Document title	Draft for the indicator Abundance and distribution of harbour porpoises
Code	4-2
Category	CMNT
Agenda Item	4 – Baltic Sea harbour porpoise
Submission date	3.9.2019
Submitted by	Indicator team
Reference	

Background

SEAL 12-2018 took note of the information on progress on the harbor porpoise distribution and abundance indicator as presented by Germany (presentation 9 to that meeting). The meeting welcomed the suggestion and justification for splitting the indicator into two.

Attachment 1 to this document contains a draft for the candidate indicator on abundance and distribution of harbour porpoises, as prepared by the indicator team.

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 distribution of harbour porpoises

The expert group has proposed to assess "Abundance and distribution of harbour porpoises" in two sub-indicators at two different scales to provide a clearer understanding of the species and facilitate good regional assessment. Separate monitoring guidelines will be developed accordingly.

The rationale behind this approach is that large-scale international population surveys, such as SCANS or SAMBAH, are currently conducted on a decadal scale only. However, most HELCOM Contracting Parties have developed national monitoring programmes that also provide important information on finer spatial and temporal scales.

Accordingly, geographical units will be on two scales:

- *Population scale*: Abundance estimates and information on distribution on larger scale (note that information on large-scale distribution is inherent within surveys like SCANS or SAMBAH);
- *Local scale:* Trends in (relative) density at key sites ("hotspots"), within the range of the two populations; by following this approach, changes in abundance and distribution will be discovered faster than if only monitored in the large-scale population surveys. The data for this indicator could originate from national monitoring programmes (see current programmes in DE, DK, FI, PL and SE).

The indicator should be linked to several other indicators (see "Policy relevance of the core indicator"); however, these links need be developed further.

In the following, open discussion points are listed, following the template of any core indicator, that the EG needs to take further in the next 24 months:

Abundance and distribution of harbour porpoises at the population scale:

- Reference level: historic level - unknown for the Baltic; no dedicated large-scale surveys were conducted prior to SCANS (1994) within the western Baltic Sea (Kattegat, Belt Seas, the Sound and the Western Baltic, inhabited by the so called 'Belt Sea population') and SAMBAH (2011-2013) in the Baltic Proper (Inhabited by the 'Baltic Proper population').
- It is, however, important that Good Environmental Status (GES) is defined separately for these two porpoise populations:
    - The EG will continue work on this in 2019/2020 by evaluating results of a planned simulation study with respect to the power to detect trends in both abundance and key site density using applied methods and survey frequencies in the area. However, the group would need dedicated resources to proceed with this approach. A brief outline as well as a cost estimate to carry out simulation work to infer on trends of porpoises in the Baltic Sea is currently under development.

Abundance and (relative) density of harbour porpoises at the local scale:

- The EG has compiled information on current monitoring programmes within each HELCOM CPs and started to come up with suggestions for key sites, which should be monitored to assess shifts and trends in density and distribution. The selection of sites in the distribution ranges of the Baltic

Proper and the Belt Sea populations will be based on existing data such as SAMBAH, other (local, smaller scale) PAM studies, visual surveys and satellite tracking.

- In the western Baltic Sea, in the range of the Belt Sea population, two monitoring methods are implemented (visual aerial surveys and passive acoustic monitoring (PAM)). In the range of the Baltic Proper population only PAM is implemented.
- A simulation study is planned with respect to the power to detect trends in key site density using applied methods and survey frequencies in the area. However, additional resources are a pre-requisite for this study.
- The EG will develop guidelines to determine these key sites. The evaluation of key site density should be harmonized since there are differences in current monitoring methods and time intervals, as well as in which metric that is used (e.g. animals/km^2 and time units for acoustic porpoise detections).
- According to MSFD, MS's are able to use directional trends as proxies until threshold values are established through the Union.

Key Message

Abundance and distribution of harbour porpoises – population scale

This core indicator evaluates whether the abundance of harbour porpoises (*Phocoena phocoena*) in the Baltic Sea (The HELCOM area) is not adversely affected due to anthropogenic pressures, such that its long-term viability is ensured, and that its distributional range and pattern is in line with prevailing physiographic, geographic and climatic conditions. In general, good environmental status for abundance is achieved when a population's abundance exceeds the population-specific Limit Reference Level (LRL, *tbd*) with a steady increasing trend towards the Target Reference Level (TRL, *tbd*).

