HELCOM

Population trends and abundance of seals – Ringed seals

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1 Key message

This core indicator report evaluates the status of the marine environment based on population trends and abundance of the Baltic Sea ringed seals (other seal species are addressed in separate reports). Good status is achieved for each species when i) the abundance of seals in each management unit has attained a Limit Reference Level (LRL) of at least 10,000 individuals to ensure long-term viability and ii) the population trend, assessed by species-specific growth rate, for a population either under or at Target Reference Level (TRL) is achieved, indicating that growth-rates are not affected by severe anthropogenic pressures.

The ringed seal is evaluated in two management units: the Bothnian Bay and the southern management unit, which consists of sub-populations in the Archipelago Sea, the Gulf of Finland and western Estonia.

For the ringed seal population in Bothnian Bay the Bayesian analyses showed 80% support for growth rate of ≥5.0% for 2003-2012. This is below the threshold of 7%. However, trend calculation for data collected after 2012 was not possible. The inventory results from these years have been anomalously high with extreme inter-annual variation, the results do not fit with the previous trend-lines and show “increases” that are not biologically possible. The ice-conditions are changing in Bothnia Bay and it is hypothesised that the inconsistent survey results are a result of an increased fraction of the total population being observed hauled-out on the ice during the survey period, likely due to lower ice-coverage and earlier ice-breakup. There have, however, been no indication of a major decrease in the population. The highest estimate of hauled out ringed seals during the assessment period (i.e. 2016-2021) was 14 602 (2021), which is over the abundance threshold of Limit Reference Level (LRL) 10 000. With one-out-all-out –approach, the Bothnian Bay ringed seal fail to achieve good environmental status (Figure 1).

In the Gulf of Finland, Archipelago Sea and western Estonia, the numbers of counted ringed seals only sums up to a small fraction of the threshold for abundance and none of the areas are showing signs of increase. The southern ringed seal management unit does not achieve good environmental status (Figure 1).

Confidence of the indicator evaluation is considered to be high for the southern ringed seal management unit and low for the Bothnian Bay ringed seal management unit.

