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Report of the Norwegian 2010 survey for minke whales within the *Small Management Area* CM around Jan Mayen

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ABSTRACT

As part of a six-year program over the period 2008-2013 with the aim to get a new estimate of minke whale abundance in the Northeast Atlantic, the area around Jan Mayen, comprising the *Small Management Area* CM, was surveyed with one vessel during July-August 2010. The total survey area was divided into three blocks which were all covered twice. About 2,028 nautical miles of primary search effort was conducted within the survey blocks. In addition, about 569 nautical miles were searched with "large whale effort" using one platform. The most common species sighted were minke and fin whales. Humpbacks were observed mainly in an area northwest of Iceland. The sighting rates of killer whales and sperm whales have increased over the years Norwegian surveys have been conducted in the area.

MONITORING, SURVEY - VESSEL, ATLANTIC OCEAN, COMMON MINKE WHALE

INTRODUCTION 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, since 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 for the following years to cover the northeast Atlantic by small-scale annual surveys over six-year periods (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 et al. 2004), a feature which they share in common with other surveys discussed in the Scientific Committee in recent years. 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 from the six-year survey periods 1996-2001and 2002-2007 is that the program has been quite successful (Skaug et al. 2004, Bøthun et al. 2009) in the mentioned respects. Norway therefore decided to continue with a new series of sighting surveys in the northeast Atlantic over the period 2008-2013 (Øien and Bøthun 2008) with the aim of presenting a new estimate of minke whale abundance in 2014. The survey conducted in the summer 2010 is the third one in this survey series.

AREAS SURVEYED IN 2010

When the survey plans 2008-2013 were presented in 2008 (Øien and Bøthun 2008), we suggested to preferably cover one *Small Management Area* during one year's survey as the basic approach. In 2008 the survey cycle started by covering the Svalbard area (*Small Management Area* ES), in 2009 the North Sea area of the *Small Management Area* EN was covered, and in 2010 the areas around Jan Mayen, the *Small Management Area* CM, was covered. This area was last covered in 2005 (Øien 2006).

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. In the ongoing survey cycle the block structure has been evaluated and redesigned to achieve a better total effort distribution over the covered area. The new implemented block structure for the Jan Mayen area, comprising of the three strata CM1-CM3, is shown in Figure 1.

CRUISE SUMMARIES

The original cruise plans involve an effort of 10 boat weeks each year. Due to economic constraints, only one vessel, the M/S *Hegur*, was dedicated to a six week survey in 2010. The survey was conducted over the period 20 July to 31 August. On board the vessel, G. Bøthun, K.A. Fagerheim and N. Øien acted as team leaders.

The 2010 total survey area was divided into three ordinary survey blocks (Figure 1). Due to (i) reduced available survey effort and (ii) a displacement of survey time period to somewhat later in the season, we decided to make some changes to the

implementation of the survey. To handle an eventual seasonal factor, the survey was divided into two parts in each of which a full coverage of the survey area was intended. Additionally, the available survey effort was too sparse to allow for the usual construction of transects with a primary transect with intended full coverage. The construction of transects was therefore based on a continuous 18 hour run per day and setting the usual full watch when sighting conditions were according to the survey protocol. In addition some effort, "large whale effort", was run under conditions beyond those acceptable in the survey protocol for minke whales; only the upper platform was on watch during these parts of the survey.

The established sightings procedures (Øien 1995), including tracking of minke whales, were followed as in previous surveys in which minke whales have been the primary target species.

The survey vessel was able to survey about 2,028 nautical miles altogether in primary search mode in the designed survey blocks (Table 1). This turns out to be about the effort we could anticipate for primary transects based on earlier experiences of weather and conditions and time available. In addition, 569 nautical miles were conducted with "large whale effort". Realised primary search effort, as well as the additional "large whale effort", in the three blocks surveyed in 2010 are shown in Figure 1. Apparently, the effort seems to have been reasonably well distributed over the survey area.

A summary of the number of groups of whales sighted during the 2010 survey when on primary search effort is shown in Table 1. Distributions of primary sightings of minke whales, fin whales, humpback whales, killer whales, *Lagenorhynchus* spp., Northern bottlenose whales and sperm whales are shown in Figures 2-3.

The Jan Mayen area was last surveyed during the NILS surveys in 2005. Norwegian surveys have covered this area or parts of it in 1988, 1995, 1997, 2005 and now in 2010. Area weighted sighting rates for several species from these surveys have been plotted in Figure 4. These curves may give a skewed impression of the two species humpback whales and *Lagenorhynchus* dolphins in the early years. The reason is apparently that these two species mainly are distributed in the south western part of the CM block, which had no coverage by Norwegian vessels in 1995 or earlier.