As stated above, 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 ranges, 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 the Belt Sea population is based on data from four dedicated visual surveys from 1994 to 2016 (Hammond et al., 2017, 2013, 2002; Viquerat et al., 2014), and for the Baltic Proper population on data from one PAM survey in 2011-2013 (SAMBAH, 2016). Due to the very low density of the Baltic Proper population, only dedicated acoustic methods should be applied.

The abundance of harbour porpoises of the Belt Sea population has varied over years, but no statistical change has been detected and the latest population estimate is 42,324 animals (95% CI 23,368-76,658) (Hammond et al., 2017).

The abundance of harbour porpoises of the Baltic Proper population has been estimated to 497 animals (95% CI 80-1091), which is below the population-specific LRL and TRL of *tbd*. The 2011-2013 SAMBAH survey identified a summer core area for the Baltic Proper population around the offshore banks Hoburg's Bank, and the Northern and Southern Mid-Sea Banks. Acoustic detections were made in all EU Member

States but Estonia (Carlén et al., 2018). The survey did not cover waters north of Åland Sea/ Archipelago Sea, and opportunistic observations are very rare (HELCOM, 2019).

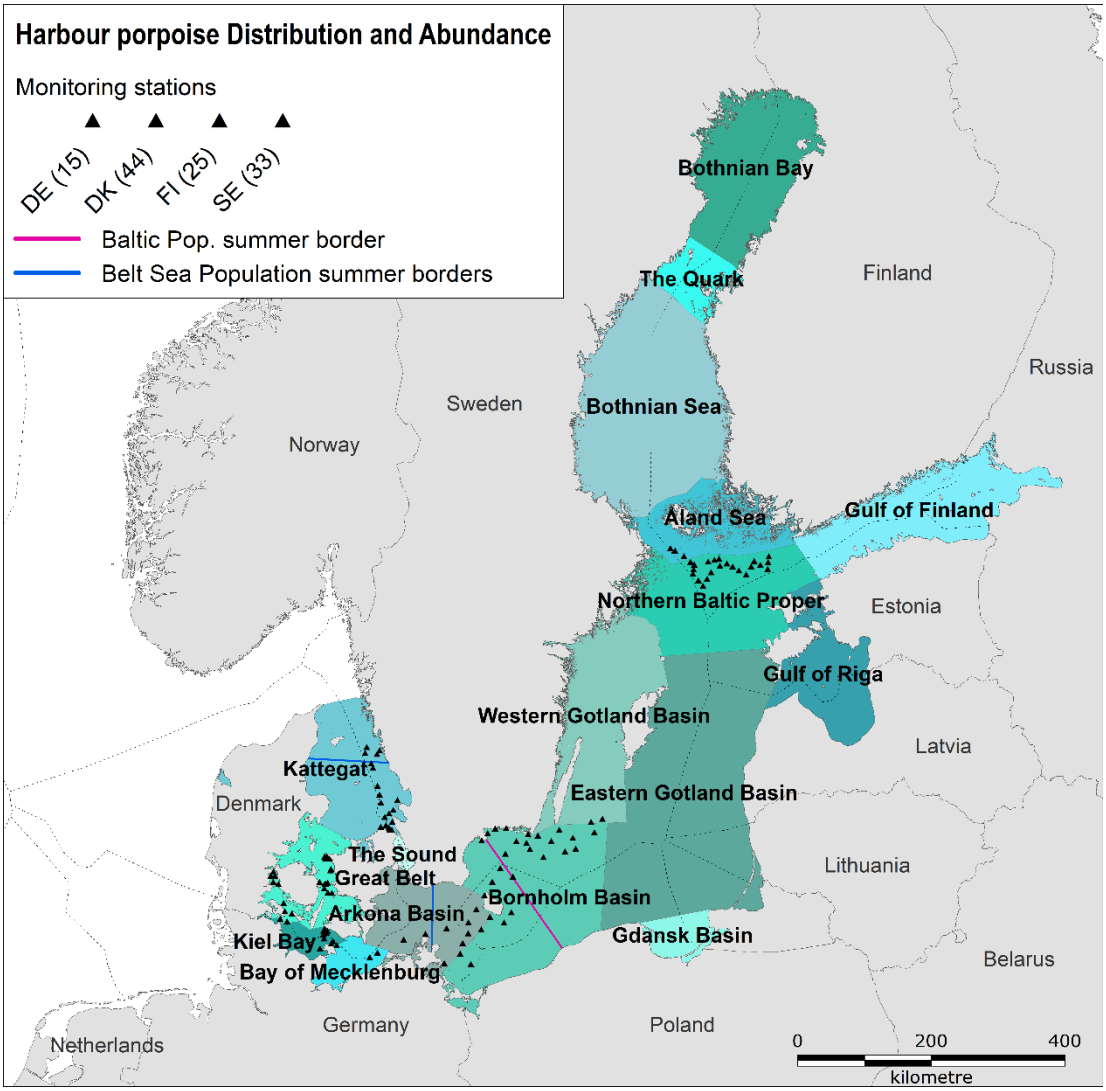