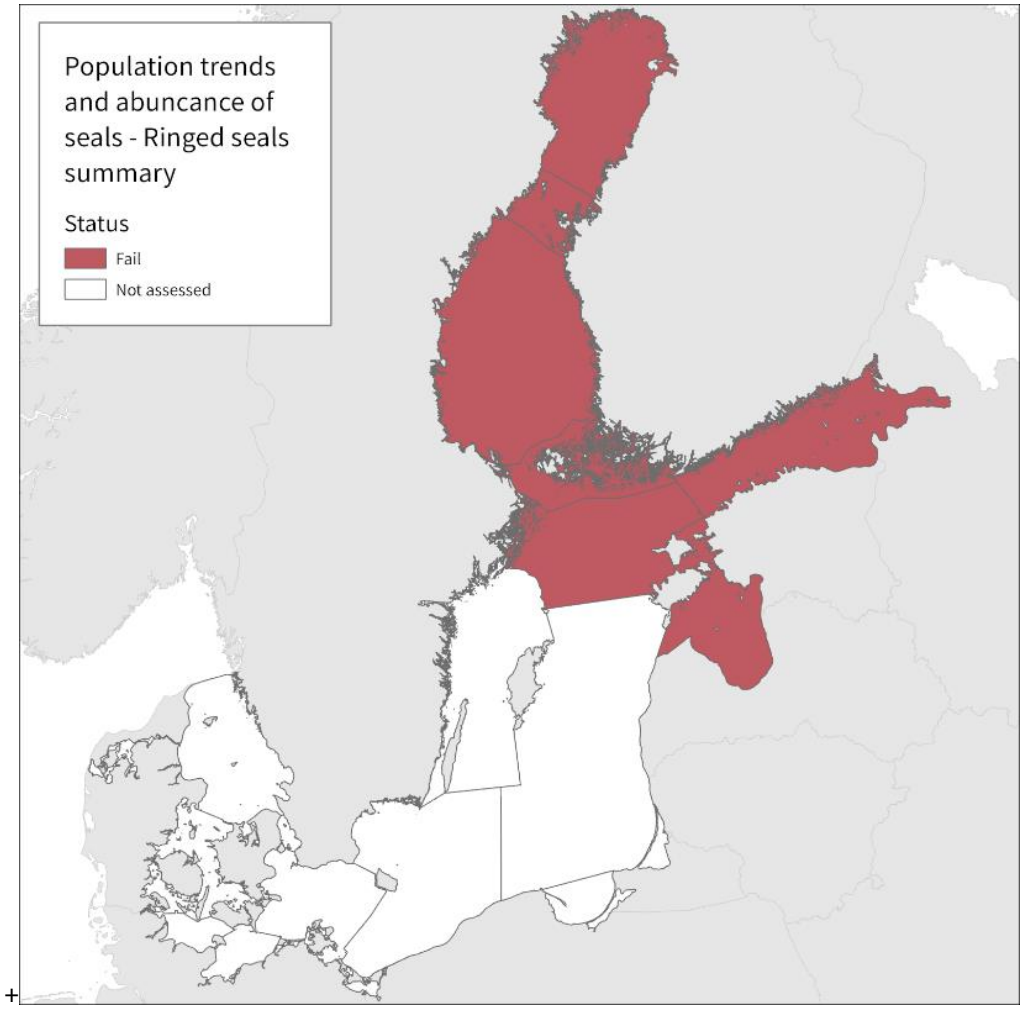

Figure 1. The overall status evaluation results based on evaluation of the indicator 'population trends and abundance of seals' – Ringed seals. The evaluation is carried out using Scale 2 HELCOM assessment units (defined in the HELCOM Monitoring and Assessment Strategy Attachment 4), using the one-out-all-out approach. Thus, if a seal management unit, in not good status, has a given assessment unit as part of its range, the assessment unit is marked red. **See 'data chapter' for interactive maps and data at the HELCOM Map and Data Service.**

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) Population trends and abundance of seals. HELCOM core indicator report. Online. [Date Viewed], [Web link].

ISSN 2343-2543

2 Relevance of the indicator

2.1 Ecological relevance

The population trends and abundance 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 growth rate of a population is the result of age-specific mortality rates and age-specific fecundity rates. It is therefore a sensitive parameter signalling if mortality or fecundity rates change. Depleted, undisturbed ringed seal populations are expected to grow by 10% per year. Significantly decreasing growth rates can be signs of density-dependence for example due to limiting food or other resources (Svensson *et al.* 2011), the functional factors of carrying capacity. However, decreasing growth can also indicate impaired health caused by contaminants or diseases, as well as excessive hunting or high levels of by-catches.

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 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	Segment: Biodiversity Goal: "Baltic Sea ecosystem is healthy and resilient" • 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".	Descriptor 1 Species groups of birds, mammals, reptiles, fish and cephalopods. • 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 (harbour seals).
Complementary link	Segment: Biodiversity Goal: "Baltic Sea ecosystem is healthy and resilient" • Ecological objective: "Functional, healthy and resilient food webs". • Management objective: "Reduce or prevent human pressures that lead to imbalance in the foodweb". Segment: Hazardous substances and litter goal	Descriptor 1 Species groups of birds, mammals, reptiles, fish and cephalopods. • 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 (harbour seals). Descriptor 4 Ecosystems, including food webs. • Criteria 4 Productivity of the trophic guild is not adversely affected due to anthropogenic pressures. • Feature – Species groups (seals).

	Goal: "Baltic Sea unaffected by hazardous substances and litter" • Ecological objective: "Marine life is healthy". • Management objective: "Minimize input and impact of hazardous substances from human activities".	• Element of the feature assessed – Trophic guilds. Descriptor 8 Concentrations of contaminants are at levels not giving rise to pollution effects. • 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).
Other relevant legislation:	• 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.	

