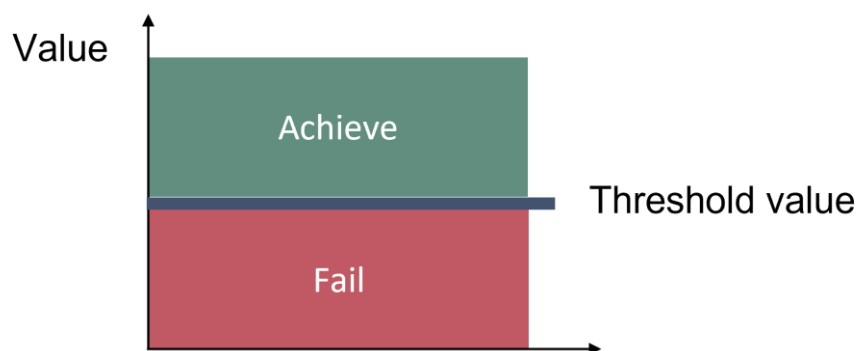


Figure 2. Good status is achieved when distribution of seals is close to pristine conditions (e.g. 100 years ago), or where appropriate when all currently available haul-out sites are occupied (modern baseline), and when no decrease in area of occupation occurs.

3.1 Setting the threshold value(s)

The following criteria are used to evaluate whether the threshold value is achieved or failed:

- Breeding distribution. The threshold value is achieved when available land breeding sites are colonized, and distribution is not diminishing.
- Moulting distribution: The distribution of haul-out sites used for resting and moulting of harbour seals are almost identical to the distribution of breeding sites. The threshold value is achieved when all existing suitable sites are colonized.
- Area of occupancy: the threshold value is achieved when seals have access to all feeding grounds and they can move freely among haul-out sites and the feeding grounds.

The modern baseline approach is applied for harbour seal distribution since some formerly used haul-out sites have disappeared in the southern Baltic as a consequence of exploitation of sand for industrial use. This type of a modern baseline should be defined so that the species will thrive and persist in the future.

4 Results and discussion

4.1 Status evaluation

For the distribution indicator, the harbour seals subpopulations Kalmarsund (Bornholm Basin and Western Gotland Basin), SW Baltic (Arkona basin, Bay of Mecklenburg, Kiel Bay, Great Belt and the Sound), Kattegat and Limfjord are assessed independently as two separate management units (as set out under HELCOM Recommendation 27/28-2; 1) Harbour seals in the Kalmarsund region (Sweden); 2) Southwestern Baltic and Kattegat harbour seals (Denmark, Germany, Poland, Sweden)) using distribution during pristine conditions as the base-line (Figure 1). Additional information is also provided at smaller scales to represent recent advances to gain new knowledge on seal distribution.

Moulting and breeding distribution:

In the areas of the Kattegat and Limfjord the harbour seal populations are observed at all historical haul-out sites during the moulting survey (Figure 3). In the SW Baltic, harbour seals do not currently breed regularly at historical localities south of the island of Fyn or in the Great Belt. There is also a lack of occupied haul-out sites along the German coast. In the Kalmarsund, harbour seals are increasing and showing signs of expanding and still colonizing new areas. Haul-out sites are only routinely monitored across the range during the moulting-time in August. Thus, the evaluation is most accurate in determining moulting distribution. However, harbour seals are relatively sedentary compared to the other Baltic Sea seal species and their moulting haul-out sites mostly correspond to their pupping sites. As such, the Limfjord and the Kattegat, if assessed separately would achieve good environmental status, whilst the Kalmarsund and SW Baltic fail to achieve good environmental status for the moulting and distribution assessment (Figure 4). When grouped only as the agreed management units however, both fail to achieve good environmental status.

