A review of abundance estimates of common minke whale using the sighting surveys conducted in subareas 5 and 6 by Korea from 2000 to 2009

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ABSTRACT

The sighting data from the recent surveys conducted by Korea in the Yellow Sea (subarea 5) and the East Sea (subarea 6) were analyzed to estimate the abundance of common minke whales. The covariates such as 'year', 'area' and 'wind' were considered and g(0) was assumed to be 1 for the estimation. The Hazard-rate and half normal model were considered as detection function and the hazard-rate model was chosen by AIC. Two coastal and one offshore blocks for the Yellow Sea and three coastal and two offshore blocks for the East Sea were set based on the survey area coverage. The abundance in the Yellow Sea were estimated at 1,534 (CV=0.523) in 2001, 799 (CV=0.321) in 2004 and 680 (CV=0.372) in 2008. Those of the East Sea were estimated at 549 (CV=0.419) in 2000, 391 (CV=0.614) in 2002, 485 (CV=0.343) in 2003, 336 (CV=0.317) in 2005, 459 (CV=0.517) in 2006, 575 (CV=0.347) in 2007 and 884 (CV=0.286) in 2009. These figures, however, may be underestimated because some efforts and sightings were omitted to compare the estimations for the same area coverage by year. And also g(0)=1 makes these figures underestimated.

INTRODUCTION

Korea has conducted systematic sighting surveys in the Yellow Sea and the East Sea under the cooperative research between Korea and Japan since 1999. The SC has requested to integrate the abundance estimate for J-stock common minke whales using the Korean and Japanese sighting data in the research area. This document presents the abundance estimation of common minke whales in the Yellow Sea and the East Sea.

SURVEY AND METHODS

All the sighting surveys were conducted on the research vessel, Tamgu 3 (360 GT and 1,600HP) equipped with a top barrel at the height of 11.5m from the sea level for observation. The survey was performed under the good weather condition with two or longer nautical miles visibility and three or smaller Beaufort scale.

The survey area was divided into 3 blocks in the Yellow Sea and 5 blocks in the East Sea to compare the estimates for the same area coverage by year (Fig. 1) and therefore some efforts and sightings were excluded from the estimation. Most of the surveys were conducted from April to May except for 2000, 2002 and 2004 when the surveys were extended to early June (Table 1). The surveys were operated in normal closing mode. The perpendicular distance data were truncated at 1.2 nautical miles for the improvement in the detection function fitness.

The abundance estimates were calculated by the program developed by Okamura using 'R' software with covariates such as 'year', 'area', and 'wind'. Two key functions (hazard-rate and half-normal) were used for the detection curve. The model and covariates for the estimates was selected by AIC. The detection probability on the transect line, g(0) was assumed to be 1 because IO platform was not equipped in the research vessel.

RESULTS

The hazard-rate model was selected for key function and fitness of the detection curve is shown in Fig. 2. The sighting positions of common minke whales and summary of each estimate are shown in Fig. 3, Table 1.

The abundance in the Yellow Sea were estimated at 1,534 (CV=0.523) in 2001, 799 (CV=0.321) in 2004 and 680 (CV=0.372) in 2008. Those of the East Sea were estimated at 549 (CV=0.419) in 2000, 391 (CV=0.614) in 2002, 485 (CV=0.343) in 2003, 336 (CV=0.317) in 2005, 459 (CV=0.517) in 2006, 575 (CV=0.347) in 2007 and 884 (CV=0.286) in 2009. The estimates will have bigger numbers because some efforts and sightings were excluded to compare the estimations for the same area coverage by year. And also g(0)=1 made these figures underestimated.

Table 1. Summary of abundance estimates of common minke whales sighted in the Korean surveys from 2000 to 2009.

