

# Planning of annual partial sighting surveys over the six-year period 2014-2019 to estimate abundance of minke whales in the Northeastern Atlantic

NILS ØIEN

*Institute of Marine Research, P.O.Box 1870 Nordnes, N-5817 Bergen, Norway*  
[nils@imr.no](mailto:nils@imr.no)

## BACKGROUND AND OBJECTIVES

The management of Norwegian minke whaling is based on the Revised Management Procedure (RMP) developed by the IWC Scientific Committee (IWC 1994). RMP requires a monitoring program, as input data for RMP include time series of annual catches and of absolute abundance estimates with associated variance statistics. Abundance estimates for use in this context have been based on sighting surveys. Large-scale synoptic sighting surveys to estimate the abundance of minke whales in the Northeast Atlantic were conducted in 1988, 1989 and 1995 (Schweder et al. 1997). Based on the experiences from the 1995 survey in which 11 vessels and 140 people were involved, it was chosen to cover the northeast Atlantic by small-scale annual surveys over a six-year period (Øien & Schweder 1996). One obvious problem associated with this approach is how to account for the additional variance introduced in multiyear sighting surveys relative to a synoptic survey (Skaug 2000). The problem has been discussed in the Scientific Committee in recent years and implemented in the analyses presented to and eventually approved by the Scientific Committee (Skaug et al. 2004, Bøthun et al. 2009). The arguments for a multiyear sighting survey were that it would be more feasible to achieve common standards and better quality of data collection through more training of the observers and the scientists. Additional benefits were that the logistics would be simpler and costs could be shared over more years. Our experience so far is that the program has been quite successful in the mentioned respects. We therefore intend to conduct a new series of sighting surveys in the northeast Atlantic over the period 2014-2019 with a new estimate of minke whale abundance to be presented in 2020.

The main objective of these surveys is to obtain data for estimating the abundance of minke whales in the medium E area (that is, for small areas EB, ES, EW and EN) as well as the CM small area for calculating catch limits by the RMP at the end of the survey period. In addition, we expect to obtain abundance estimates for other cetacean species in these areas and spatial distribution and other data relating to the population biology of minke whales and other species.

## SURVEY SCHEDULE

Over the survey period 1996-2001, 2002-2007 and in the current survey period 2008-2013 we have intended to cover small management areas within a year as a rule (Figure 1). This has given us information on distributional aspects within these areas, but made it difficult to catch up on movements between them which then need to be handled by the additional variance analyses mentioned above. The surveys were originally designed for an annual effort of 10 boat weeks. However, due to economic constraints the average annual effort has been far below this in the ongoing survey period (about 60%) and we do not expect that this situation will change for the coming survey period. With this in mind, we will probably not be able to survey more than about 3,000 nautical miles a year so this effort can not be spread in the usual way over a very large area. As it is, the recession of ice in summer has also made larger areas accessible north of Svalbard, in the northern Barents Sea and in the Greenland Sea. The available survey effort is therefore expected to be too sparse to allow for the usual construction of transects with a primary transect with intended full coverage. The construction of transects will instead be based on a continuous 18 hour run per day and setting the usual full watch when sighting conditions are according to the survey protocol. In addition some effort, "large whale effort", will be run under conditions beyond those acceptable by the survey protocol for minke whales; on those occasions only the upper platform will be manned.

The stratum definitions we have been using up to and including the survey period 2002-2007, have changed over time due to increased experience. Changes in the *Small Management Area* structure in 2003 (IWC 2004) also led to block modifications which were motivated of the wish to keep some consistency throughout a survey period and make comparisons with previous surveys easier. However, these adaptations have made it difficult to distribute survey effort in an efficient manner as many of the survey blocks have been small with impractical shapes as a result of the changes. In the ongoing survey cycle (2008-2013) the block structure has been evaluated and redesigned to achieve a better total