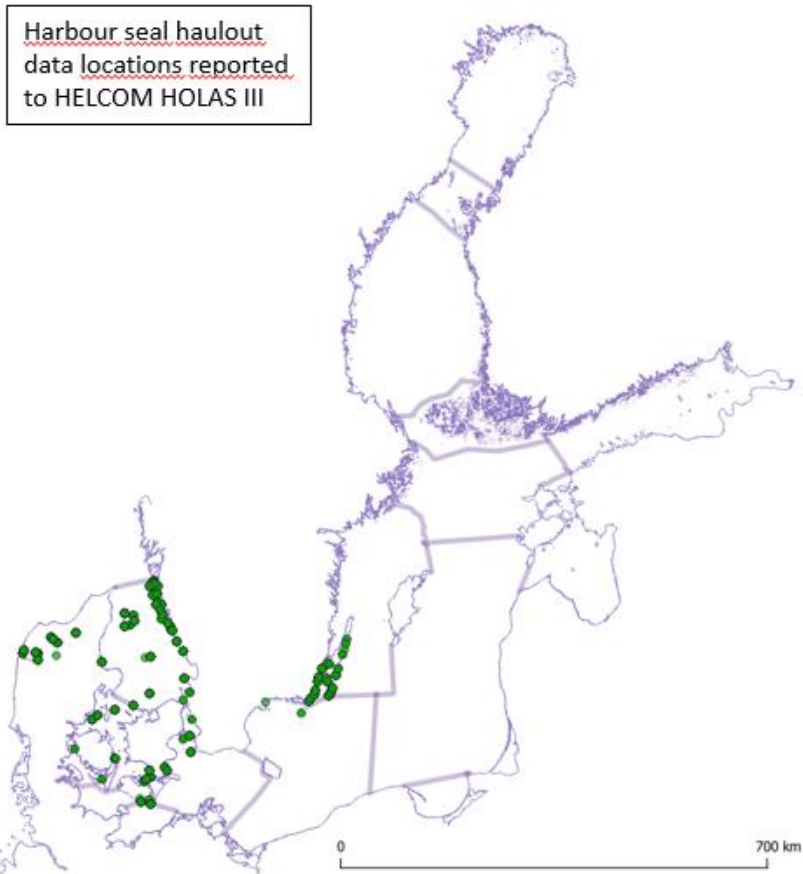


Figure 3: Distribution of harbour seal moulting haulouts in the Baltic Sea according to the data reported to HELCOM HOLAS III. The map includes all currently known haul-out sites. Harbour seal moulting haulouts correspond to their breeding haulouts. Harbour seals have not yet recolonized all the historically known and available breeding and moulting haul-out sites in southwestern Baltic and in Kalmarsund.