Figure 1: Temporary map showing proposed management units for harbour porpoises during summer, acoustic monitoring stations for harbour porpoises (Polish data are missing), and HELCOM sub-basins. [The final map shall show "Key message figure 1: Status assessment results based evaluation of the indicator 'Abundance and distribution of harbour porpoises – population scale'. 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.

Abundance and distribution of harbour porpoises – local scale (key sites)

This core sub-indicator evaluates whether the local density of harbour porpoises (*Phocoena phocoena*) in the Baltic Sea is not adversely affected due to anthropogenic pressures, such that the populations' long-term viabilities are ensured. The evaluation only covers pre-determined key sites for harbour porpoises in the Baltic Sea. Good environmental status per population is achieved when the trend in harbour porpoise density at key sites (*tbd*)... The evaluations are carried out separately for each key site, interpreted on the population level and, if deemed sensible, presented on the level of HELCOM sub-basins.

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 ranges, winter distribution range uncertain for the Baltic Proper population) (Carlén et al., 2018; Sveegaard et al., 2015). For the Belt Sea population, the assessment is based on data from repeated visual surveys and repeated or continuous passive acoustic monitoring (PAM) programmes. For the Baltic Proper population, the assessment is only based on data from repeated or continuous PAM programmes, due to the very low density of this population.

