Document title	Draft for the indicator "Abundance and population trends of harbour porpoises"
Code	4-2 Rev.
Category	CMNT
Agenda Item	4 – Baltic Sea harbour porpoise
Submission date	15.9.2020
Submitted by	Julia Carlström
Reference	

This revision document contains an updated version of the document 4-2 ´Draft for the indicator "Abundance and population trends of harbour porpoises".

Background

EG MAMA 13-2019 took note of the work done in developing and splitting the indicator on harbour porpoise distribution and abundance into separate indicators, as presented by indicator co-lead Julia Carlström (presentation 5, document 4-2, 4-2 rev.1). The Meeting agreed that the information needs to be discussed in State and Conservation.

The Meeting also considered if the sections on Absolute abundance, Trends in abundance and Distribution should be considered parts of the same indicator or three separate indicators.

The Meeting also took note that the Secretariat will present a proposal for new visualization and restructuring of the indicators in the second indicator workshop and agreed that the question on how to organize the harbour porpoise abundance and distribution indicator(s) should be postponed to ensure that the indicator(s) follow the outline supported in the workshop and agreed on in consequent meetings.

The Meeting supports that funding should be acquired to support the planned simulation study. The Meeting took note that the simulation study is not currently part of the SAMBAH II project proposal.

The Meeting discussed the assessment units used for the HELCOM core indicators and noted that the borders of HELCOM assessment units, available in four nested levels, need to be used in order for the results to be included in the integrated assessment. The Meeting took note that several units can be combined when purposeful for the assessment.

Action requested

The Meeting is invited to take note of the draft indicator report and, as needed, provide further guidance for the indicator team.

Abundance and population trends of harbour porpoises

Document development status/update from the expert group (EG)

(Section below to be removed from final indicator document once complete)

- **Indicator development and assessment:** The indicator will be developed and assessed at two scales: absolute abundance (assessed using population level surveys, e.g. SCANS and SAMBAH) vs. trends in abundance (assessed using monitoring at key sites and population level surveys) for both populations of harbour porpoises in the HELCOM region (Belt Sea population and Baltic Proper population). It is important that Good Environmental Status (GES) is defined and assessed separately for the two populations.
- **Absolute abundance indicator:** Population level surveys (e.g. SCANS and SAMBAH) will assess abundance and whether the current population size is above or below the thresholds set for Limit Reference Level (LRL, still to be determined for both populations) and Target Reference Level (TRL, still to be determined for both populations). It is unlikely that these reference levels can be set without the completion of the SAMBAH II study that will assess Favourable Reference Values (FRVs) and GES for both populations using data not currently available on the demography and pressures of the two populations. The historic population level is unknown for both the Belt Sea and the Baltic Proper population, although historic records show that the abundance of harbour porpoises in the Baltic Proper population has been much higher than current levels. For the Baltic Proper population it is likely that an assessment of GES can be made for this assessment round, even without a threshold for abundance, since the current size of the Critically Endangered population is extremely low. For the Belt Sea population an assessment is unlikely to be possible for this assessment round.
- **Trend in abundance indicator:** According to the MSFD, Member States are able to use directional trends as proxies until threshold values are established through the Union. Since population-wide surveys do not happen frequently for this species in the region, key site monitoring data will be used to supplement population-wide surveys and assess trends in the abundance of the populations at shorter time intervals than if based on population-scale assessments only. Within the western Baltic Sea (Kattegat, Belt Seas, the Sound, and the south-western Baltic, inhabited by the 'Belt Sea population'), SCANS (1994) was the first population-wide assessment of abundance. However, the methods used in this survey were different to the other surveys completed to assess population size on this population. For MiniSCANS II (2020), a change in survey platform (i.e., from boat to aircraft) also took place. However, the switch in platform still resulted in a robust unbiased abundance estimate, thus making the estimates comparable. As a result, the SCANS II (2005) may be the first information available for assessment of abundance, until methods to compare the varying methods are developed. The first and only abundance survey covering the currently known distribution range of the Baltic Proper population was SAMBAH (2011-2013). Key site monitoring will occur as a part of ongoing national monitoring programs, long-term visual or acoustic monitoring, or the establishment of new monitoring programs at key sites in each country. Over the next 12 months, it is likely that the EG will be able to develop an indicator/threshold for trend

assessment for both populations. Work on this will possibly start by assessing the trend threshold set by OSPAR for the North Sea population. This means that establishment of an indicator for trends in abundance, and assessment of the current status of the Belt Sea population, may be possible for this assessment round. For the Baltic Proper population, an assessment of trends in acoustic detection rates in key sites, indicative of a trend in population abundance, can possibly be based on data from SAMBAH and national monitoring programmes.