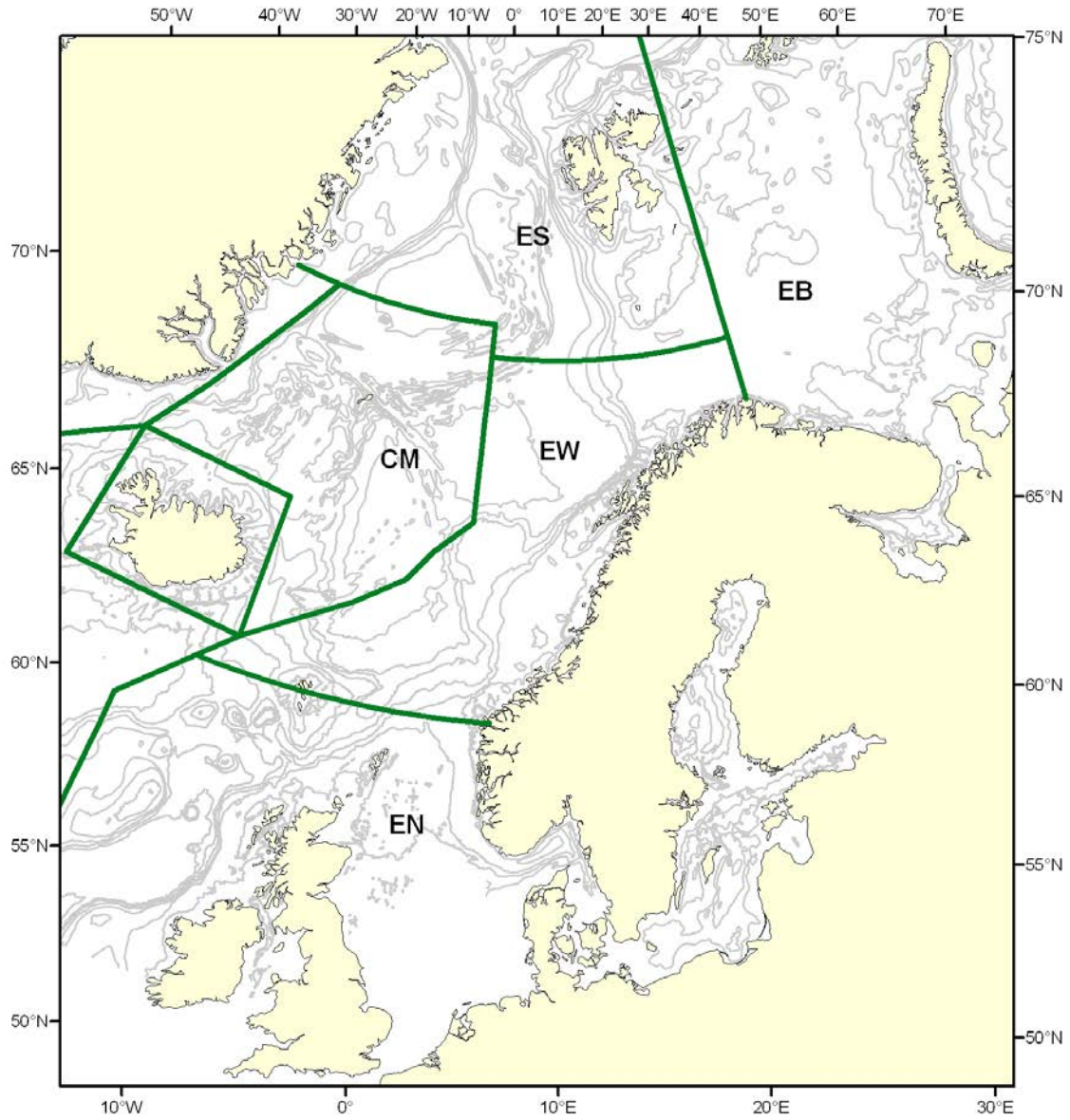


Figure 1. The current division into *Small Areas* of the area of interest to the Norwegian management of minke whales.

effort distribution over the covered area. The new implemented block structure for the Small Management Areas is shown in Figure 2. Further allocation of effort has to be postponed until the amount of effort available has been decided.