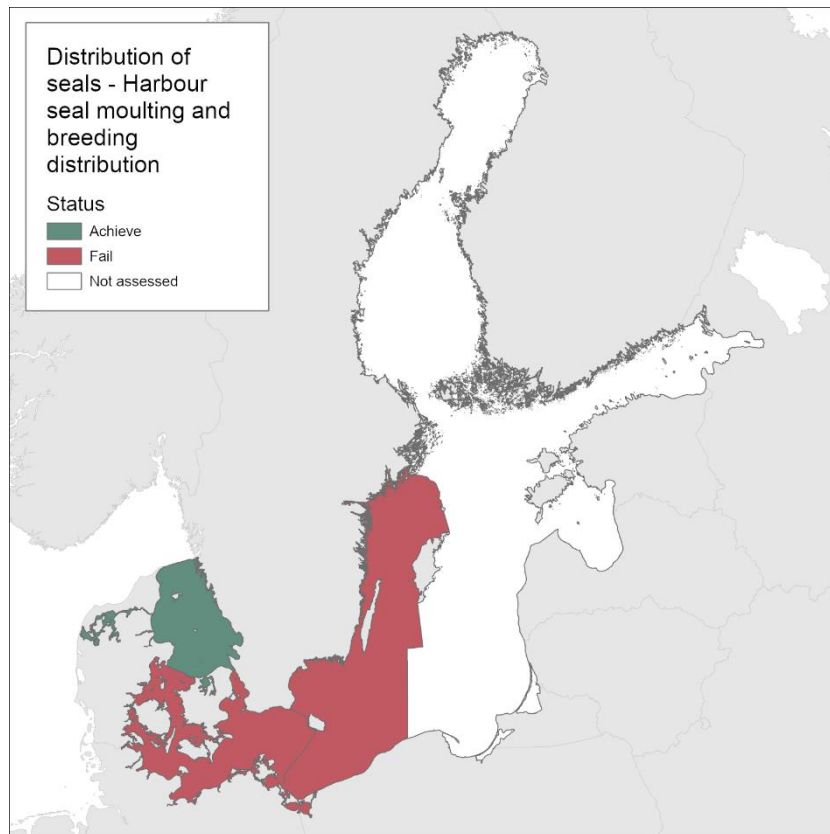


Figure 4: Evaluation of harbour seal moulting and breeding distribution.

Area of occupancy:

Although there is no structured monitoring of at sea occupancy harbour seal behaviour and movement at sea have been studied with help of satellite tracking devices. Harbour seals have been tagged to study movements in Kattegat, Limfjord and in the SW Baltic. Based on these data it has been evident that seals can travel freely among sites and feeding grounds. There have been no tagging efforts in the Kalmarsund area, but there is also no evidence to suggest that movement is restricted as the population appears to expand its distribution as observed by the occupancy of new haul-out sites during moulting. As such, harbour seals achieve good environmental status, for all subpopulations, for area of occupancy evaluation.

Overall evaluation of Distribution of Baltic harbour seals:

Based on one-out-all-out concept, the Distribution indicator achieves good status in Limfjord and Kattegat. In SW Baltic and Kalmarsund the breeding and moulting distributions have not yet reached the pristine levels leading the Distribution indicator fail to achieve good status. However, when evaluated only at the scale of the two agreed management areas both of these areas fail to achieve Good Environmental Status (Figure 1).

4.2 Trends

Changes from the previous evaluation of the status of harbour seal distribution are mainly due to new information considered.

In HOLAS II, Kalmarsund population was assessed as having occupied all of its pristine distribution. However, in that evaluation, it was not considered that the species has been present for example at Gotland and northern part of Kalmarsund (Härkönen *et al.* 2005). During the current assessment period Kalmarsund harbour seals have shown signs of expanding to new suitable haulouts towards the north and possibly the west. Understanding that our knowledge on the exact historical haulouts is still incomplete, we re-evaluated the pristine distribution to be larger than the current distribution. This led to a conclusion in HOLAS III that the threshold for breeding and moulting distribution has not yet been achieved.

Recolonization of historical haulouts has been observed in SW Baltic, too. After reports of increasing seal occurrence in the South Funen Archipelago in recent years, a pilot survey was conducted during the moulting season of 2021, revealing that the haul-outs in this area under a modern baseline were occupied after local extinction in the early 1900s. Data on breeding distribution in this area were not available for the current evaluation. Former haul-out range along the German Baltic coast has not been reoccupied, even under a modern baseline, disregarding previous haul-outs that are now permanently lost.

4.3 Discussion

An overview of the status evaluation and a comparison between the current (HOLAS 3, 2016-2021) and previous (HOLAS II, 2011-2016) periods is provide below in Table 2.

Table 2. Overview of status evaluation and comparison between assessment periods.

HELCOM Harbour seal management unit	Threshold value achieved/failed - HOLAS 2	Threshold value achieved/failed - HOLAS 3	Distinct trend between current and previous evaluation.	Description of outcomes, if pertinent.
Evaluation based on two currently agreed management areas				
Southwestern Baltic and Kattegat harbour seals	Not assessed in same format	Failed, see below.	NA, in the previous assessment period the evaluation was applied in an alternative format so no direct comparison can be carried out.	Good status is not achieved due to the failure to achieve the threshold value for moulting and breeding distribution in the SW Baltic area despite all other parameters being achieved elsewhere in this management area.
Kalmarsund	Achieved	Failed	Distribution is showing signs of	GES is not achieved in the current period

