A review on the status of bycatch minke whales in Korean waters

YONG-ROCK AN, SEOK-GWAN CHOI AND DAE-YEON MOON
Cetacean Research Institute, National Fisheries Research & Development Institute
139-29, Maeam-dong, Nam-gu, Ulsan, 680-050, Republic of Korea

ABSTRACT

This paper provides the information on the status of bycatch minke whales in Korean waters from 1996 to 2008 for the pre-implementation assessment of western North Pacific common minke whales. A total of 1,156 minke whales were by-caught in Korean waters. 83.7% of the animals were by-caught in the East Sea while only 9.1% and 7.2% were caught in the Korea Strait and the Yellow Sea, respectively. 363 animals were entangled or trapped by several kinds of set nets, 316 animals were caught by buoy or anchor rope of fish pots, 303 animals were caught by gill nets. There were two peaks of bycatch in May-June and December-January. The average body length of by-caught minke whales was 5.05m with the range from 2.7 to 9.0m. Mapping the locations of bycatch could not explain the migration of the minke whales in hypothetical two different groups because there were bycatch all year round. However, the characteristics of bycatch could be classified into couple of categories by size groups of the animals.

INTRODUCTION

The government of Korea has developed the reporting system for bycatch of cetacean animals since 1996 by help of Korea Coast Guard. Fishermen are willing to report their bycatch to the Coast Guard because they regard their bycatch as compensation for the lost of their time, labor or fishing gears. The Korea Coast Guard investigates whether fishermen catch the animals on purpose or not and then admit fishermen to utilize them if the animals are caught incidentally. In the early years, the reporting system operation was not so good in some areas of Korea, especially in the coast of the Yellow Sea where fishermen had less experience with cetacean animals and no market for whale meats. But it has been run very well in all over the coastal areas in Korea since 2000. The government of Korea is modifying and revising the reporting system including the collection of DNA samples which has never been completed for all by-caught animals. The revised reporting system will make more contribution to the management and conservation of cetacean animals in Korean waters.

DATA COLLECTION

The Korea Coast Guard conducts investigations when cetacean animals are by-caught in Korean waters and they make documents on the investigations and registers cases on the DB of the Ministry of Food,

Agriculture, Forestry and Fisheries. Researchers of the Cetacean Research Institute have rights to access to the DB on the intranet and collect data every month. Also, researchers visit the 14 local branch offices of the Korea Coast Guard twice in a year in order to consult the investigation documents and cross-check the DB with the documents. The investigation documents contain the information on date, time and location of the bycatch, name of fisherman, type of fishing gears involved, species, body length, sex of the animals and so on. We classified the bycatch by areas and fishing gears to find distribution and migration patterns of minke whales in Korean waters. The bycatch areas were classified into the southern and northern East Sea (Subarea 6), the Korea Strait (Subarea 5-6) and the Yellow Sea (Subarea 5). The fishing gears were grouped as set nets, fish pots, gill nets and others which put together trawls, longlines, seine nets, stow nets, long bag nets and so on.

RESULTS

Annual variations of bycatch by areas and fishing gears

Table 1 summarizes the by-caught minke whales in Korean waters from 1996 to 2008 by areas and fishing gears and the annual variations in the number of by-caught minke whales by areas and fishing gears are shown in Fig. 1 & 2, respectively. In 2001, the largest number of minke whales (160 animals) was caught incidentally in Korean waters and the smallest one (45 animals) in 1998. But in the early years, there might be unreported bycatch in the Yellow Sea. On the average about 88 minke whales were by-caught every year. About 83% of minke whales were by-caught in the East Sea (Subarea 6) while much lesser number of animals was by-caught in the Korea Strait (Subarea 5-6) and the Yellow Sea (Subarea 5).

Table 1. Summary of by-caught minke whales in Korean waters from 1996 to 2008 by areas, fishing gears and sex.