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

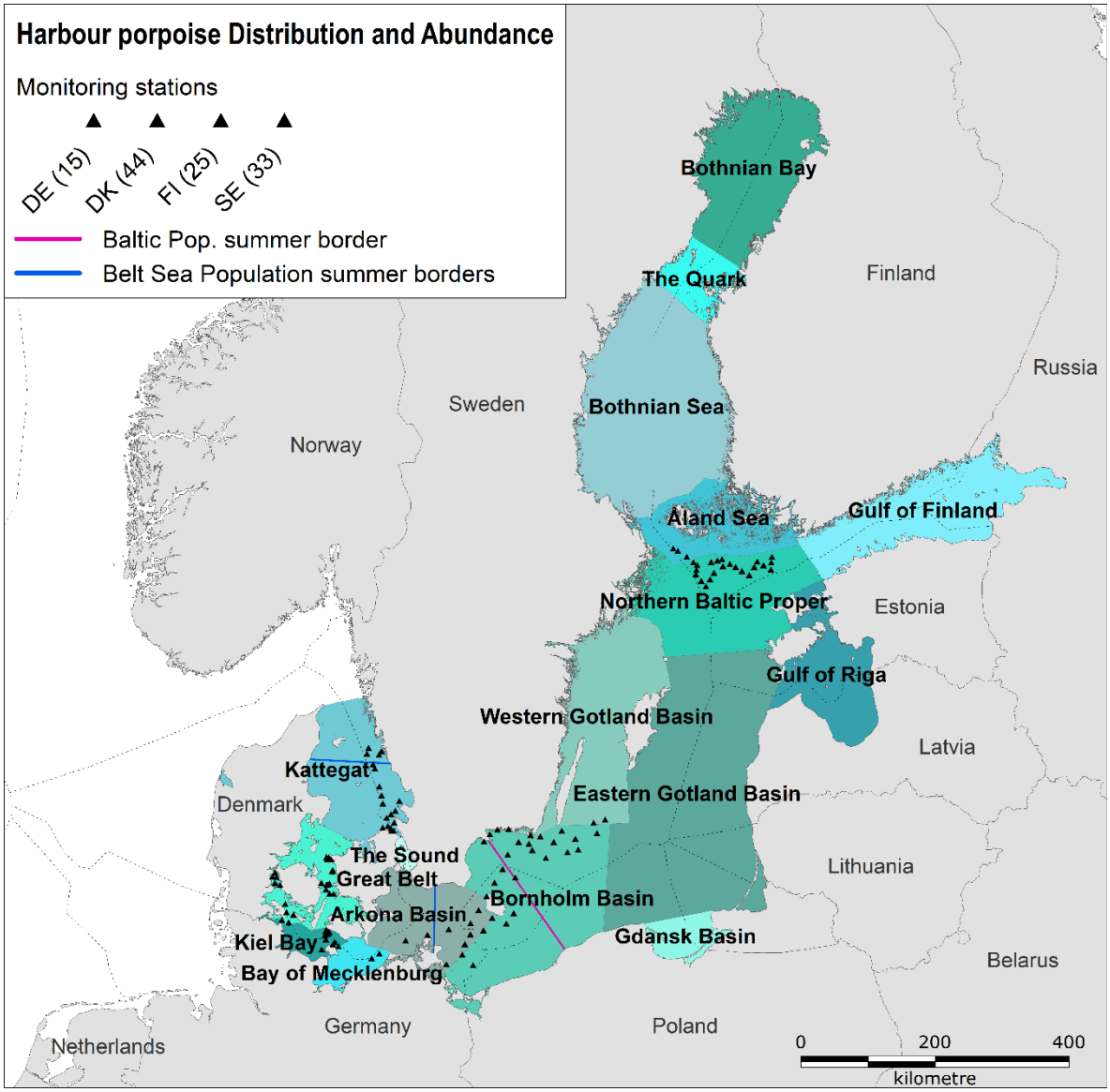

Figure 2: Temporary map showing proposed management units for harbour porpoises during summer, acoustic monitoring stations for harbour porpoises (Polish data are missing), and HELCOM sub-basins. [The final map shall show "Key message figure 1: Status assessment results based evaluation of the sub-indicator 'Abundance and distribution of harbour porpoises – local scale (key sites)'. 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 will be assessed and should be considered as either being 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.

Relevance of the core indicator

The indicator 'Abundance and distribution of harbour porpoises' signals changes in the abundance/density and distribution 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 distribution of harbour porpoises – population scale. HELCOM core indicator report. Online. [Date Viewed], [Web link].

HELCOM (year) Abundance and distribution of harbour porpoises – local scale (key sites). 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 distribution of harbour porpoises

The results of the assessment on abundance are shown in Table 1 and of key site density in Table 2.

Table 1: Overall assessment of harbour porpoise abundance in the Baltic Sea.

	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																	
Harbour porpoise Baltic Proper population																	

Table 2: Overall assessment of harbour porpoise key site density in the Baltic Sea.

	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																	
Harbour porpoise Baltic Proper population																	

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 survey (summer 2016) were limited to the new management unit, estimating an abundance of 42,324 porpoises (CV=0.30, 95% CI: 23,368 - 76,658; (Hammond et al., 2017)). However, in total four large-scale surveys covered this area, namely SCANS (1994) (Hammond et al., 2002), SCANS-II (2005) (Hammond

et al., 2013), MiniSCANS (2012) (Viquerat et al., 2014) and SCANS-III (2016) (Hammond et al., 2017). Note that in summer 2020, MiniSCANS-II is scheduled to take place. The coverage of these surveys was not comparable and a larger area than the proposed management unit has been covered (see Figure 3). However, the trend analysis still suggests that the abundance of porpoises in this larger area has been stable or is slightly increasing (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 discussed as potentially dependent on to what extent this population serves as the only source for repopulating the Baltic– i.e. if it is, then concern may need to be higher.