			increase, but the extent of the pristine distribution, which is the threshold for good status, was re-evaluated due to the observed increases. The switch in status from achieve to fail is therefore not as simple to interpret as a deterioration since increasing distribution is a positive sign for the population.	and this is dominantly driven by an increase in distribution indicative of the fact that the historic range appears still not to have been achieved.
Smaller scale of evaluation additionally applied for contextual information				
Kattegat	Achieved	Achieved	Stable, no change in status has occurred and all parameters remain above their respective threshold values.	All parameters utilised to carry out the evaluation achieve the threshold values and thus GES is achieved.
Limfjord	Achieved	Achieved	Stable, no change in status has occurred and all parameters remain above their respective threshold values.	All parameters utilised to carry out the evaluation achieve the threshold values and thus GES is achieved.
SW Baltic	Failed	Failed	Stable, no change in status has occurred and the failure to achieve the threshold value for moulting and breeding distribution remains the common thread.	Good status is not achieved due to the failure to achieve the threshold value for moulting and breeding distribution.

Changes to the way in which evaluations were applied between the two assessment periods compared result in some different comparisons, however, equivalent smaller scale evaluations are also applied in HOLAS 3 to allow better comparison. In addition, see future work, there is a need to re-evaluate the management areas applied for this species as recent scientific advances suggest a finer scale of evaluation and management is required. The 'deterioration' apparent in status for the Kalmarsund population must also be clarified carefully as the status change is due to an expansion of the population to areas previously believed to be outside of its natural historic range, thus such changes can not per se be seen as a deterioration.

5 Confidence

The confidence for harbour seal moult distribution is considered to be high in most assessment units, as moult counts are currently carried out at a high spatial and temporal frequency. Surveys in the South Funen Archipelago, where harbour seals were locally extinct by the early 1900s are only available for 2021 and no data on breeding distribution are available for this area for the current evaluation. Confidence for breeding distribution is moderate or low in Sweden where pup counts are not carried out regularly. There, observations on breeding sites are sporadic, but supporting the expectation that the breeding sites are largely the same as moulting sites. Understanding on the area of occupancy is based on some telemetry studies showing the extent of harbour seals' foraging area around their haulouts. Such telemetry studies are lacking for the Kalmarsund population. However, the threshold for area of occupancy is the free access for seals to use their haulouts and foraging grounds. For that, no obstructions are known.

6 Drivers, Activities, and Pressures

Historically, hunting of seals has been a major human pressure on all the seal species in the Baltic Sea. A coordinated international campaign was initiated in the beginning of the 20th century with the aim of exterminating the seals (Anon. 1895). Bounty systems were introduced in Denmark, Finland and Sweden over the period 1889-1912, and very detailed bounty statistics provide detailed information on the hunting pressure. The original population sizes were about 180,000 for ringed seals, 80,000 for Baltic grey seals and 5,000 for the Kalmarsund population of harbour seals (Harding & Härkönen 1999; Härkönen & Isakson 2011). Similar data from the Kattegat and Skagerrak suggest that populations of harbour seals amounted to more than 17,000 seals in this area (Heide-Jørgensen & Härkönen 1988).

Table 3 Brief summary of relevant pressures and activities with relevance to the indicator.

	General	MSFD Annex III, Table 2a
Strong link	The main pressures affecting the distribution of Baltic seal populations include hunting, by-catches, disturbance and destruction of haul-out sites.	Biological <ul style="list-style-type: none"> - Disturbance of species (e.g. where they breed, rest and feed) due to human presence. - Extraction of, or mortality/injury to, wild species (by commercial and recreational fishing and other activities).
Weak link	The effects of climate change are a threat to the ringed seal that breeds on sea ice. Fishery and food availability.	Substances, litter and energy <ul style="list-style-type: none"> - Input of other substances (e.g. synthetic substances, non-synthetic substances, radionuclides).