Year	*Area*				*Fishing gears*				*Sex*			*Total*
	S. East Sea	N. East Sea	Korea Strait	Yellow Sea	Set net	Fish pot	Gill net	Others	Female	Male	Unid.	
1996	107	19	2		32	50	45	1	13	9	106	128
1997	50	27	4		36	24	14	7	5	1	75	81
1998	27	15	3		27	7	11		10	3	32	45
1999	47	11	4		16	17	18	11	20	3	39	62
2000	52	12	4	12	36	16	18	10	7	5	68	80
2001	82	56	13	9	57	22	57	24	62	29	69	160
2002	49	29	4	7	29	17	28	15	29	31	29	89
2003	58	16	9	9	12	33	29	18	25	48	19	92
2004	29	17	14	9	15	21	15	18	25	36	8	69
2005	63	27	11	6	41	36	22	8	46	54	7	107
2006	34	22	16	10	20	26	16	20	23	46	13	82
2007	40	20	10	10	16	20	22	22	20	36	24	80
2008	35	24	11	11	26	27	8	20	16	26	39	81
Total	673	295	105	83	363	316	303	174	301	327	528	
	1,156				1,156				1,156			1,156

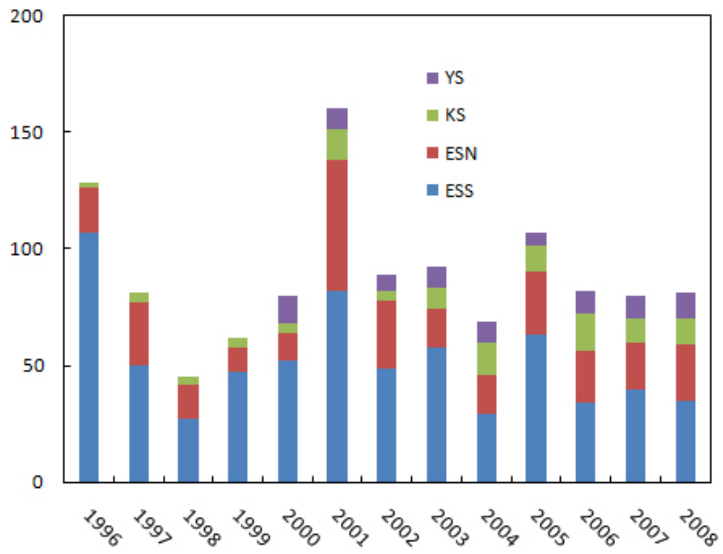

Fig. 1. Annual variation in the number of minke whales by-caught in Korean waters by areas (YS: Yellow Sea; KS: Korea Strait; ESN: northern East Sea; ESS: southern East Sea).

Most of bycatch animals were caught by set nets, fish pots and gill nets with similar proportions while other fishing gears such as trawls, longlines, seine nets, stow nets, long bag nets etc. accounted for only 15% of the bycatch. Minke whales were entangled by several types of rope or nets of these fishing gears except younger animals which trapped in set nets.

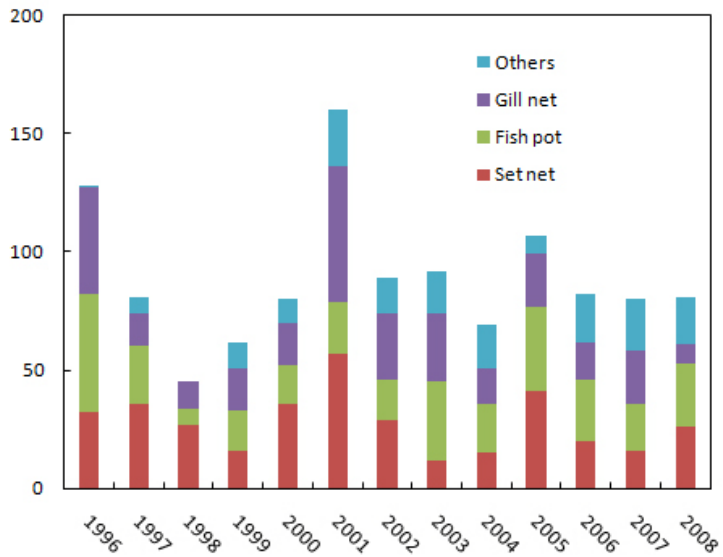

Fig. 2. Annual variation in the number of minke whales by-caught in Korean waters by fishing gears.