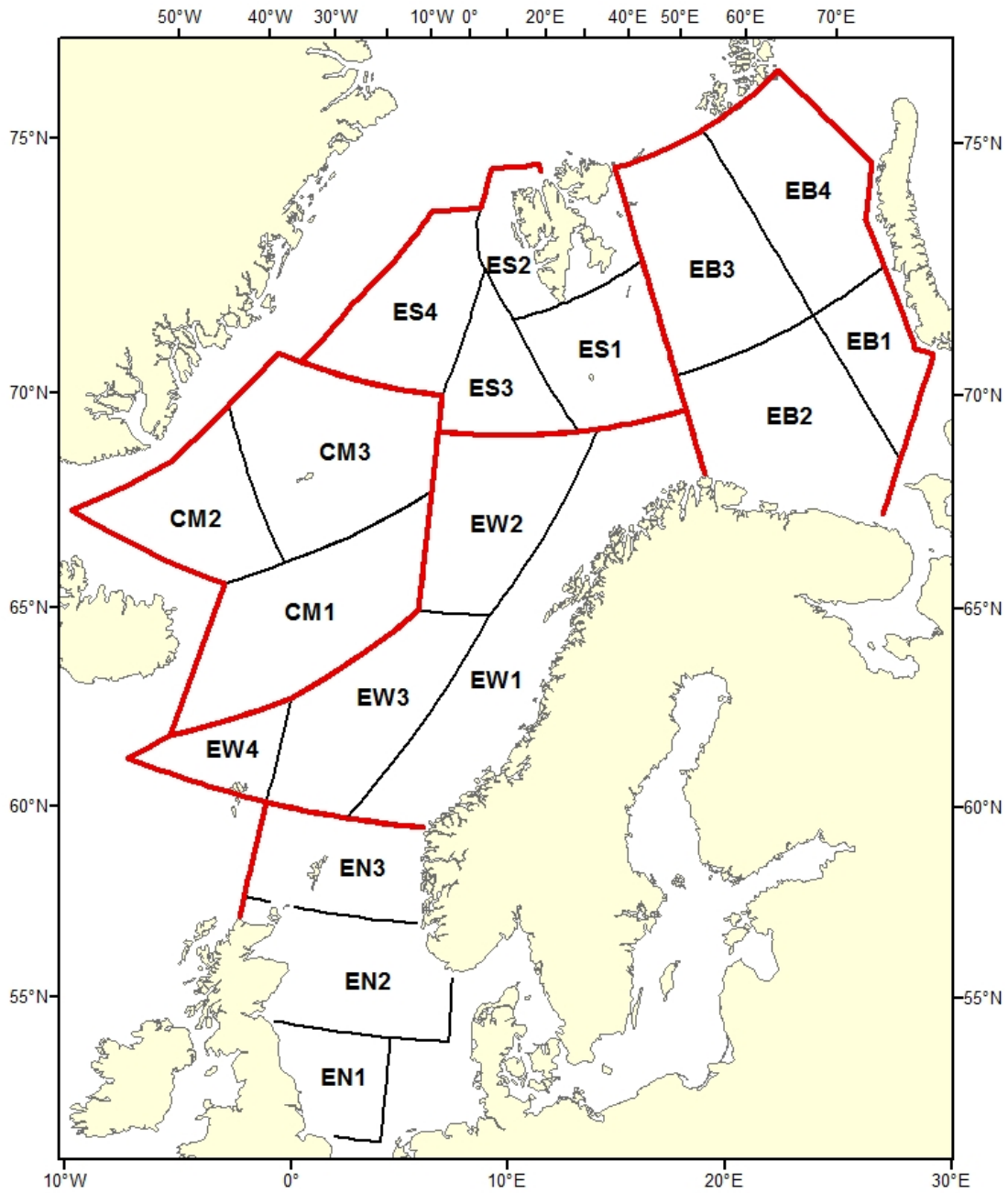


Figure 2. Block divisions within the Small Management Areas as used in the most recent survey cycle 2008-2013.

## DATA COLLECTION AND ANALYSIS

Data will be collected following basically the same procedures and protocols as started with and were used for the 1995 survey (Øien 1995) and for the surveys conducted over the periods 1996-2001, 2002-2007 and the current survey period 2008-2013. On each vessel there will be two independent platforms and four observer teams each consisting of two persons (which will be kept the same as far as possible throughout the cruises). Watches will be organised into an 18 hours work schedule per day. All sightings will be recorded with a time stamp attached to them and all minke whales shall be tracked. The recording system used records the observer reports digitally to sound files on disk.

Distance and angle estimation training will be conducted regularly throughout the surveys. Angle estimation will be based on use of angle boards and radial distances will be judged by eye. Tests for validating these estimations will in general be done at the beginning, midway and at the end of the cruise.

As in previous sighting surveys, these ones will also be conducted with July as core time. Cruise reports after each year's survey will be submitted to the IWC/SC. Biopsy samples will be collected when possible both from minke whales and other cetacean species for which requests are made.

The abundance estimate analyses will be carried out according to the methods most recently outlined in Skaug et al. (2004) and Bøthun et al. (2009).

## REFERENCES

- Bøthun, G., Skaug, H.J. and Øien, N. I. 2009.** Abundance of minke whales in the Northeast Atlantic based on survey data collected over the period 2002-2007. *Paper SC/61/RMP2* presented to the IWC Scientific Committee, May 2009 (unpublished).
- International Whaling Commission. 1994.** Report of the Scientific Committee. Annex H. The Revised Management Procedure (RMP) for baleen whales. *Rep.int.Whal.Commn 44: 145-167.*
- International Whaling Commission. 2004.** Report of the Scientific Committee. Annex D, Appendix 14. Report of the working group on North Atlantic minke whales RMP *Implementation Review. J. Cetacean Res. Manage. 6 (Suppl.):171-183.*
- Øien, N. 1995.** Norwegian Independent Linetranssect Survey 1995. *Interne notat, nr. 8 - 1995,* Havforskningsinstituttet, 58 pp (internal report).
- Øien, N. & Schweder, T. 1996.** Planning of sighting surveys to cover the Northeast Atlantic over a six-year period. *Paper SC/48/NA4* presented to the IWC Scientific Committee, June 1996 (unpublished).
- Schweder, T., Skaug, H.J., Dimakos, X.K., Langaas, M. and Øien, N. 1997.** Abundance of northeastern Atlantic minke whales, estimates for 1989 and 1995. *Rep.int.Whal.Commn 47: 453-483.*
- Skaug, H.J. 2000.** Combination of multiyear surveys for North Eastern Atlantic minke whales. *Paper SC/52/RMP12* presented to the IWC Scientific Committee, June 2000 (unpublished).
- Skaug, H.J., Øien, N., Schweder, T. and Bøthun, G. 2004.** Abundance of minke whales (*Balaenoptera acutorostrata*) in the Northeast Atlantic: variability in time and space. *Canadian Journal of Fisheries and Aquatic Sciences, 61:870-886.*