2.3 Relevance for other assessments

The status of biodiversity is assessed using several core indicators. Each indicator focuses on one important aspect of this complex issue. In addition to providing an indicator-based evaluation of the population trends and abundance of seals, this indicator will also contribute to the overall biodiversity assessment, along with the other biodiversity core indicators.

The results are utilised in the HELCOM Biodiversity integrated assessment (BEAT tool) to support an overall evaluation of marine mammals.

3 Threshold values

Status for the population trends and abundance of seals in the Baltic Sea is determined by comparing population data with threshold values that have been defined based on concepts developed for the conservation of seals, in particular the HELCOM Recommendation 27/28-2 'Conservation of seals in the Baltic Sea area', which states that the population size is to be managed with the long-term objective of allowing seal populations to recover towards carrying capacity.

Good status is achieved for population trends and abundance of seals in a management unit if the population is above the Limit Reference Level (LRL). Good status for abundance is achieved in a management unit if the population is above the Limit Reference Level (LRL). HELCOM set a LRL of 10,000 individuals for all the Baltic seal species for each ecologically and genetically isolated population. The LRL corresponds to the safe biological level and minimum viable population size. The LRL of 10,000 implies a population with approximately 5,000 adult seals (and thus 2,500 adult female seals). LRL has been calculated based on estimates of minimum viable population sizes based on different extinction risk levels (1, 3, 5 and 10%) for genetically and ecologically isolated populations. Although several values were modelled for these parameters, the set LRL only reflects one of these percentage values: 1% extinction risk over 100 years. For ringed seals the results of the line-transect surveys represent number of seals hauled out on ice during the survey. The hauled-out fraction of the total population is currently unknown, but it has recently varied a lot depending on ice-conditions. At the moment, the results of the surveys can only be taken as minimum abundance estimate.

The growth rate aspect of the threshold value is assessed separately for populations at and below the Target reference level (TRL). TRL is the level where the growth rate starts to level off and the population asymptotically approaches the current carrying capacity level.

- For populations that have reached the TRL, good status is defined as 'No decline in population size exceeding 10% occurred over a period up to 10 years'
- For populations below TRL, good status is defined as 3% below the maximum rate of increase for seal species, i.e. 7% annual rate of increase for ringed seals.

The approach, methods and data used to define the threshold values for abundance and growth rates are explained in detail in the previous indicator report Population trends and abundance of seals HELCOM core indicator 2018 (pdf).

4 Results and discussion

The results of the indicator evaluation that underlie the key message map and information are provided below.

4.1 Status evaluation

Both ringed seal management units fail to achieve good environmental status the population growth rates are below the threshold value for good status (Figure 2).