Year	Area	Size of area (n.m.^{2})	Month	Survey effort (n.m.)	No. of sightings	Abundance	Density	CV
2001	sub-area 5	15,678	Apr-May	751	27	1,534	0.099	0.523
2004			Apr-Jun	807	18	799	0.053	0.321
2008			Apr-May	841	17	680	0.045	0.372
2000	sub-area 6	10,046	May-Jun	709	25	549	0.121	0.419
2002			May-Jun	590	16	391	0.093	0.614
2003			Apr-May	1,064	14	485	0.057	0.343
2005			Apr-May	846	19	336	0.101	0.317
2006			Apr-May	833	13	459	0.050	0.516
2007			Apr-May	941	20	574	0.069	0.437
2009			Apr-May	1,133	35	884	0.088	0.286

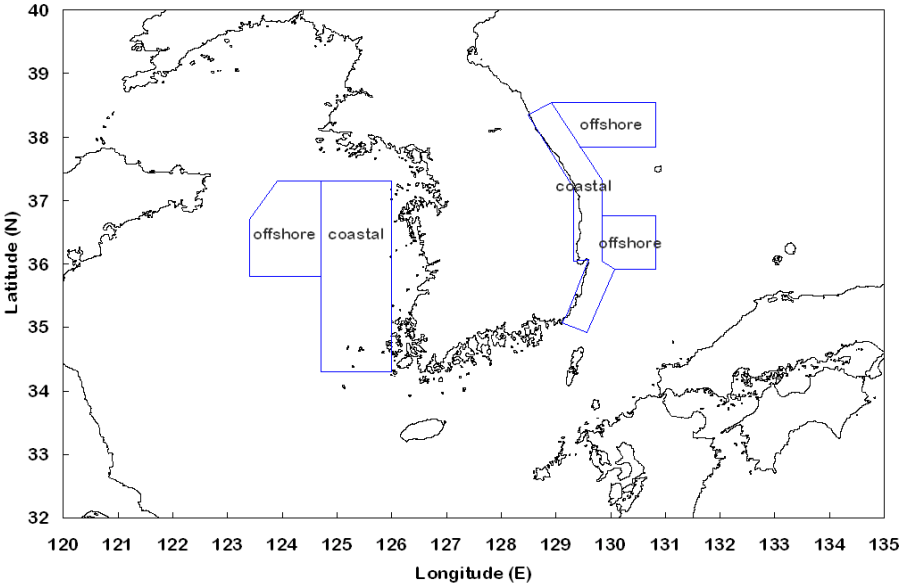

Fig. 1. The block lines for the minke whale abundance estimation.

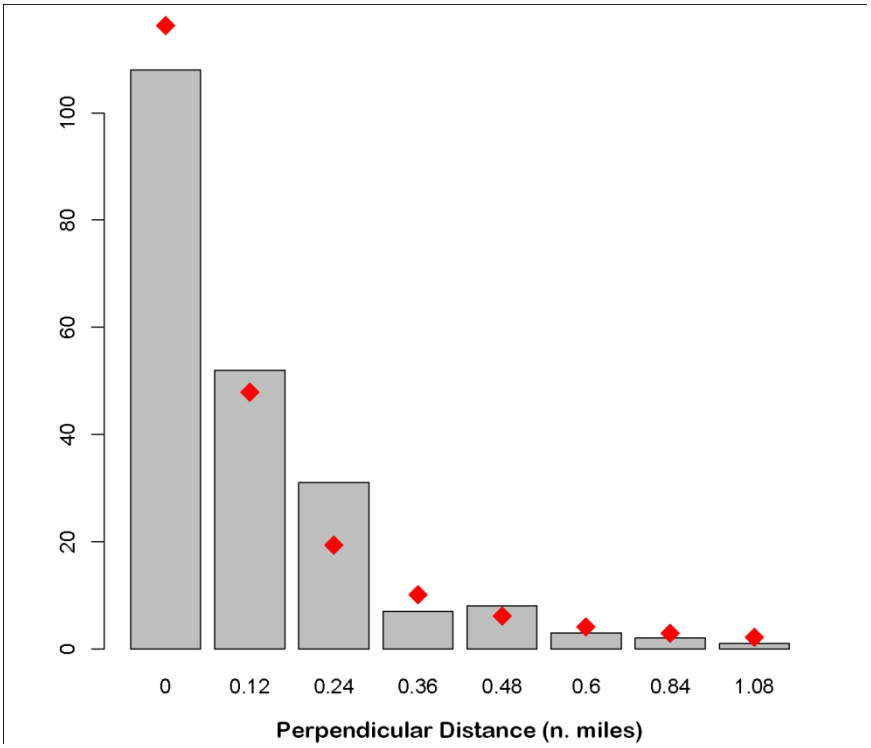

Fig. 2. Perpendicular distance distribution and the fitness of detection curve.