Table showing the foreseen status of the indicator development on harbour porpoise abundance by September 2021.

	Absolute abundance		**Trend in abundance**	
	Indicator developed	Assessed	Indicator developed	Assessed
Belt Sea population	No[1]	No	Possibly[2]	Possibly[2]
Baltic Proper population	No[1]	Yes	Possibly[2]	Possibly[2]

[1] Possible after completion of SAMBAH II project (2021-2027).
[2] Dependent on funding and data availability.

- **Monitoring guidelines:** one document will be developed that outlines the methods recommended for monitoring harbour porpoises in both populations in the HELCOM area (Belt Sea population and Baltic Proper population). In the western Baltic Sea, in the range of the Belt Sea population, two monitoring methods are currently implemented (visual aerial surveys and passive acoustic monitoring (PAM)). In the range of the Baltic Proper population only PAM is implemented as the population abundance is too low for successful visual surveys. The monitoring guidelines document will contain details on methods for both visual and acoustic surveys, and provide suggestions for criteria to determine the location of key sites. The EG has compiled information on current monitoring programmes within each of the HELCOM CPs and has begun developing suggestions for key sites criteria, which should be monitored by CPs to assess population trends in between larger scale population-wide surveys. This process will also highlight the differences in monitoring programs between countries, likely showing the need for a more harmonised distribution-wide monitoring program. Where a country has no current or previous monitoring program, the EG will likely recommend key sites be selected as areas that have:
    1) the highest density of porpoises during population-wide survey locations (e.g. SAMBAH stations in the Baltic Proper),
    2) historical importance for the porpoise populations, or
    3) similar environmental features to known harbour porpoise hotspots (e.g. offshore banks in the Baltic Proper).

The EG will continue work on this document and the development of indicators in 2020/2021.

Key Message

Abundance and population trends of harbour porpoises

This core indicator evaluates whether the absolute abundance and the trend in abundance of harbour porpoises (*Phocoena phocoena*) in the Baltic Sea is adversely affected due to anthropogenic pressures, and whether its long-term viability is ensured. In general, good environmental status (GES) for abundance is achieved when a population's abundance exceeds the population-specific Limit Reference Level (LRL) with a steady increasing trend towards the population-specific Target Reference Level (TRL).

The HELCOM area is inhabited by two separate harbour porpoise populations: (i) the Belt Sea population in southern Kattegat, the Belt Sea, the Sound, and south-western Baltic, and the (ii) the Baltic Proper population in the waters east thereof (summer distribution range, winter distribution range uncertain for the Baltic Proper population) (Carlén et al., 2018; Sveegaard et al., 2015). The assessments are carried out separately for the two populations, and if deemed sensible presented on the level of HELCOM sub-basins. The assessment of absolute abundance is always completed on the population level. Trends in abundance are to be assessed on population-wide data when available. On shorter time scales, a trend in key site detection rates, animal density, or abundance are to be assessed, indicative of a change in population abundance. The rationale behind this approach is that large-scale international population surveys that provide information on abundance are only conducted at long time intervals. For the Belt Sea population, SCANS surveys have been carried out about every 10 years, although the aim is every 6 year, with MiniSCANS occurring at intervals between. For the Baltic Proper population, a SAMBAH survey has only been carried out once, and will hopefully continue on a 10-12 year time-scale with SAMBAH II proposed for monitoring in 2023. However, most HELCOM Contracting Parties have developed national monitoring programmes that also provide important information on finer spatial and temporal scales that can be used to assess population trends at key sites.