Monthly variation of bycatch by pooled data

The numbers of bycatch minke whales were pooled by month and the monthly variation in the number of bycatch is shown in Fig. 3. There were two seasonal peaks in May-June and December-January which might reveal the main seasons of minke whales migration in Korean waters. There were sudden declines of bycatch after the two peaks in February and July. It could be explained by inter-migration seasons and harsh conditions for fishing in February-March (winter seasons with strong winds) and July-August (rainy seasons), either.

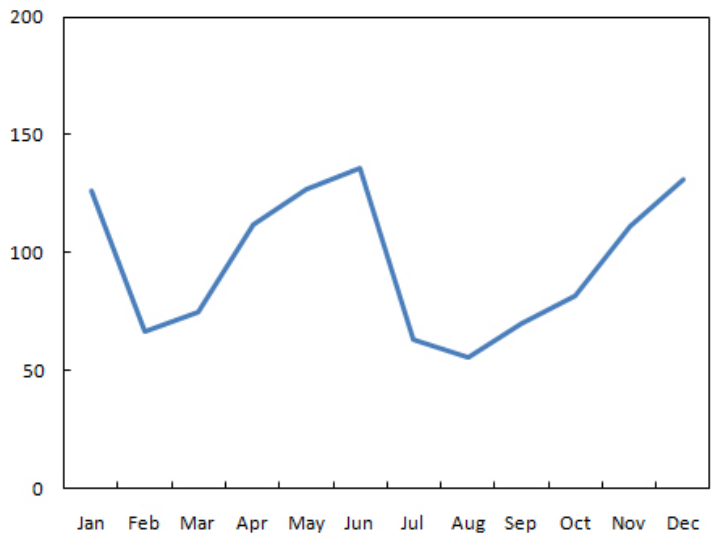

Fig. 3. Monthly variation in the number of minke whales by-caught in Korean waters (pooled data by month).

Size frequency in body length of by-caught minke whales

The body lengths of 996 by-caught animals were measured and sex of 626 animals were identified (Fig. 4). The average body length was 5.05m with the range from 2.7 to 9.0m and male animals were larger than female ones. Immature animals tend to approach to the coastal areas therefore they have higher risk to be by-caught than larger animals.