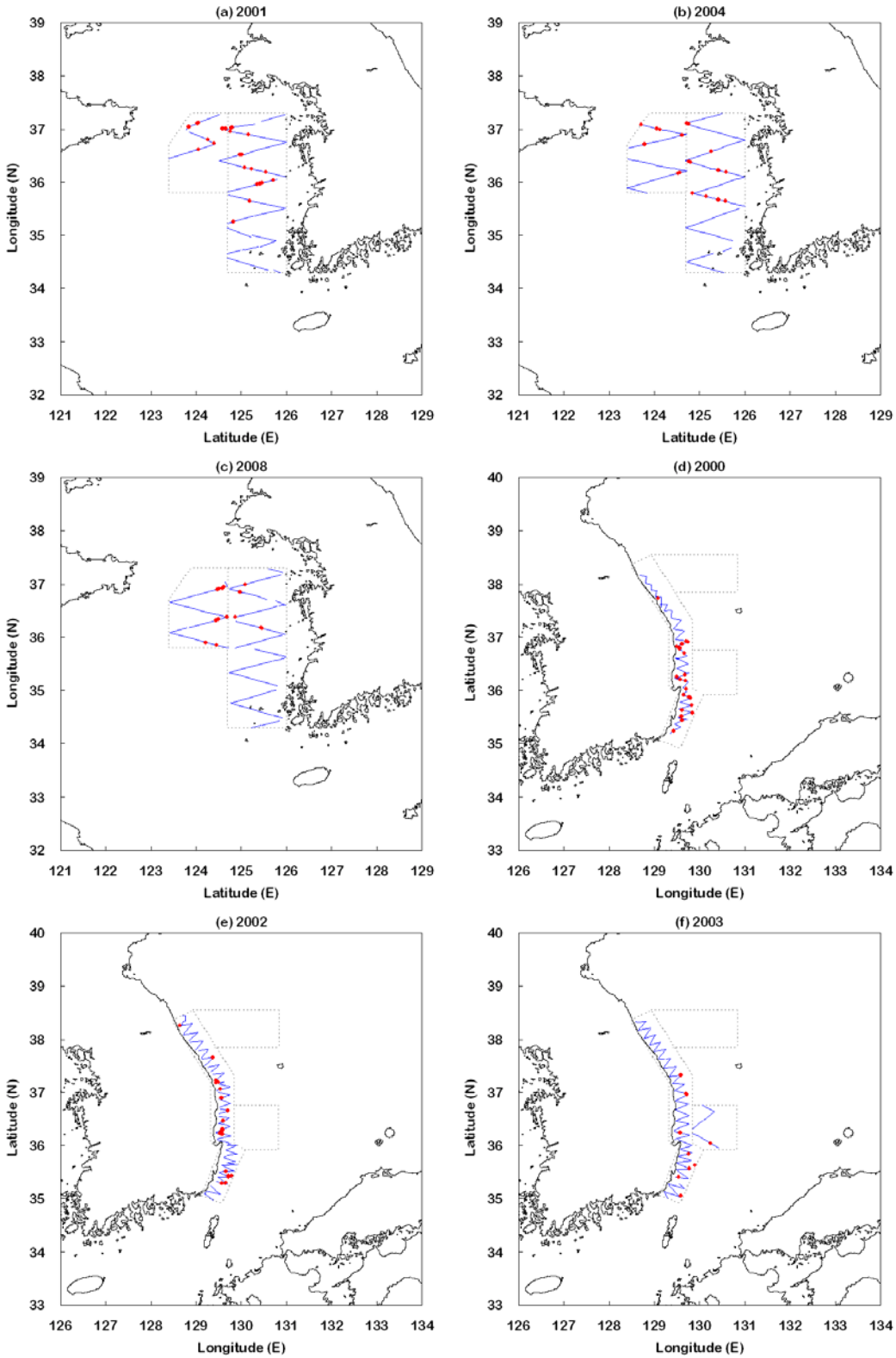

Fig. 3. Sighting positions of common minke whales in the Yellow Sea and the East Sea from 2000 to 2009 (solid lines: track lines; dashed lines: block lines; red circles: sighting positions).