Confidence assessment information on distribution.

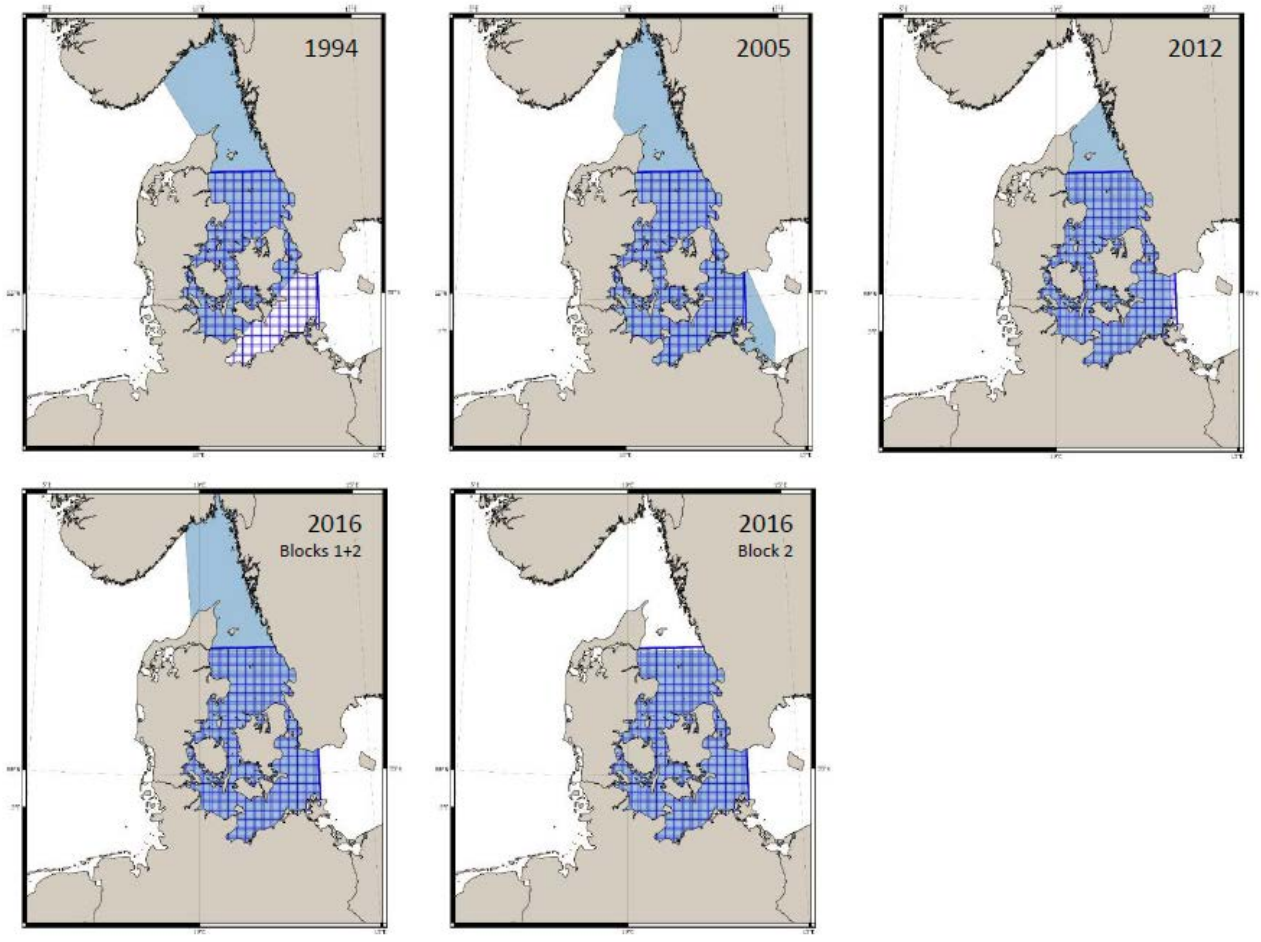

Figure 3: Areas covered during the three SCANS surveys (1994, 2005, 2016; Hammond et al. 2002, 2013, 2017) and the "MiniSCANS" survey in 2012 (Viquerat et al. 2014) in the Skagerrak/Kattegat/Belt Seas (coloured light blue) compared with the area believed to represent a separate population (Sveegaard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