The latest estimate of the abundance of the **Belt Sea population** is 42,324 animals (95% CI 23,368-76,658) (Hammond et al., 2017), which is above/below the population-specific LRL of [tbd- to be developed as part of SAMBAH II] and above/below the population-specific TRL of [tbd- to be developed as part of SAMBAH II]. Based on data from five dedicated visual surveys from 1994 to 2020 (Hammond et al., 2017, 2013, 2002; Viquerat et al., 2014), including MiniSCANS-II (2020), the trend in population abundance is increasing/stable/decreasing, based on the following definitions: [tbd – OSPAR proposal to be applied and evaluated]. Further, data from visual and acoustic national monitoring programmes show an increasing/stable/decreasing trend, based on the following definitions: [tbd – dependent on funding for collating and modelling national datasets]. The trend indicates that the population abundance and/or distribution is increasing/stable/decreasing.

Due to the very low density of the **Baltic Proper population**, only dedicated acoustic methods should be applied. To date, one population-wide abundance survey has been carried out in 2011-2013, yielding an abundance of 497 animals (95% CI 80-1091) (SAMBAH, 2016), which is below both the population-specific LRL and TRL of [tbd- to be developed as part of SAMBAH II, however the small population size is enough to conclude that absolute abundance is sub-GES]**.** Data on acoustic detection rates from SAMBAH and acoustic national monitoring programmes show an increasing/stable/decreasing trend, based on the following

definitions: [tbd – dependent on funding for collating and modelling national datasets together with SAMBAH data]. The trend in acoustic detection rates in key sites indicates that the population abundance and/or distribution is increasing/stable/decreasing.