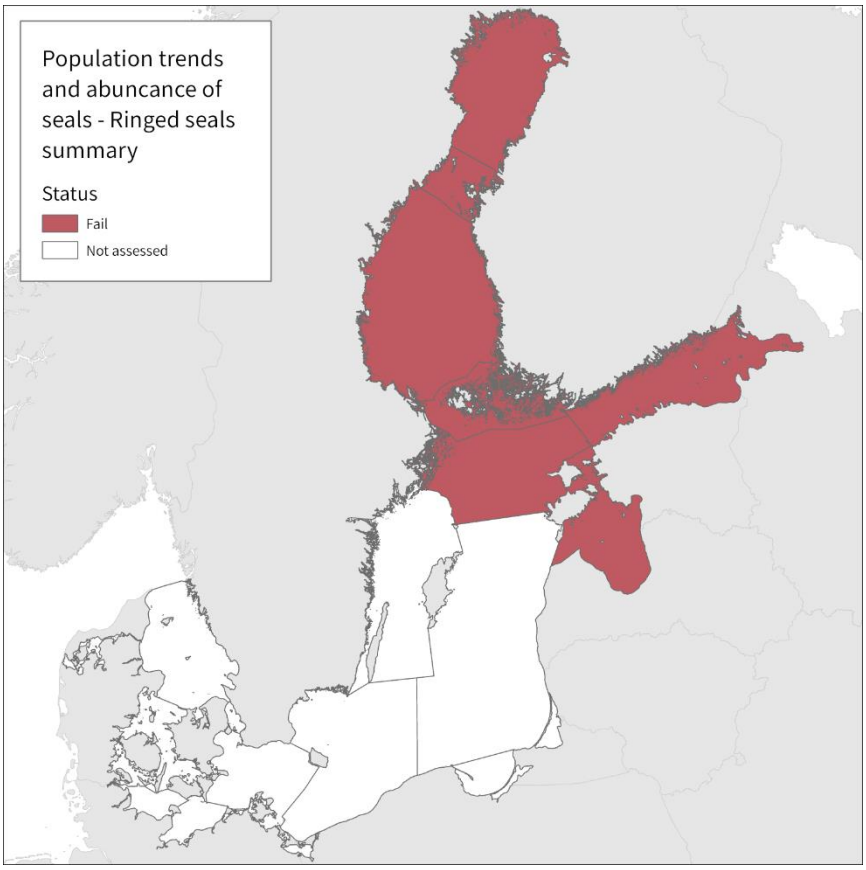

Figure 2. Ringed seals in the two management units (1 - the Bothnian Bay and 2 - the southern unit encompassing the Archipelago Sea, the Gulf of Finland and the Gulf of Riga including Estonian coastal waters) do not achieve good status.

Bothnian Bay ringed seal management unit

Population trend evaluation: The ringed seal population in the Bothnian Bay management unit was growing with annual rate of 4.6% during 1988-2012. For a later part of that period, growth rate tends to be somewhat higher, but given the interannual variation in the survey results, average annual growth rate varies depending on the exact period of years selected: it was 4.9% for 2000-2012, 5.6% for 2002-2012, 6.8% for 2003-2012 and 5.5% for

2004-2012 (Figure 3). A Bayesian analysis gives 80 % support for a growth rate ≥ 5.0 % during 2003-2012 which is well below the threshold value of 7%.

However, the growth rate could only be calculated until 2012. Since then, inventory results have been anomalously high with extreme inter-annual variation, the results do not fit with the previous trend-lines and show "increases" that are not biologically possible. The ice-conditions are changing in Bothnia Bay and it is hypothesised that the inconsistent survey results are a result of an increased fraction of the total population being observed hauled-out on the ice during the survey period, likely due to lower ice-coverage and earlier ice-breakup. These results are excluded from the *trend* analysis as statistical outliers and because they likely do not reflect the same fraction of the population as earlier surveys and strongly reflect variations in ice (Table 2). Due to exceptionally mild winters in recent years, the compact pack ice and fast ice, which are the most preferred habitats of ringed seals, have started to break up during or before the survey time. In these circumstances, new features in the hauling out behaviour of ringed seals has been observed. In survey years where there have been a lot of cracks in the pack and fast ice in the time of the surveys, seals have been observed hauled-out on the ice in large groups. This phenomenon was not observed in years prior to 2012 where seals were mostly observed individually or in pairs or groups of a few individuals and there was more intact fast and pack ice. Even if trend calculation for recent years is not possible, no improvement of the population growth rate is expected given deteriorating breeding conditions and increased hunting pressure. There have, however, been no indication of a major decrease in the population. Based on available data the Bothnian Bay management unit of ringed seals do not achieve good environmental status for population trend.

Population abundance evaluation: The survey results from 2015, a year with very limited ice-cover and early ice-breakup revealed that the population size most probably exceeded 20 000 animals in the Bothnian Bay management unit. During this assessment period the highest estimated number of hauled-out seals was 14602 individuals. This is well above the LRL of 10 000 animals and the Bothnia Bay ringed seal population achieve good environmental status for population abundance. The proportion of the true population hauled-out on the ice during the survey remains uncertain.