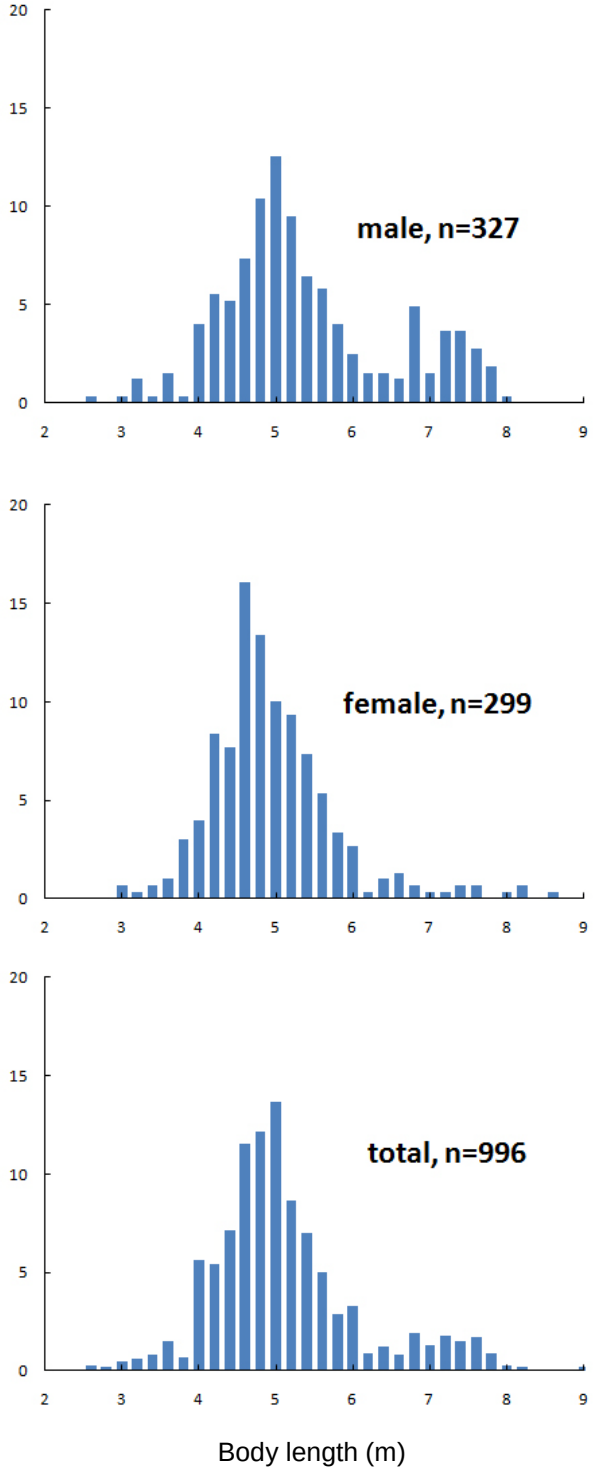

Fig. 4. Size frequencies of the body length of by-caught minke whales in Korean waters.

Monthly locations of by-caught minke whales

The monthly locations of by-caught animals in Korean waters are shown in Fig. 5. Bottom topography of the ocean basins around the Korean Peninsula made quite big differences in the distribution patterns of bycatch. Minke whales were by-caught in the narrow band on the continental shelf of the East Sea while bycatch were scattered widely all over the shallow basins of the Yellow Sea and the Korea Strait. Along the coastline in the East Sea, bycatch were happened in every month while there was no bycatch in April and October in the Yellow Sea and Korea Strait, respectively. The Yellow Sea and the Korea Strait might have lower possibilities to have bycatch because minke whales distribute far from the coast where too shallow to reside in. Also there are smaller efforts to fish with major gears of bycatch (set nets, fish pots and gill nets) in the Yellow Sea because of big tidal differences and accompanying strong tidal currents. Therefore, these phenomena might cause less number of bycatch in the Yellow Sea than it is expected although the abundance estimates by sighting surveys in the Yellow Sea were bigger than in the East Sea (SC/62/NPM16). In conclusion, bottom topography and oceanic conditions in the Yellow Sea make less number of bycatch even though there are minke whales all year round and monthly locations of bycatch cannot explain the existence of two difference migrations around the Korean Peninsula.

Characteristics of bycatch with size groups of minke whales

Canonical Correspondence Analysis was introduced to explain the characteristics of bycatch containing categorical data such as areas, fishing gears and size groups of animals. The bycatch areas can be interpretable using CCA in Fig. 6. Younger animals (<4.5m) tend to be caught in the southern part of the East Sea while larger animals (>6.5m) in the Yellow Sea. Also younger animals (<4.5m) tent to be trapped in set nets while middle-sized animals (>4.5m, <6.5m) entangled by fish pots and gill nets (Fig. 7). Larger whales (>6.5m) were caught by various types of gears. In terms of seasonality, younger whales were by-caught mainly in spring (March-June) while larger whales in other seasons (July-February, Fig. 8). Consequently, it seems that younger animals were trapped by set nets in mainly the southern part of the East Sea in spring season. On the other hand larger whales were by-caught by various fishing gears in the Yellow Sea from summer to winter and middle-sized animals were entangled by fish pots and gill nets at the northern part of the East Sea and the Korea Strait all year round.

