



Baltic Marine Environment Protection Commission

Ad hoc Seal Expert Group

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Background

STATE & CONSERVATION 3-2015 agreed on using a common template for harmonization of HELCOM monitoring guidelines. SEAL 9-2015 agreed that the new and existing monitoring guidelines for seals will be prepared/edited to be in line with the template. SEAL 10-2016 recommended that the guidelines for monitoring of abundance be combined with the guidelines for distribution monitoring, as the data source is the same; (mostly) aerial surveys of seals during their pupping and moulting seasons.

This document includes the latest draft of monitoring guidelines for seal abundance and distribution in the HELCOM area, transferred to the template format by Mr. Anders Galatius, Denmark.

Action requested

The Meeting is invited to take note of the new format of the monitoring guidelines for seal abundance and agree on forwarding the guidelines to State & Conservation 7-2017 for endorsement.

Guidelines for monitoring Seal abundance and distribution in the HELCOM area

1. Background

HELCOM Recommendation 27-28/2 tasks the HELCOM SEAL Expert Group to develop and coordinate monitoring programmes to, among other things, assess the size and growth, reproduction and breeding distribution of Baltic seal management units. The HELCOM Core Indicators 'Distribution of Baltic seals' and 'Population trends and abundance of seals' are used to assess Good Environmental Status under the EU Marine Strategy Framework Directive based on parameters of seal abundance and distribution. To obtain the objectives of Recommendation 27-28/2 and these core indicators, standardized data from internationally coordinated efforts are necessary. This document describes data collection for these needs as recommended by the HELCOM SEAL Expert Groups and describes current deviations from these recommendations.

1.1 Introduction

The three regularly occurring seal species in the Baltic Sea are monitored at their haulouts on land or ice during their annual moulting and pupping seasons, with the aim of estimating the abundance and abundance trends (moulting counts) and pup production (pupping counts) as well as the distributions and distribution trends of these species during their moulting and pupping seasons. 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.

1.2 Purpose and aims

As top predators of the Baltic Sea, seals are important sentinels for the state of the ecosystem. Furthermore, all three species have been severely depleted in the 20th century and still face anthropogenic pressures such as hunting (and other deliberate killing), bycatch, pollution, disturbance and prey depletion. Ultimately, abundance trends reflect the combined effects of such pressures on the populations. Distribution of seals reflects combined effects of such pressures on the populations as well as more local effects such as local disturbance and habitat degradation. These monitoring data are used to assess the status of the populations under the HELCOM core indicator 'Population trends and abundance of seals'.

2. Monitoring methods

2.1 Monitoring features

For most of the year seals spend majority of time in water and are impossible to be observed and counted. They use land or ice for resting, breeding and moulting. The highest percentage of the population can be seen hauling out on land or ice during moulting time when seals haulout for increasing their skin temperature which accelerates the moult. Timing of surveys is targeted to species-specific peak moulting times when the highest proportion of the animals can be observed in the surveys.

Grey seals and harbour seals gather to their established haul-out localities on land where they are counted. Ringed seals moult scattered over ice where they are surveyed along line transects and distance sampling methods are used to estimate their abundance. For poor ice-conditions substitutive methods are developed for Southern areas of ringed seal distribution. Even if the largest proportion of seals are hauling out in the peak moulting time, the methods do not result to total population sizes, but the number of

hauling out seals at the time of the surveys. Weather is also affecting the number of seals hauling out. Seals tend to have a higher haul out rate in dry weather with moderate wind and waves. Therefore, days with such weather prior and during the surveys are selected.

Aerial surveys are used in population monitoring of seals. Counting the number of individuals exhaustively in dense herds on rugged surface is only possible from above. By air-crafts, large areas can be covered in a relatively short time and with minimized disturbance in areas out of reach with other methods.

2.2 Time and area

2.2.1 Harbour seals

a. Two aerial surveys of breeding harbour seals in June in the Danish part of the Kattegat area.

b. Three aerial surveys of moulting harbour seals at all significant haul-outs in all areas during the peak moulting season in August (Teilmann et al 2010). In Kattegat, these surveys are coordinated and synchronized between Denmark and Sweden.

2.2.2 Grey seals

a. Grey seal pups: 2 aerial or land surveys in the end of February / early March and in mid to late March

- Denmark: aerial surveys at all grey seal breeding localities in the Danish HELCOM area.

- Estonia: land surveys on major breeding islands (2-4) in Estonian western Archipelago and the Gulf of Riga;

- Finland, Poland, Sweden and Russia: no counts are carried out during the pupping season.

b. Grey seal moult: All the moult counts are carried out during a two-week period in late May – early June, which is agreed among the international partners.