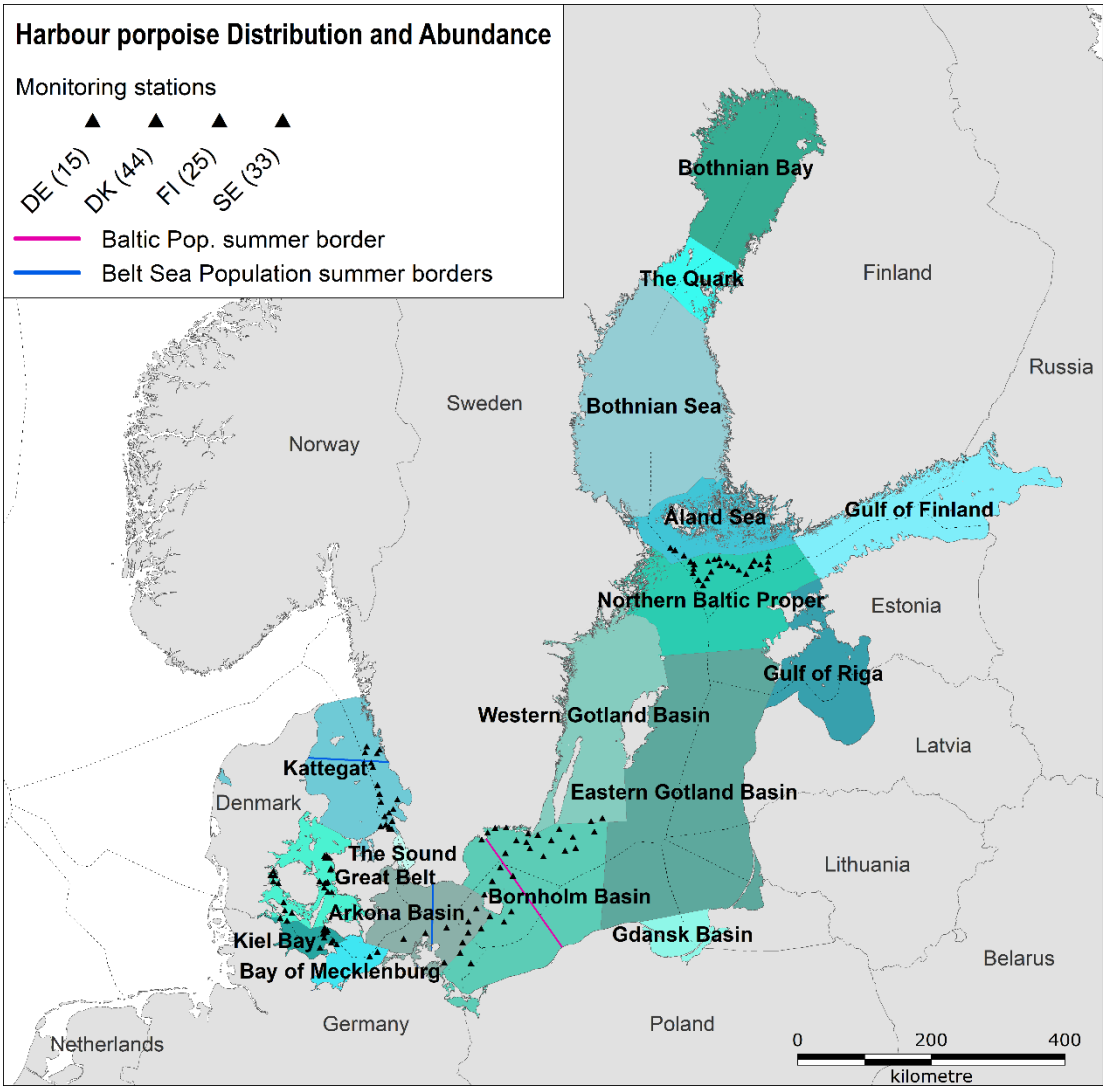

Figure 1: Temporary (to be changed) map showing proposed management units for harbour porpoises during summer, acoustic monitoring stations for harbour porpoises (Polish data are missing), and HELCOM sub-basins. [The final map shall show "Key message figure 1: Status assessment results based evaluation of the indicator 'Abundance and population trends of harbour porpoises'. The assessment is carried out using Scale X HELCOM assessment units (defined in the HELCOM Monitoring and Assessment Strategy Annex 4)."]

The confidence of the indicator evaluation is considered to be low/medium/high for the Belt Sea population and low/medium/high for the Baltic Proper population.

The indicator is applicable in the waters of all nine countries bordering the Baltic Sea. Add comment on regional differences, such as the low density of Belt Sea Porpoises E of 13°E and of Baltic Proper porpoises N of Åland Sea/ Archipelago Sea.

Insert information on population-specific criteria for trends, results from measured data, and conclusion of evaluation (Figure 2).

Relevance of the core indicator

The indicator 'Abundance and population trends of harbour porpoises' signals changes in the abundance/density of a marine top predator in the Baltic Sea. Being top predators of the marine ecosystem, harbour porpoises are good indicators of the state of food webs, levels of hazardous substances, direct human disturbance and incidental removal.

Policy relevance of the core indicator

	BSAP segment and objectives	MSFD Descriptor and criteria
Primary link	Biodiversity ● Viable populations of species	D1 Biodiversity - D1C2 Population abundance - D1C4 Species distributional range and pattern
Secondary link	Biodiversity ● Thriving and balanced communities of plants and animals	D1 Biodiversity - D1C1 Incidental by-catch - D1C3 Population demographic characteristics - D1C5 Habitat extent and condition D4 Food webs - D4C1 Diversity of trophic guild - D4C2 Balance of abundance between the trophic guilds - D4C4 Productivity of trophic guild Contaminants - D8C2 Health of species and condition of habitats - D8C4 Significant acute pollution events
Other relevant legislation: Habitats Directive (92/43/EEC), EU Water Framework Directive (2000/60/EC)		

Cite this indicator

HELCOM (year) Abundance and population trends of harbour porpoises. HELCOM core indicator report. Online. [Date Viewed], [Web link].

Download full indicator report

Core indicator report – web-based version [month year] (pdf)

Results and Confidence

Abundance and population trends of harbour porpoises

The results of the assessment on absolute abundance are shown in Table 1, of trend in population abundance in Table 2, and of trend in key site density in Table 3.

Table 1: Assessment of harbour porpoise absolute abundance in the Baltic Sea. Grey: status cannot be assessed yet due to lack of data and an approved indicator. Red: status is sub-GES. White: the area is outside the known historical range of the population. N.a.: not assessed (occurrence of the population in this area is seasonal or uncertain).

	Kattegat	Great Belt	The Sound	Kiel Bay	Bay of Mecklenburg	Arkona Basin	Bornholm Basin	Gdansk Basin	Eastern Gotland Basin	Western Gotland	Gulf of Riga	Northern Baltic	Gulf of Finland	Åland Sea	Bothnian Sea	The Quark	Bothnian Bay
Harbour porpoise Belt Sea population							n. a. [1]										
Harbour porpoise Baltic Proper population					n. a. [2]												

[1]Seasonal occurrence.

[2]Occurrence uncertain.