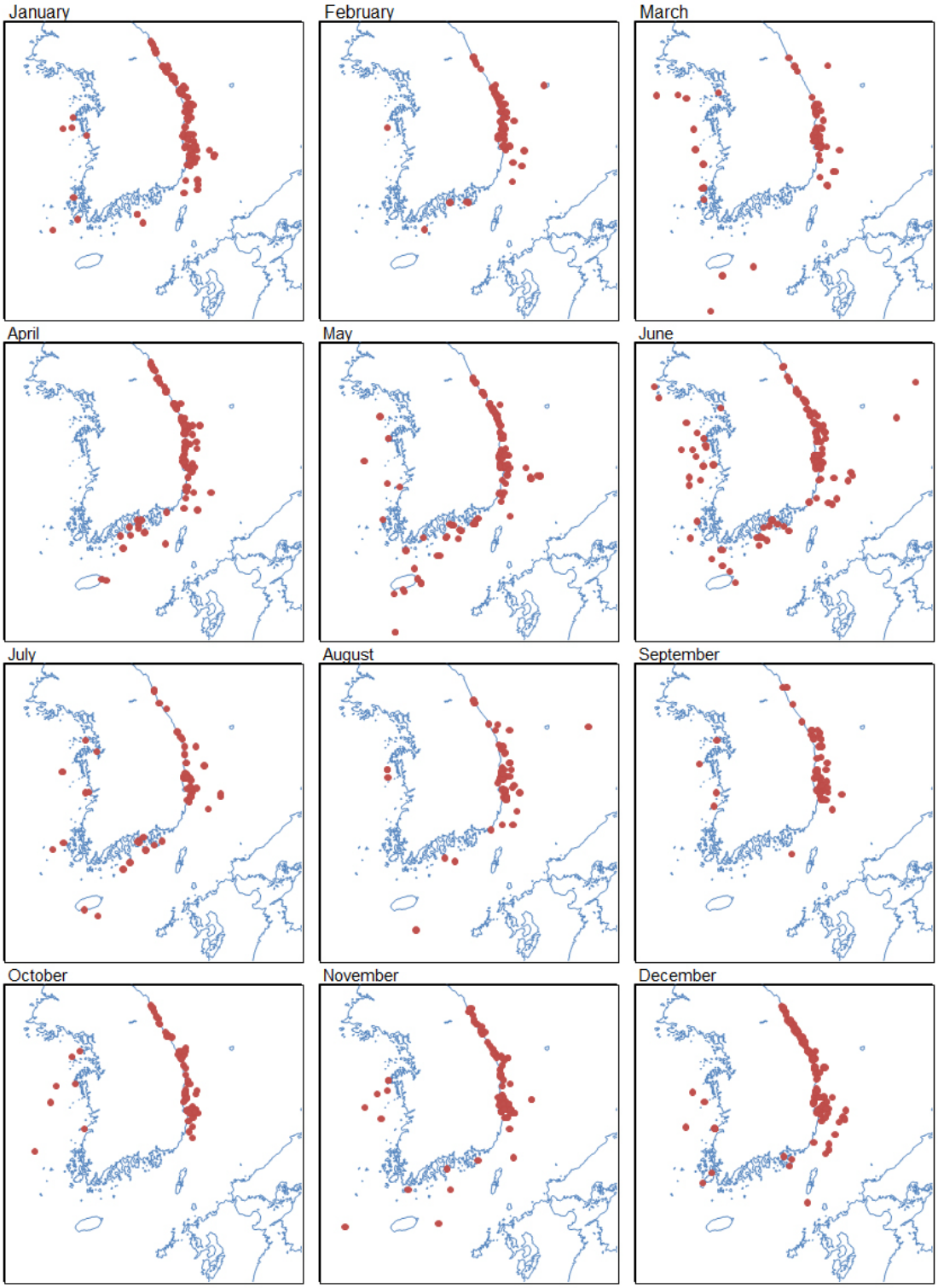

Fig. 5. Monthly locations of the by-caught minke whales in Korean waters.