Distance and angle estimation training as well as experimental tests were conducted on 3, 26 and 28 August 2010.

SURVEY DESIGN, SIGHTING PROCEDURES AND DATA COLLECTION

The survey procedures followed were the same as in NILS-95 (Øien 1995, Schweder et al. 1997, Skaug et al. 2004, Bøthun et al. 2009). The equipment was basically the same as was used in the NILS-95 survey, but some modifications have been made since then to the software to make relevant data recording of especially weather covariates easier. Digital recording of speech is made directly to disk. This system has proved useful and easy for transcription and checking. Double platform effort is used exclusively during primary search following the defined protocol, and the observers are organised into teams of two persons. This has been consistent in all our surveys since 1997.

During the sighting survey in 2010, identification photos were collected from about 10 humpbacks. No new dive time data series were collected in 2010.

FUTURE SURVEY ACTIVITY

Within the on-going survey program for the six-year cycle 2008-2013, the Svalbard area was covered in 2008, the North Sea area in 2009, the Jan Mayen area in 2010 and the Norwegian Sea will be covered in the summer 2011. The future survey plans are uncertain due to economic constraints, but the *Small Management Area* EB, which includes the Barents Sea proper, still remains to be covered but will probably be on the schedule for 2013.

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Table 1

Number of groups of whales seen from the upper and lower platforms during primary search, and realised primary search effort (nautical miles) by survey stratum, during the 2010 survey. The 'F' effort is search conducted in conditions not acceptable for minke whale search and observations during that effort are given in parentheses.

		Survey block			
Species	***Platform***	**CM1**	**CM2**	**CM3**	**Total**
Minke whale	*Upper*	18 (+1)	6	10 (+3)	**34 (+4)**
	Lower	11	2	7	**20**
Fin whale	*Upper*	2	23	6 (+6)	**31 (+6)**
	Lower	1	18	5	**24**
Sei whale	*Upper*	0	0	0	**0**
	Lower	0	1	0	**1**
Humpback whale	*Upper*	1	34	0	**35**
	Lower	0	31	0	**31**
White-beaked dolphin	*Upper*	0	10	0	**10**
	Lower	0	8	0	**8**
Lagenorhynchus sp.	*Upper*	0	4	1	**5**
	Lower	0	5	2	**7**
Killer whale	*Upper*	8 (+5)	0 (+2)	3	**11 (+7)**
	Lower	8	0	2	**10**
Northern bottlenose whale	*Upper*	0	0	1	**1**
	Lower	1	0	2	**3**
Sperm whale	*Upper*	28	0	0	**28**
	Lower	23	0	0	**23**
Large whales	*Upper*	1 (+1)	18	4	**23 (+1)**
	Lower	1	7	2	**10**
Total, groups	***Upper***	**58 (+7)**	**95 (+2)**	**25 (+9)**	**178 (+18)**
	Lower	**45**	**72**	**20**	**137**
Realised primary effort	***Nmi, T***	**958**	**526**	**544**	**2,028**
	Nmi, F	**265**	**144**	**160**	**569**