Confidence of the indicator status evaluation

Harbour porpoise – Belt Sea population

The confidence of the abundance assessment is low/medium/high (tbd).

The Belt Sea population resides in southern Kattegat, the Belt Seas, the Sound and the south-western Baltic. The best summer management unit for this population was defined by (Sveegaard et al., 2015) to be 13.5˚E towards the Baltic Proper in the East and 57˚N towards Skagerrak in the North. At present only the SCANS-III (2016) and the MiniSCANS-II (2020) surveys were limited to the new management unit, estimating an abundance of 42,324 porpoises in 2016 (CV=0.30, 95% CI: 23,368 - 76,658; (Hammond et al., 2017)). Prior to these surveys, three large-scale surveys have been carried out covering parts of or more than the management range of the Belt Sea population, namely SCANS (1994) (Hammond et al., 2002), SCANS-II (2005) (Hammond et al., 2013), and MiniSCANS (2012) (Viquerat et al., 2014). Disregarding the dissimilarities in the survey area (see Figure 3), a trend analysis suggests that the abundance of porpoises in this larger area has been stable or is slightly increasing from 1994 to 2016 (Figure 4).

By applying a population dynamics production model on data from the abundance surveys in 1994-2016, and on estimated bycatch numbers derived from observed bycatch rates and national fisheries statistics for the years 1994-2017, and an assumed constant bycatch number for the years 2017-2025, the population trajectory from 1994 to 2025 was estimated (North Atlantic Marine Mammal Commission and the Norwegian Institute of Marine Research, 2019). The model indicated that, in 2016, the Belt Sea population

was depleted to 78% of the 1994 abundance estimate. However, the population was estimated to currently increase slowly, reaching 81% of the 1994 abundance estimate in 2025. The level of concern for the Belt Sea population was concluded to be low to medium, but if also serving as the only source for repopulating the Baltic, then concern may need to be higher.