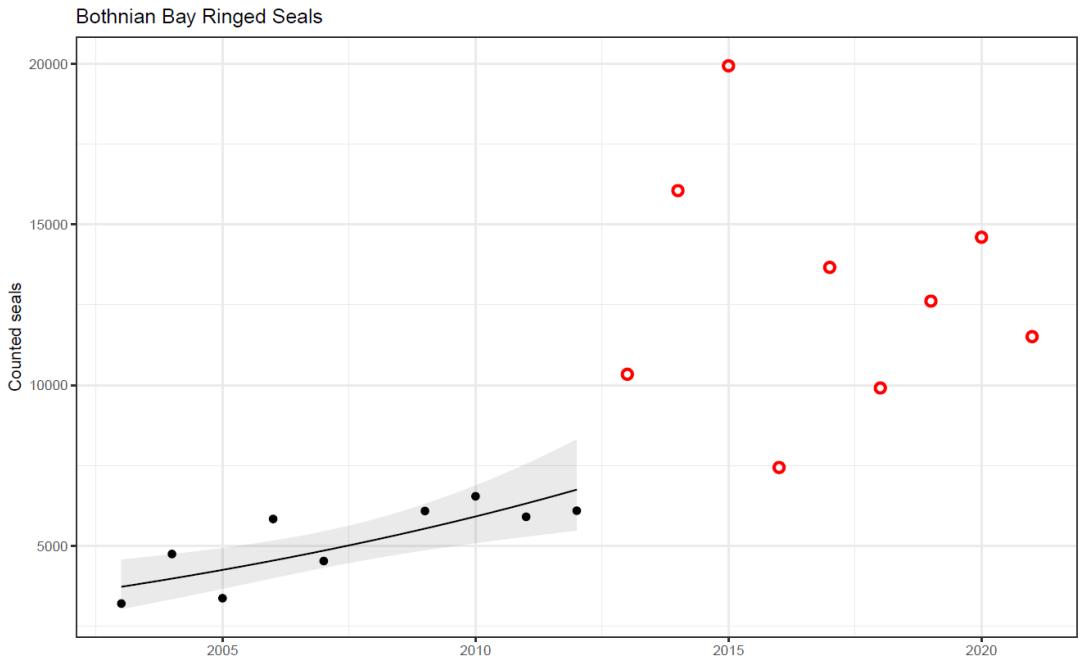

Figure 3. The estimated number of ringed seals hauled out on the ice during moult 2003-2021. The annual growth rate of ringed seals in the Bothnian Bay during 2003-2012 was 6.8 %, while the Bayesian analysis showed 80% support for a growth rate ≥5.0 %. The growth rate was under the threshold of 7%. After 2012 (red circles) the data is not comparable as a different fraction of the seal population is hauling-out, making them incomparable statistical outliers. The criteria for good status are not met based on growth rate 2003-2012 and there is no evidence of improvement. Modelled count index and 95% confidence interval around index are provided with a black line and grey area.

Table 2. Annual ringed seal survey results from the Bothnian Bay showing the number of observed ringed seals on the survey strips, fraction of the area covered with the survey strips and the estimated number of seals hauled out on the ice (calculated from the first two variables).

Year	Observed	Sampling fraction	Hauling out
2003	426	13.3	3203
2004	631	13.3	4744
2005	448	13.3	3368
2006	776	13.3	5835
2007	602	13.3	4526
2008			
2009	809	13.3	6083
2010	1740	26.6	6541
2011	785	13.3	5902
2012	3241	53.2	6092
2013	1375	13.3	10338
2014	4222	26.3	16053
2015	3441	17.26	19936
2016	502	6.75	7437
2017	2332	17,07	13664
2018	1331	13,43	9911
2019	1842	14,6	12615
2020	3154	21,6	14602
2021	2486	21,6	11509