The hunting pressure resulted in extirpation of grey and harbour seals in Germany and Poland in 1912, and grey seals were also extirpated from the Kattegat by the 1930s. Ringed seals declined to about 25,000 seals in the 1940s, whereas grey seals were reduced to about 20,000 (Harding & Härkönen 1999) over the same time period. Ringed seal breeding occurred in Stockholm county up to the beginning of the 1940s, but ceased in the mid of that decade (Hult 1943). A similar rate of reduction of harbour seals occurred in the Kalmarsund and the Kattegat (Heide-Jørgensen & Härkönen 1988; Härkönen & Isakson 2011). However, after these heavy reductions, populations appear to have been stable up to the 1960s (Harding & Härkönen 1999).

7 Climate change and other factors

Climate change is expected to have significant impacts on the Baltic Sea ecosystem (HELCOM and Baltic Earth, 2021). Climate change will likely have widespread impacts on the Baltic Sea ecosystem, including on higher trophic levels. Such changes may influence status evaluations and also need to be reflected in management (e.g. potentially the need to be precautionary). Climate change impacts could include flooding of haul out sites, changed temperature, stratification, and altered prey distribution, quality and quantity, all of which, though difficult to current predict risk impacts on marine mammals. Being at the top of the marine food web, these predators are sensitive to changes throughout the ecosystem, and changes in food webs on which they rely (and for which our current understanding is poor) may be significant with potential changes in food availability and altered transfer of contaminants.

Such food web and ecosystem changes may force a re-distribution of seals but a significant direct impact is the projected sea level rise which would flood many or all harbour seal haulouts in the SW Baltic (Meier *et al.* 2022). However, the effects of climate change should themselves not be directly included in evaluations according to the Habitat Directive.

8 Conclusions

Harbour seal distribution achieves the good status in Kattegat and Limfjord areas, if assessed independently, where all available haulouts for breeding, moulting and resting are occupied and they have free access to and between these sites and foraging grounds. However in the SW Baltic area the status is not good, based on harbour seals not regularly occurring at historical localities south of the island of Fyn or in the Great Belt. Thus when assessed as a single management area the overall status fails to achieve GES. In the Kalmarsund sub-population (management area) harbour seals have not yet colonized all available and suitable haulouts for breeding, moulting and resting and therefore do not achieve good environmental status.

8.1 Future work or improvements needed.

Pup counts covering the whole breeding distribution would improve the geographical and temporal resolution of the breeding data. Regular telemetry studies in all populations would provide more accurate information on the foraging grounds and movement behaviour as well as potential changes in them. The proposed approach to re-evaluate harbour seal management units, as set out in intersessional work under EG MAMA and State and Conservation (i.e. developing of more and smaller relevant management areas based on latest science and re-evaluating relevant Limit Reference Levels), needs to be carried out to improve future evaluations.

9 Methodology

9.1 Scale of assessment

This core indicator evaluates the distribution of Baltic Sea seal species using HELCOM assessment unit scale 2 (division of the Baltic Sea into 17 sub-basins), aggregated into the two management areas defined under [HELCOM Recommendation 27/28-2 Conservation of seals in the Baltic Sea area](#). The assessment units are defined in the [HELCOM Monitoring and Assessment Strategy Annex 4](#).

The existing management plans for seals operate according to management units that are based on the distribution of seal populations. The management units typically encompass a handful of HELCOM scale 2 assessment units. Evaluations are therefore done by grouping HELCOM assessment units to align with the management units defined for each seal population.

- Harbour seals in the Kalmarsund, Sweden, constitute a separate management unit within Bornholm and Western Gotland Basins.

Harbour seals in the southwestern Baltic occur in Arkona Basin, Bay of Mecklenburg, Kiel Bay, southern part of Great Belt and The Sound, the Kattegat population of harbour seals inhabits Kattegat and northern part of Great Belt, and the Harbour seals in the Limfjord form a separate management unit and are genetically distinct from the Kattegat harbour seals (Olsen *et al.* 2014).