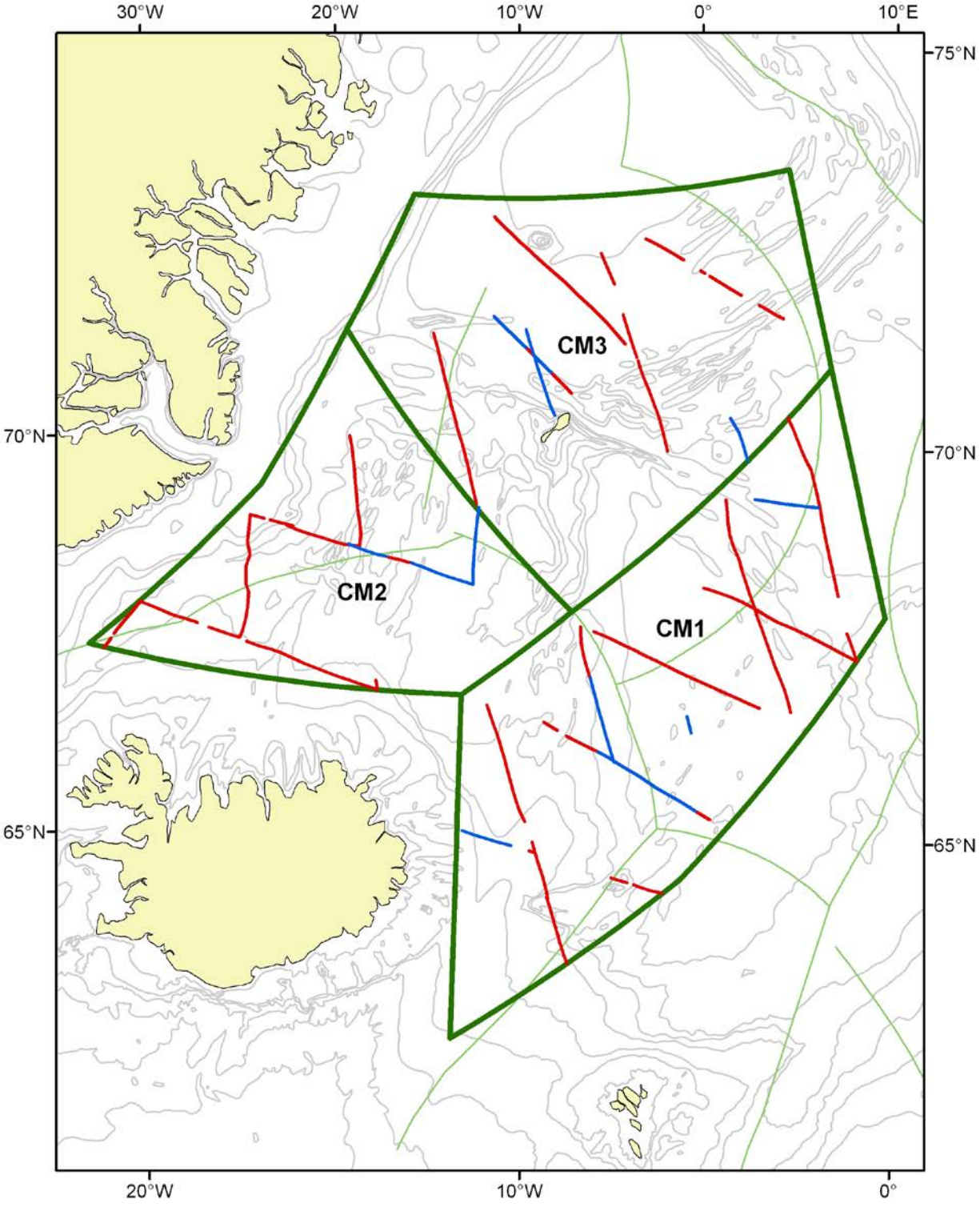

Figure 1. *The CM Small Management Area with the block structure, CM1-CM3, adopted for the survey. Realised transects with primary search effort within these survey blocks have been added. The red lines represent search effort conducted within the limits of the acceptable weather conditions defined by the survey protocol, while the blue lines represent search effort in extended conditions and with single platform mode.*