Southern ringed seal management unit

In the southern ringed seal management unit (i.e. Gulf of Riga, Gulf of Finland and the Archipelago Sea) improving trends have not been observed and the counted number of individuals only sum up to a small fraction of the LRL. Due to lack of ice in most years, survey methods for ice-free circumstances have been under development in all the three areas. The western Estonia population has been surveyed with these methods five times during this assessment period (2016, 2018-2021). The results have been at approximately same level compared to the earlier surveys over ice and indicate a stable trend at around 1000 ringed seals and the total population size is estimated to 1500 individuals (Figure 4, Jüssi & Jüssi, 2017). In the Archipelago Sea, ice-free methods are still under development. Based on the sporadic surveys over ice and the incomplete counts in ice-free winters, no indication of an increasing trend can be derived (M. Ahola, pers. comm.). The best

estimates for the total population size in the area are at the level of 200 animals (Ahola & Nordström, 2017). In the Gulf of Finland three traditional aerial surveys in sufficient ice conditions have been conducted (2017, 2018, 2021). The results varied around 100 ringed seals, with no sign of increase, (M. Verevkin & M. Jüssi, unpublished data). These are alarmingly low numbers and trends. Thus, the Southern ringed seal management unit clearly does not achieve good environmental status for population abundance or growth rate.

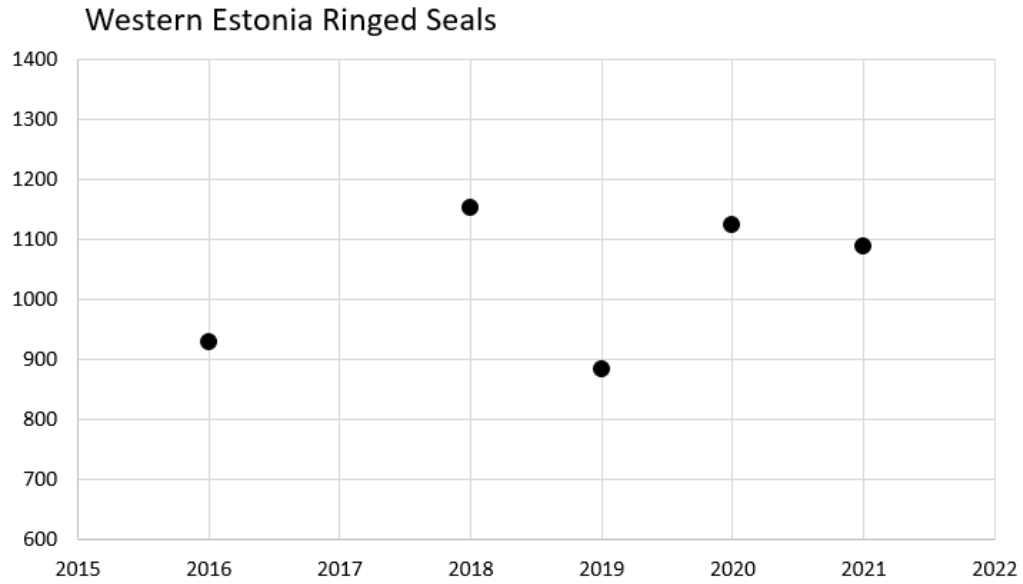

Figure 4. The number of ringed seals hauled out in Western Estonia on land in ice-free years during moult 2016-2021. The few data-points do not indicate any change in the abundance, but a longer time-series is needed for drawing further conclusions.

4.2 Trends

The status of the Population trends and abundance – indicator for both ringed seal management units remained the same as in the previous assessment (HOLAS II).

4.3 Discussion text

Table 3. Overview of evaluation outcomes and comparison with previous evaluations.

HELCOM Assessment unit name (management areas)	Threshold value achieved/failed	Distinct trend between current and previous evaluation.	Description of outcomes, if pertinent.
Bothnian Bay	failed	In the previous indicator report (during HOLAS II) GES was not achieved	Taken into account deteriorating breeding conditions and increased hunting pressure, no status improvement is anticipated.
Southern management unit (subpopulations in Archipelago Sea, Gulf of Finland, Western Estonia)	failed	In the previous indicator report (during HOLAS II) GES was not achieved	Taken into account deteriorating breeding conditions and increased hunting pressure, no status improvement is anticipated.