- Finland: 3 aerial surveys of moulting grey seals at all known haul-outs in SW Archipelago (the core area of moulting distribution) and 2 aerial counts in the Gulf of Bothnia and the Gulf of Finland.

Note: Since 2016 all the localities in the Finnish part of the Bothnian Bay have been decided to be surveyed every third year. The few most important localities have still been photographed once every year. From 2018, Finland will probably not carry out annual grey seal censuses in any area.

- Denmark: 1 survey covering the Danish HELCOM area is performed.

- Sweden: 3 aerial surveys are carried out at haul-outs in the key areas from archipelago of Central Sweden to Qvarken, in other areas 3 surveys are carried out from land or boat.

- Estonia: Gulf of Finland and Estonian W archipelago including Gulf of Riga are surveyed in separate flights.

- Russia: Eastern part of the Gulf of Finland is surveyed from ships or boats for 1-2 times depending on weather.

- Poland: on-line camera monitoring and visual surveys in the Gulf of Gdańsk, Vistula mouth, are performed in the period.

2.2.3 Ringed seals

- a. Bay of Bothnia: Line transect surveys between the 20th of April to the 1st of May
- b. Archipelago Sea: 2 aerial line transect surveys of moulting ringed seals in mid-April in years with noticeable ice-cover. In addition, surveys in open-water circumstances have been tested in known haul-out localities on land.
- c. Gulf of Finland: in the Finnish side of the Gulf of Finland two transect surveys East of Helsinki (the main series of transect lines located east of the Kotka longitude; and in the Russian side of Gulf of Finland 1-2 aerial line transect surveys between 15th of April and 1st of May in years with noticeable ice-coverage.
- d. Gulf of Riga: aerial line transect survey between 15th of April and 1st of May in years with noticeable ice-coverage. In addition, surveys in open-water circumstances have been tested in known haul-out localities on land.

2.4 Monitoring procedure

2.4.1 Monitoring strategy

Seals are counted on land during key stages of their life cycle, namely breeding and moulting. During these key stages seals are in particular need of land sites throughout their distribution. During breeding, pups are counted to get an estimate of pup production and mortality. During the moult the highest proportion of the population haul out, which makes it the optimal time for counting the population to get the highest / minimum / best comparable abundance estimate

2.4.2 Sampling method(s) and equipment

2.4.2.1 Harbour seals

Aerial surveys follow a standard protocol, which has been in use since 1979. There are two observers on each survey. As seals tend to have a higher haul out rate in dry weather, surveys are not carried out if there has been rain at a haul-out within 6 hours prior to the survey. To ensure photographic quality, surveys are only carried out at wind velocities below 10 m/s. The haul-outs are photographed from an altitude of 500-700 feet. Each observer takes a series of overlapping photographs of seal groups at the haul-out through the open window. Occurrence of seals outside the photographs is noted. At a few localities, seals haul out on individual rocks covering a large area. At these sites, overlapping photographs are not possible and the seals are counted independently by each observer and the mean of these counts is used.

Equipment:

- High-wing fixed wing aircraft with opening windows
- 2 digital cameras with zoom lenses including 200mm in their range and image stabiliser. The cameras should have a resolution and lenses of high optical quality to facilitate species recognition.
- GPS-log
- Binoculars
- Intercom headsets

- Immersion suits and life vests

2.4.2.2 Grey seals

Grey seal moult surveys methods have been under development since 1990's. Since 2005, timing and extent of the surveys has been internationally coordinated, covering all the moulting distribution and methods standardized. Aerial surveys with fixed wing aircraft (float plane) or helicopter follow a standard protocol. As seals tend to have a higher haul out rate in dry weather, surveys are not carried out if it has rained at a haul-out within 6 hours prior to the survey. To ensure photographic quality, and high haul-out rate, surveys are only carried out at wind velocities below 8-10 m/s. A pilot and one or two observers are required for each survey. The pilot is making sure that the flight route allows the photographing observer to take pictures of all the targets. The observer at the opening window takes a series of overlapping photographs of seal groups at each haul-out while both the pilot and the other observer, if present, are helping observing hauled out groups or seals swimming outside of them..

Note: in Denmark, surveys are performed at mean wind velocities up to 10 m/s, in Estonia and Finland at wind speeds up to 8 m/s.

Note: in Estonia, only one observer is used during haul out surveys.

Note: in Estonia, grey seal pups in different age classes as well as remains of dead pups are counted separately during land visits on the main breeding islands.

Note: in Russia, the main haul-outs are located in a no-fly zone, and photographs are taken from boats at the distance of 100-400 meters.