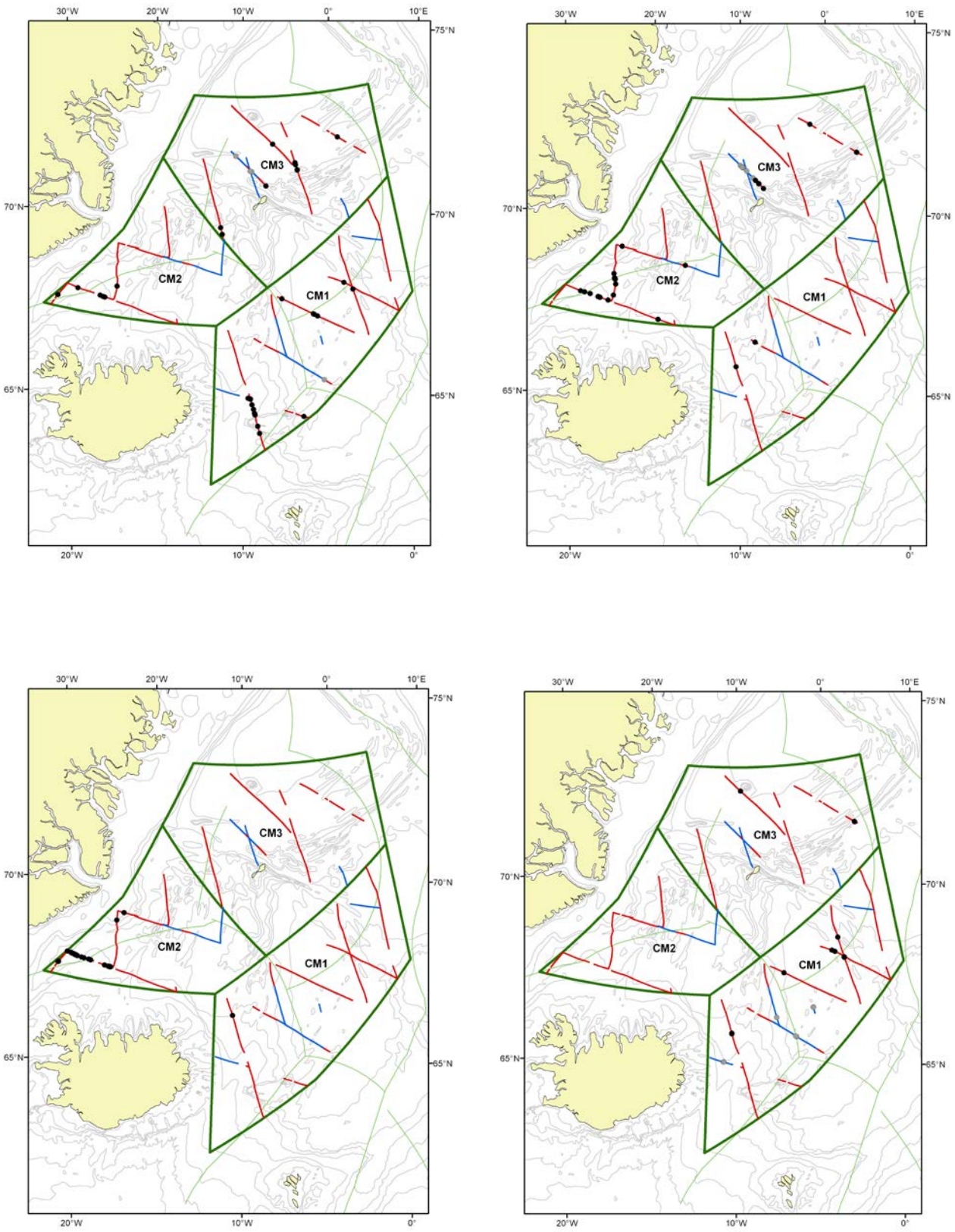

Figure 2. *Primary sightings of minke whales (upper left), fin whales (upper right), humpback whales (lower left) and killer whales (lower right). The black dots are sightings made within the limits of acceptable weather conditions set by the survey protocol, while grey dots are sightings made under extended conditions.*