5 Confidence

Although it is important for management to obtain better data from the southern part of the population, in terms of evaluation under this indicator it can be confidently stated that the stocks in the Southern management unit are very far from good status both with respect to abundance as well as growth rate, which is why the confidence of the evaluation is high. The Bothnian Bay management unit exceeds the LRL based on the number of seals estimated to be hauled out on the ice. However, the growth rate is uncertain as is the fraction of the population observed on ice. The original assumptions of the survey method were that the same fraction of the population haul out on the ice and that the seals are evenly distributed on the ice- allowing data to be scaled up from the line-transect to encompass the whole ice-covered area. Due to the high inter-annual variation in survey results after 2012, due to the changed haul-out behaviour of the seals during the survey period, tracking accurate trends in the Bothnian Bay is currently not possible. Therefore, the confidence of the evaluation is low. Even in the absence of the trend, no status improvement can be foreseen considering deteriorating breeding conditions and increased hunting pressure.

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 have been estimated to be about 180,000 ringed seals in the Baltic (Harding & Härkönen 1999).

The hunting pressure resulted ringed seals to decline to about 25,000 seals in the 1940s (Harding & Härkönen 1999). After these heavy reductions, populations appear to have been stable up to the 1960s (Harding & Härkönen 1999).

Then, in the beginning of the 1970s, grey seals were observed aborting near full term foetuses, and only 17% of ringed seal females were fertile (Helle 1980). Later investigations showed a linkage to a disease syndrome including reproductive disorder, caused by organochlorine pollution, in both grey seals and ringed seals (Bergman & Olsson 1985). The reduced fertility resulted in population crashes, where numbers of ringed and grey seals dwindled to approximately 3,000 of each species in the beginning of the 1980s (Harding & Härkönen 1999). Increasing numbers of these species were only recorded after levels of PCB in biota decreased by the end of the 1980s.

Incidental catches of seals in fisheries are known to have substantial effects on the population growth rate of ringed seal subspecies such as the Saimaa and Ladoga ringed seals (Sipilä 2003). The current knowledge on the level of incidental catches of Baltic seal species is limited to a few dedicated studies which suggest that this factor can be substantial. An analysis of reported incidentally caught grey seals estimated that approximately 2,000 grey seals are caught annually in the Baltic fisheries (Vanhatalo *et al.* 2014), but numbers of incidentally caught ringed seals and harbour seals are not known. Hunting of ringed seals has increased in the last few years with current quotas for in Sweden at 420 individuals (protective hunt) and 375 in Finland (quota-based regular hunt).

Most haul-out sites of harbour and grey seals in the Baltic are protected during critical periods of time, since seals are vulnerable to disturbance during the lactation period. For ringed seals only a very few protected areas are established, since they are primarily hauling out on ice. However, with decreasing ice-cover ringed seals are increasingly dependent on land haul-outs especially in the southern management unit, but also in the Bothnian Bay during the ice-free times of the year. Currently land-haulouts across the range are not well known.

Table 4. 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 abundance and growth rate of Baltic seal populations include hunting, by-catches, and disturbance The effects of climate change are a threat to the ringed seal that breeds on sea ice	Biological disturbance: -selective extraction of species, including incidental non-target catches (e.g. by commercial and recreational fishing)
Weak link	The effects of climate change are a threat to the ringed seal that breeds on sea ice Fishery and food availability	Contamination by hazardous substance: - introduction of synthetic compounds - introduction of non-synthetic substances and compounds

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 poses a pressure on species breeding on ice because shorter and warmer winters lead to more restricted areas of suitable ice fields (Meier *et al.* 2004, 2022). In addition to decreasing amount of habitat, the deteriorating ice-conditions are likely to reduce reproductive success of ringed seals. Ringed seals are adapted to breed in lairs they burrow in the drifted snow on ice. The lairs protect the pups both against predation and harsh weather. As a result, the predicted rate of climate warming is likely to cause extirpation of the southern subpopulations (Sundqvist *et al.* 2012, Meier *et al.* 2022). Consequently, ringed seals are predicted to be negatively affected by a warmer climate.