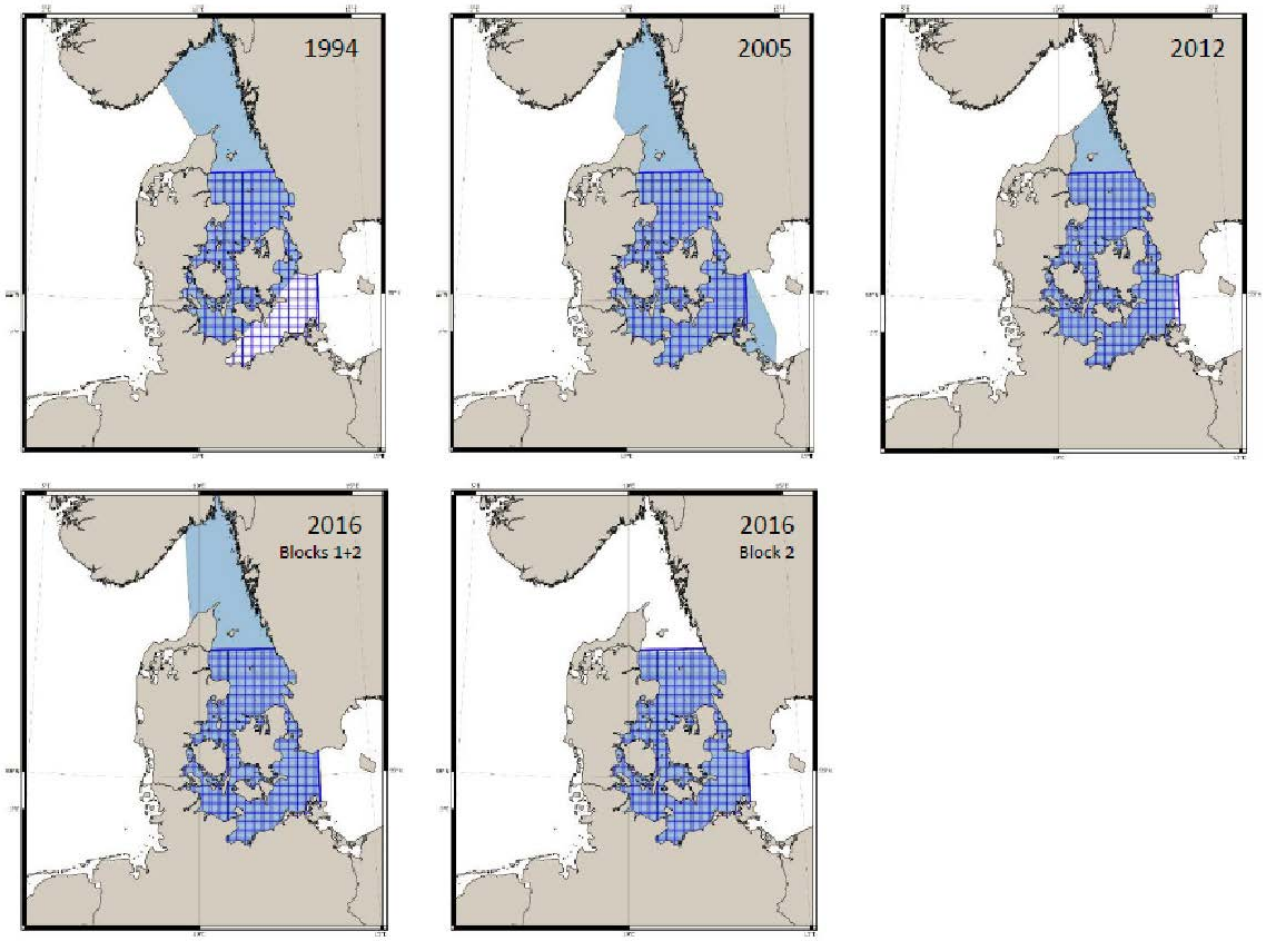

Figure 3: Areas covered during the three SCANS surveys (1994, 2005, 2016; Hammond et al. 2002, 2013, 2017) and the "MiniSCANS" survey in 2012 (Viquerat et al. 2014) (MiniSCANS II (2020) still to be added) in the Skagerrak/Kattegat/Belt Seas (coloured light blue) compared with the area believed to represent a separate population (Sveegaard et al. 2015) (cross-hatched dark blue).

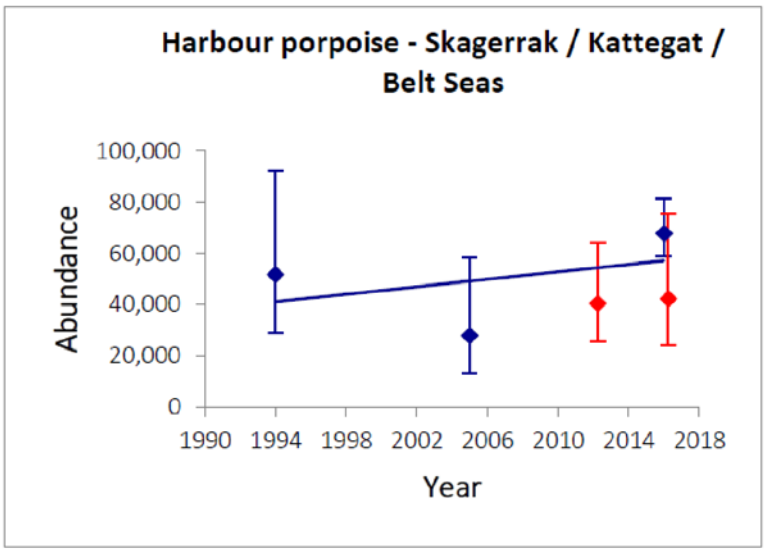

Figure 4: Trend lines fitted to time series of the abundance estimates for harbour porpoises in the Skagerrak/Kattegat/Belt Seas area (blue dots and line) from 1994 to 2016 – estimated rate of annual change = 1.24% (95%CI: -39; 67%), p = 0.81. Estimates for the Kattegat/Belt Seas population area shown as red dots (Hammond et al. 2017).

Harbour porpoise – Baltic Proper population

The confidence of the abundance assessment is low/medium/high.

The harbour porpoise population in the Baltic Proper has only been assessed once, namely in the SAMBAH project 2010-2015 (SAMBAH, 2016). Here, porpoise click detectors were deployed over a systematic grid of 304 stations in eight countries in 2011-2013. The SAMBAH project estimated a total summer population size of 497 animals (95% CI: 80-1091) east and north of the defined population management border.