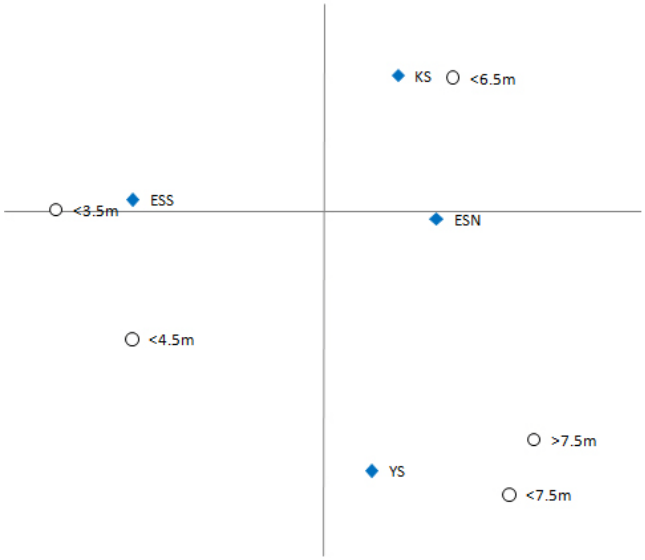

Fig. 6. Results of the Canonical Correspondence Analysis based on areas and size group of by-caught minke whales (YS: Yellow Sea; KS: Korea Strait; ESN: northern East Sea; ESS: southern East Sea).

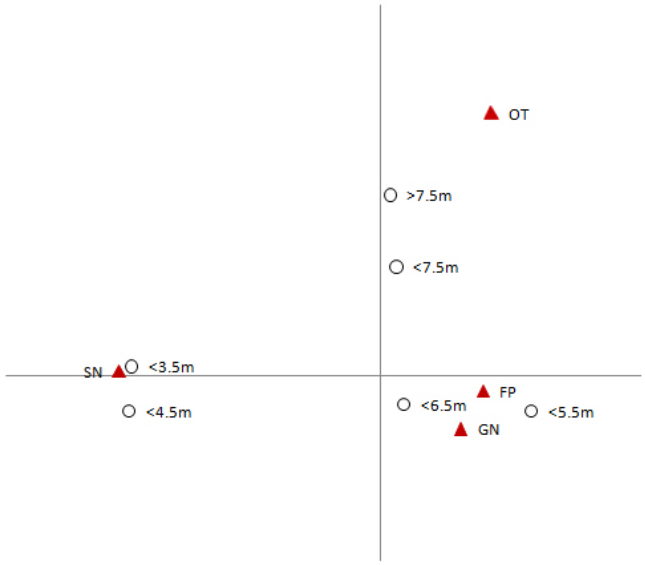

Fig. 7. Results of the Canonical Correspondence Analysis based on fishing gears and size group of by-caught minke whales (SN: set nets; FP: fish pots; GN: gill nets; OT: others).

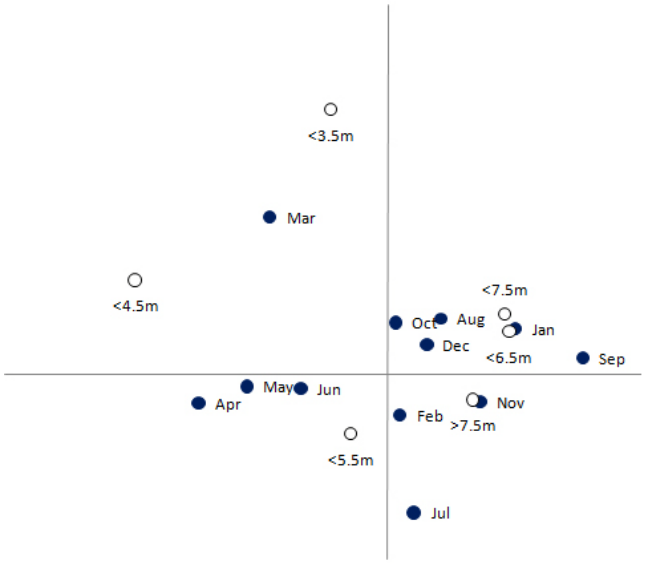

Fig. 8. Results of the Canonical Correspondence Analysis based on month and size group of by-caught minke whales.