Note: in Poland a small new haul out site is established on a remote island close to the mainland and on-line camera together with land based visual surveys are used.

Equipment

- High-wing fixed wing aircraft (grey seal pup counts in Finland and grey seal moult counts in Sweden) with opening window or side door
- Digital cameras with zoom lenses including 200 - 300mm in their range and image stabiliser. The cameras should have a resolution and lenses of high optical quality to facilitate species recognition
GPS-log (not used in Denmark)
- Binoculars
- Intercom headsets
- Immersion suits and life vests
- Boats (in Russia and some areas in Sweden)
- on-line video camera (in Poland)

2.4.2.3 Ringed seals

Line transect methodology (Härkönen & Lunneryd 1992, Härkönen et al. 1998) has been carried out since 1988. The methodology is employed since ringed seals haul out scattered on ice to moult. Surveys are flown at an altitude of 90m and the surveyed strips are 800m wide. The two observers photograph all the seals on the strips (one 400 m strip on each side of the plane). The transects are evenly spaced over the ice area in a manner so that a minimum of 13% of the entire ice covered sea area is surveyed. A greater survey fraction only marginally reduces variances of survey results (Härkönen & Lunneryd 1992).

In the Archipelago Sea and Finnish side of the Gulf of Finland transect lines are set ca. 4 km from each other over the ice area. The flight altitude is 170-180m and the whole area between the transect lines is observed. In the Archipelago Sea, ringed seals in area without ice-cover may haul out on land instead of moving to the ice-covered area. Thus, no proper estimates of unseen fraction of hauling out individuals are produced.

Notes: In the Gulf of Riga, Gulf of Finland and the Archipelago Sea, poor ice conditions in most years have suggested that seal distribution on ice has not resembled that of a “normal” winter, the observation results can then only be used to describe distribution rather than calculate or compare abundance estimates.

Equipment

- High-wing fixed wing aircraft
- 2 digital cameras with zoom lenses including 200mm in their range and image stabiliser. The cameras should have a resolution and lenses of high optical quality to facilitate species recognition
- GPS-logs
- Binoculars
- Intercom headsets
- Immersion suits and life vests
- Inclinator to mark width of transect strip
- Dictaphones, if GPS-logs are not used.

2.4.3 Sample handling and analysis

2.4.3.1 Harbour seals

Counting from photographs is performed by examination of the series using a computer. Two persons perform individual counts of each locality. In cases of discrepancies exceeding 5% of the two counts, a third independent count is performed. The mean of two counts within 5% of each other constitutes the count for a locality/haul-out. A ‘trimmed mean’ (the average of abundance of the two surveys with the highest counts) is used for as the index of ‘haul-out abundance’ for each year (Teilmann et al. 2010).

2.4.3.2 Grey seals

Numbers of grey seals are counted from the pictures. Numbers of observed seals are summed up by sea area and the highest number obtained over the survey days in each area is used as the counted population size.

2.4.3.3 Ringed seals

The location data of observations are retrieved from EXIF of aerial photographs, the photos are visually scanned for all seals, and overlapping areas of series of photographs are visually excluded. Hauling out population is calculated by multiplying the number of seals on the observed strips to the whole ice-covered area. For the hauling out distribution, the data is tabulated, flight transects are segmented into smaller units (5 km segments of observation strip or specially defined spatial grid, e.g. squares of 5 sq.km each) using data treatment software (R-package or GIS tools). Seal densities per square kilometer in each unit, abundance estimate, based on the mean densities and coverage of the ice area together with 95% confidence interval of the estimate are calculated using the standard statistical procedures (Härkönen and Lunneryd 1992).

3. Data reporting and storage

All data are secured in databases of the National Center for Environment and Energy, Aarhus University (DCE), the Danish Nature Agency, the Swedish Meteorological and Hydrological Institute (SMHI), Natural Resources Institute Finland, the Estonian Environment Agency and Hel Marine Station and University of Gdansk. Raw data are partially treated before being entered into the databases. After initial processing, all data are publicly available. Data are also reported to the HELCOM Seal Abundance Database.

4. Quality control

4.1 Quality control of methods

The development of methods was done in cooperation among the participating institutions and international partners and represents state of the art in seal monitoring.

4.2 Quality control of data and reporting

For harbour and grey seals, two persons perform individual counts of each locality. In cases of discrepancies exceeding 5% of the two counts, a third independent count is performed. Reporting of data is done in reports from the relevant institutions.

Note: Only one person is counting the number of individuals in some years in Sweden, Finland(?), other countries?

5. Contacts and references

5.1 Contact persons

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5.2 References

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