By applying a population dynamics production model on data from the abundance surveys in 2011-2013, and estimated bycatch numbers derived from observed bycatch rates of the Belt Sea population adjusted for the lower porpoise density of the Baltic Proper population and fishing effort from national fisheries statistics for the years 2009-2017, and an assumed constant bycatch number for the years 2017-2025, the population trajectory from 1994 to 2025 was estimated (North Atlantic Marine Mammal Commission and the Norwegian Institute of Marine Research, 2019). The model indicated that the Baltic Proper population had decreased by 9% from 2009 to 2017, and the decline would continue until 2025 by another 3%. It was concluded that the Baltic Proper harbour porpoise population is severely depleted and its abundance is estimated to be in continued decline.

Good Environmental Status (GES)

Abundance and population trends of harbour porpoises

GES with respect to the abundance of harbour porpoises is determined by comparing population data with threshold values that have been defined based on concepts developed for the conservation of porpoises (ref) (Figure 5)

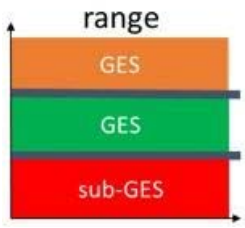

Figure 5: Good environmental status (GES) is achieved when the population growth rate trend and abundance of porpoise are above the threshold value.

GES for abundance for a harbour porpoise population is achieved when the number of animals in the appropriate management unit is above the Limit Reference Level (LRL), and there is a steadily increasing trend towards 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.

Key site density of harbour porpoises

[GES boundary definition FOR KEY SITE DENSITY, quantitative value in first paragraph, more details in following paragraphs]

Assessment Protocol

[indicator assessment methodology described as a step-by-step protocol from processing or raw data until indicator assessment result for assessment unit]

Assessment units

The assessments of harbour porpoise abundance and population trends on population and local scales (key sites) are carried out separately for the two populations, and if deemed sensible presented on the level of HELCOM sub-basins. HELCOM's assessment units are defined in the HELCOM Monitoring and Assessment Strategy Annex 4.

Relevance of the Indicator

Biodiversity assessment

The status of [e.g. biodiversity] is assessed using several core indicators. Each indicator focuses on one important aspect of the complex issue. In addition to providing an indicator-based evaluation of the [name of indicator], this indicator will also contribute to the next overall [e.g. biodiversity] assessment to be completed in 2018 along with the other [e.g. biodiversity] core indicators.

Policy relevance

[details on indicator policy relevance]

Role of [indicator ecosystem component] in the ecosystem

[details on the role of the indicator ecosystem component in the ecosystem, the text is to explain how the indicator works i.e. what is the mechanism that the indicator is built on]

Human pressures linked to the indicator

	General	MSFD Annex III, Table 2a
Strong link		
Weak link		

[further descriptions]

Monitoring Requirements

Monitoring methodology

Monitoring of breeding [indicator parameter] in the Contracting Parties of HELCOM is described on a general level in the **HELCOM Monitoring Manual in the [hyperlink to sub-programme]-**

Specific monitoring guidelines for [hyperlink to monitoing guidelines in HELCOM Monitoring Manual if available].

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

Sub-programme: [hyperlink to monitoring concepts table in relevant sub-programme]

[if relevant, discussion on current differences in monitoring efforts in different regions of the Baltic Sea]

Description of optimal monitoring

[short discussion on what monitoring effort would be needed to achieve high confidence in the indicator assessment based on monitoring data and any current gaps]

From NAMMCO 2017 HP WS:

For improvement of the model outputs, the workshop recommended continued regular abundance surveys and further development of bycatch estimates with less associated uncertainty for the Belt Sea population. The recommendations for the Baltic Proper population were additional abundance estimates with reduced CV, and improved data on fishing effort and bycatch rates.

SAMBAH data gap:

The SAMBAH survey did not cover waters north of the Åland Sea/ Archipelago Sea, or waters deeper than 80 m due to logistical constraints.

Data and updating

Access and use

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

HELCOM (201X) [Name of indicator]. HELCOM core indicator report. Online. [Date Viewed], [Web link].

ISSN 2343-2543

Metadata

[details on metadata]

Contributors and references

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Archive

This version of the HELCOM core indicator report was published in [month year]:

Core indicator report – web-based version [month year] (pdf)

Older versions of the core indicator report are available:

[hyperlink to pdf]

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Additional relevant publications

[add other relevant references]