This second management unit is the one requiring revision based on recent scientific studies and greater details on the sub-sections of it are provided in the current results.

9.2 Methodology applied

Monitoring methodology:

HELCOM common monitoring relevant for the seal population trends is documented on a general level in the HELCOM Monitoring Manual under the [sub-programme: Seal abundance](#).

[HELCOM monitoring guidelines for seals](#) were adopted in 2014 and updated in 2018 ([HELCOM Guidelines for monitoring seal abundance and distribution \(2018\)](#)).

The three regularly occurring seal species in the Baltic Sea: harbour seal, ringed seal and grey seal, are monitored at their haul-outs on land during their annual moulting and pupping seasons, with the aim of estimating the abundance and trends (moulting counts) and pup production (pupping counts). Ringed seals are counted during moult on the ice. Where possible, the monitoring is performed using aerial surveys, where the seal haul-outs are photographed during the relevant periods in areas where there is a significant occurrence of seals.

Detailed descriptions of the survey methodology and analysis of results are given in the HELCOM monitoring guidelines ([HELCOM Guidelines for monitoring seal abundance and](#)

[distribution \(2018\)](#)). The monitoring carried out according to these guidelines will not be very sensitive to detecting positive changes in range and mainly constriction in range can be detected. Other means are needed for detecting range expansion, and surveys are adjusted to cover expansions in range based on satellite telemetry data and other observations.

Current monitoring:

The monitoring activities relevant to the indicators that are currently carried out by HELCOM Contracting Parties are described in the HELCOM Monitoring Manual in the [Monitoring Concept Table](#).

Sub-programme: Seal Abundance
[Monitoring Concept Table](#)

Current monitoring covers all haul-out sites presently used by seals in the Baltic Sea and is considered to be sufficient to cover the needs of the indicator except for southern ringed seals. See description in the [Assessment Requirements](#) of the HELCOM Monitoring Manual.

10 Data

The data and resulting data products (e.g. tables, figures and maps) available on the indicator web page can be used freely given that it is used appropriately and the source is cited as following:

HELCOM (2023) Distribution of Baltic seals. HELCOM core indicator report. Online. [Date Viewed], [Web link]. ISSN 2343-2543.

[Result: Distribution of Baltic seals - Harbour seal](#)

[Data: Distribution of Baltic seals - Harbour seal](#)

The national survey data is compiled annually by the HELCOM Seal Expert Group. A regional database has been developed and is hosted at the HELCOM Secretariat. The new database will include detailed spatial information and is to be updated annually prior to HELCOM Seal Expert Group meetings.

Status evaluations are to be accomplished by the Lead and co-Lead countries. The outcome of such assessments will be presented and discussed at future HELCOM Seal Expert Group meetings.

The first compilations for the database have been completed and an [intermediate version of the seal database can be accessed](#). During 2015-2016 work continued to operationalize the database. Further metadata was included at a later stage.

The data collected and used in the indicator are based on national aerial surveys. The survey methodology is described in the relevant [HELCOM Guidelines for monitoring seal abundance and distribution \(2018\)](#). This data covers only haul-out sites and not areas used e.g. as foraging grounds.

11 Contributors

This indicator report for HOLAS 3 was prepared by Markus Ahola, Anders Galatius and Anja Carlsson.

The assessment principles, methodology and background information are largely based on the previous assessment report by Tero Härkönen, Anders Galatius, Karin Hårding, Olle Karlsson, Markus Ahola, Morten Tange Olsen.

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12 Archive

This version of the HELCOM core indicator report was published in April 2023:

The current version of this indicator (including as a PDF) can be found on the [HELCOM indicator web page](#).

Earlier versions of this indicator are available at:

[Distribution of Baltic seals HELCOM core indicator 2018](#) (pdf)

[HOLAS II component - core indicator report July 2017](#) (pdf)

[Population growth rate, abundance and distribution of marine mammals 2013](#) (pdf)

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