8 Conclusions

Both the Bothnian Bay and the Southern ringed seal management unit fail to achieve good environmental status.

8.1 Future work or improvements needed

Further research and relevant quantitative measures for the ice quality are needed to gain a better understanding the haulout behaviour of ringed seals, calibrating the survey results in different ice-conditions to establish reliable trend indexes and for estimating the true population size.

The Baltic ringed seal is distributed in the Gulf of Bothnia (first management unit) and the Archipelago Sea, Gulf of Finland and Gulf of Riga (second management unit). Ringed seals from both areas have shown a high degree of site fidelity (Härkönen *et al.* 2008) and it is unlikely that extensive migrations occur at current low population numbers, although some individuals may show more extensive movements during foraging season (Oksanen *et al.* 2015). However, more research is needed to understand the population structure and possible gene flow between the management units. Current degree of gene-flow and connections even between the three southern areas are poorly known. Therefore, it is unclear if they should be assessed separately or kept as one unit. Monitoring on all of them have been challenged by the degraded ice-conditions which have also likely negatively affected reproductive success in these subpopulations. Thus, better knowledge on the population structure in the southern management unit is needed. Still, it is clear that the status of abundance and population trend of the southern sub-populations is not good.

9 Methodology

9.1 Scale of assessment

This core indicator evaluates the population trends and abundance of seals using HELCOM assessment unit scale 2 (division of the Baltic Sea into 17 sub-basins). The assessment units are defined in the HELCOM Monitoring and Assessment Strategy Attachment 4.

The existing management units of seals 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.

Monitoring of ringed seal populations is based on aerial transect sampling surveys over ice-covered areas in the Bothnian Bay. This method has been poorly applicable for the southern management unit and therefore methods for counting ringed seals at their land haul-outs have been under development for the southern sub-populations.

Ringed seals in the Bothnian Bay management unit are surveyed using aerial transect sampling methodology during their moult on the ice (HELCOM Monitoring Manual in the Sub-programme: Seal Abundance). Monitoring area varies between years with the area which is covered by ice in the time of surveys. This method has been poorly applicable for the southern management unit and therefore methods for ice-free circumstances have been under development for all southern sub-populations. Current monitoring covers all haul-out areas which are used by ringed seals in most areas, but in the Archipelago Sea haulouts in some parts of the area are still inadequately mapped.

9.2 Methodology applied

This core indicator evaluates whether good status is achieved by determining the growth rate of the population as well as the population size over a specified time period. The data collected and used in this indicator are based on national aerial surveys described in Galatius *et al.* (2014).

Each assessment unit is evaluated against two threshold values, for population growth rate and the Limit Reference Level (LRL). The overall status of seals in each management unit only achieves good status if both threshold values are met.

Time series of data are used as input values in Bayesian analysis with uninformative priors, where it is evaluated whether observed data support the set threshold value. In this process, 80% support for a growth rate ≥ the threshold value is required. If the unit fails to achieve good status, the probability distribution is used to evaluate the confidence of the assessment. The package 'bayesm' in the program R has been used for the analysis. For further details, see the previous indicator report.

9.3 Monitoring and reporting requirements

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.

Detailed descriptions of the survey methodology and analysis of results are given in the HELCOM monitoring guidelines.

Current monitoring

The monitoring activities relevant to the indicator 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

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. The indicator should be cited as following:

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Result: Population trends and abundance of seals – Ringed seal

Data: Population trends and abundance of seals – Ringed seal

11 Contributors

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

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, Morten Tange Olsen, Markus Ahola, Karin Hårding, Olle Karlsson, Mervi Kunnasranta, Lena Avellan, Petra Kääriä, Minna Pyhälä, Owen Rowe.

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 the indicator report are available:

Population trends and abundance of seals HELCOM core indicator 2018 (pdf)

Core indicator report - web-based version January 2016 (pdf)

Extended core indicator report – outcome of CORESET II project (pdf)

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

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14 Other relevant resources

No additional information is provided at this stage.