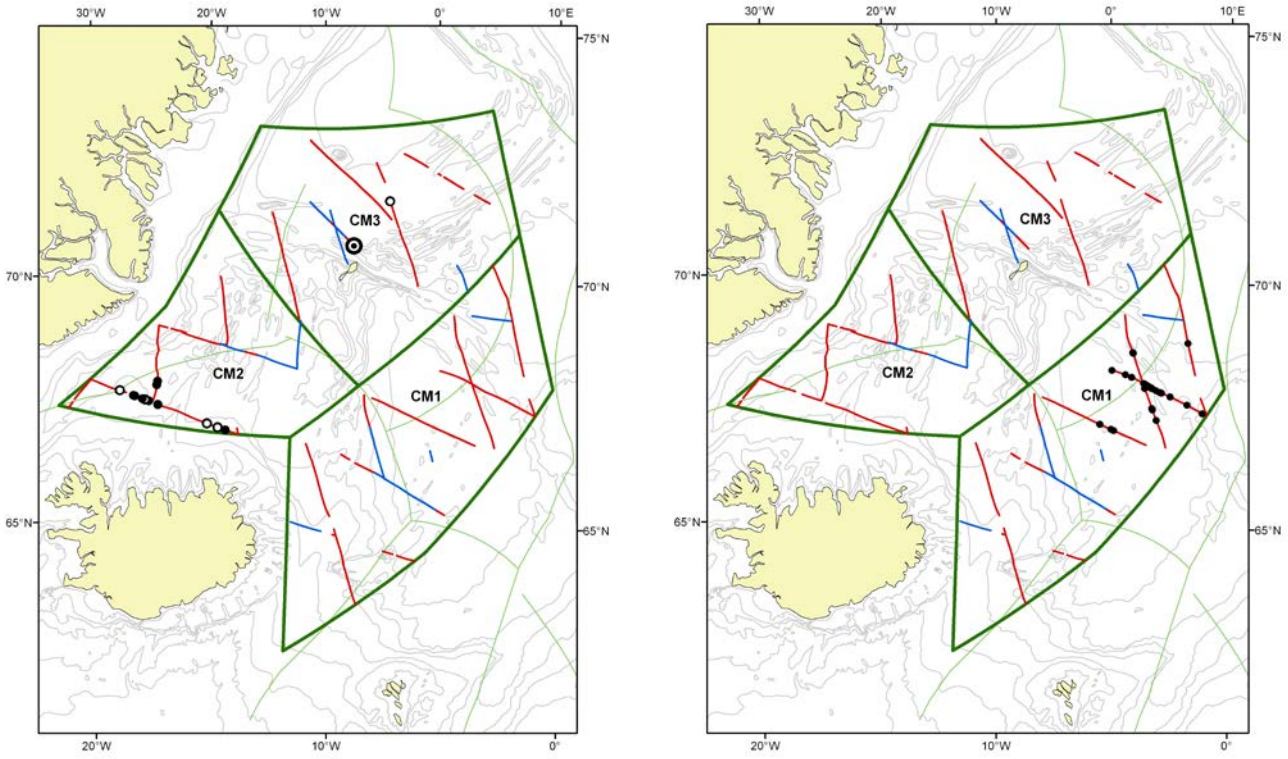

Figure 3. *Primary sightings of unidentified dolphins and northern bottlenose whale (left) and sperm whales (right). In the left panel, the black circles are sightings of Lagenorhynchus albirostris, the open circles are sightings of unidentified dolphins (L. spp., undetermined), while the double circle is a sighting of a Northern bottlenose whale.*

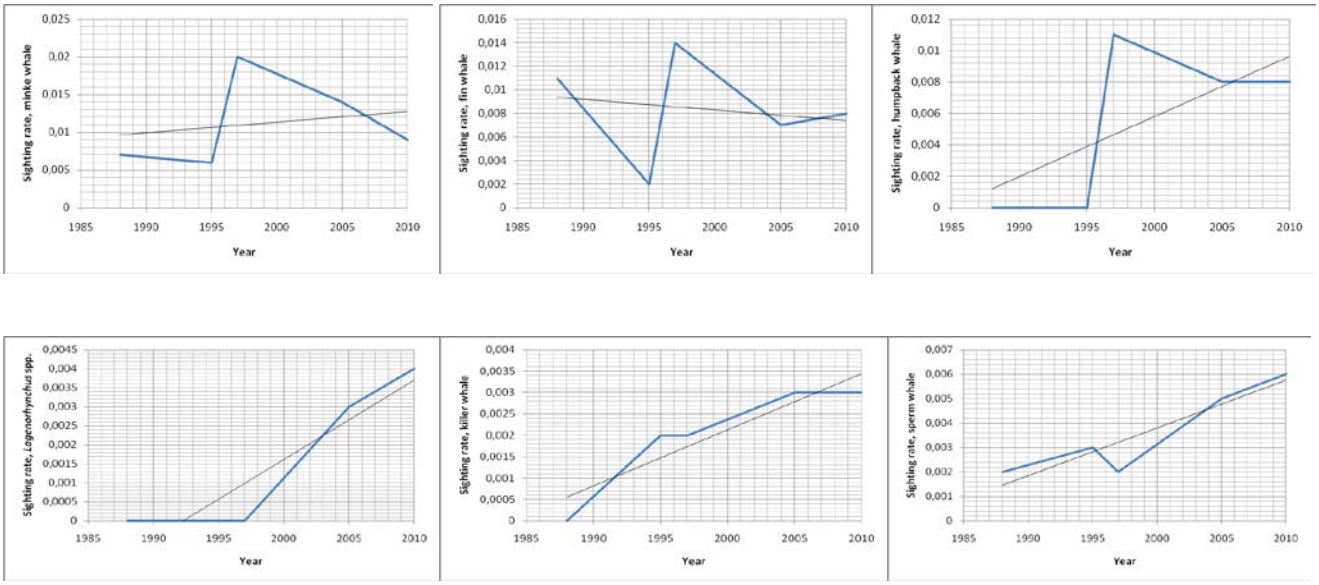

Figure 4. *Sighting rates for several cetacean species (minke, fin, humpback, dolphin spp., killer and sperm whales) derived from Norwegian survey data from the Jan Mayen area over the period 1988-2010. See text for details.*