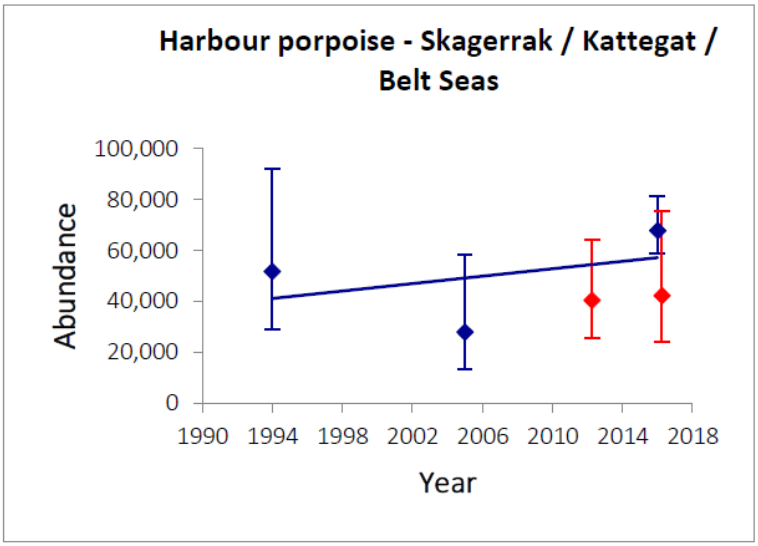

Figure 4: Trend lines fitted to time series of the abundance estimates for harbour porpoises in the Skagerrak/Kattegat/Belt Seas area (blue dots and line) – estimated rate of annual change = 1.24% (95%CI: -39; 67%), p = 0.81. Estimates for the Kattegat/Belt Seas population area shown as red dots (Hammond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

Harbour porpoise – Baltic Proper population

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

The harbour porpoise population in the Baltic Proper has only been assessed once, namely in the SAMBAH project 2010-2015 (SAMBAH, 2016). Here, passive acoustic monitoring and species distribution models were used to describe the spatial and seasonal distribution of harbour porpoises in the Baltic Proper (Carlén et al., 2018). Porpoise click detectors were deployed over a systematic grid of 304 stations in eight countries 2011-2013. Generalized additive models (GAMs) were used to describe the monthly probability of detecting porpoise clicks as a function of spatially-referenced covariates and time. During the reproductive season, two main areas of high probability of porpoise detection were identified. One of those areas, situated on and around the offshore banks Hoburg's Bank and the Northern and Southern Mid-Sea Banks in the Baltic Proper, is clearly separated from the known distribution range of the Belt Sea population during breeding season, suggesting this is an important breeding ground for the Baltic Proper population. This separation led to the identification of southern management border during May – October for the Baltic Proper harbour porpoise population stretching from Hanö Bight in south-eastern Sweden to a point on the Polish coast close to Słupsk (Carlén et al., 2018). 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 distribution 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)

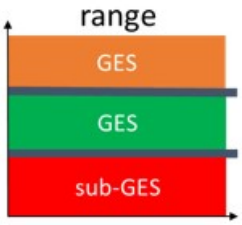

Figure 5: Good environmental status (GES) is achieved when the population growth rate trend and abundance of porpoise are above the threshold value.

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.

[GES boundary definition for DISTRIBUTION/DISTRIBUTIONAL PATTERN, quantitative value in first paragraph, more details in following paragraphs]

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 distribution 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.

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

Contributors

Signe Sveegaard, Sacha Viquerat, Anita Gilles, Michael Dähne, Julia Carlström, Olli Loisa, Iwona Pawliczka

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]