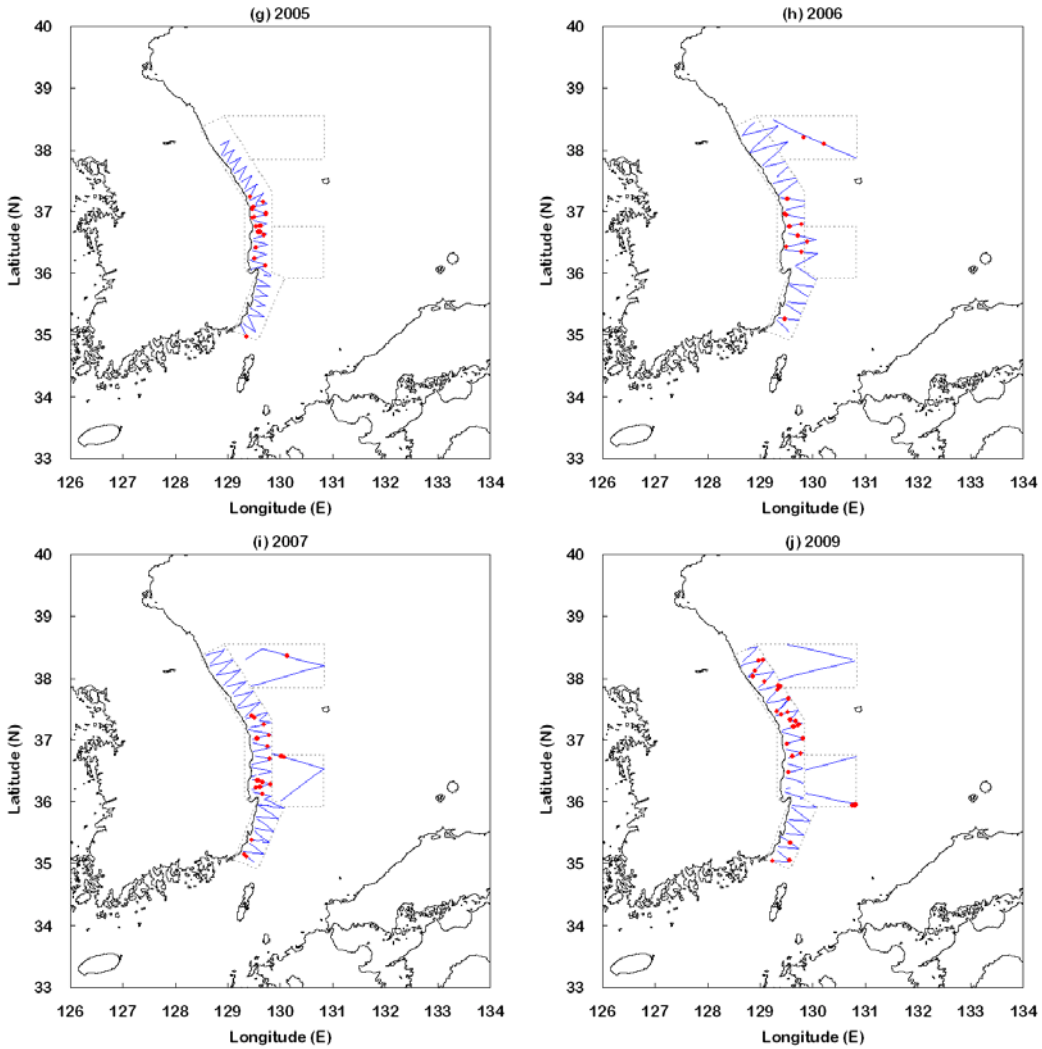

Fig. 3. (continued).