

# **Levels of incidental catches of common minke whales in the western North Pacific**

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## **Abstract**

This paper provides information on incidental catches of common minke whales by Japan and Korea in the western North Pacific. Some suggestions are made to get plausible estimations of future incidental catches as well to reconstruct past series considered defective.

## **1. Incidental catch used in the *Implementation Simulation Trials (IST)* in 2003**

### 1.1. The Republic of Korea

Option Ki : This is described in page 121 of JCRM 6 (Suppl) (IWC, 2004). Incidental catch in sub-area 6 is assumed to be zero until 1988 after which it increases linearly to 78 in 1995. Reported catch of 45-148 are used from 1996 to 2001. Future catches are calculated by an equation in proportion to the population size based on the average catch of 89 in 1996-2001.

Option Kii : This is described in page 121 of JCRM 6 (Suppl) (IWC, 2004). The historic catch until 2001 is the same as for Option Ki. Future catches are calculated by the fixed number of the equation, which is changed from average (89) to maximum catch (148).

### 1.2. Japan

Option Ji: This is described in pages 121-122 of JCRM 6 (Suppl) (IWC, 2004). Catches from 1979-99 are taken to be the reported catches in the Japanese progress reports. Catches before these years are set at 3.8 which is the average of these years. Future catches are taken in proportion to the population size using an

equation with a fixed number of 25.

Option Jii : This is described in page 122 of JCRM 6 (Suppl) (IWC, 2004). An incidental catch of 100 animals is assumed in each year from 1900 to the present. Future catches are assumed by the same equation but with a fixed number of 100 animals.

## **2. Record in recent years**

### 2.1. The Republic of Korea

Incidental catches from 2002 to 2008 were reported in the Korean progress reports. Those are 61-107 animals.

### 2.2. Japan

A new ministerial ordinance on the by-caught animals in Japan started in July 2001. This ordinance allowed the sell of whale meat of by-caught animals with the condition of a registration of tissue sample in the Japanese DNA register for large whales, and therefore it was believed that under-reporting was dissolved in practical terms. By-catches are 109-156 after 2002, and an increasing trend is suggested (Hakamada and Ishikawa, 2009). Allocation of by-caught whales to stocks (J and O stocks) became feasible by genetic analysis (Kanda *et al.*, 2009).

## **3. Suggestions for establishing plausible time series of incidental catch**

### 3.1. The Republic of Korea

Until 1995 records are not available, then until that year the same values with  $K_i$  and  $K_{ii}$  are proposed until reports become available. Future catches are proposed in proportion to the population size with a fixed number corresponding to the average of the last five years. A maximum annual catch for the fixed number causes overestimation.

### 3.2. Japan

The incidental catch series used in the 2003 *IST* contains arbitrary numbers, and the assumption of 100 animals during 100 years is a contradiction of the assessment that J-stock was depleted. For example, the assessment of J-stock in the 1987IWC SC meeting estimated a depletion of 18 – 43 % for an initial population and RY of 0 – 175 (IWC, 1988). Consequently, the category of protection stock was maintained. On the other hand, the recent by-catch levels of Korea and Japan suggest that the 1987

assessment was too pessimistic. More plausible time series of Japanese by-catch are suggested as follows:

- i) The incidental catch in 2001 is two times the reported catch (because new regulation started in July this year) .
- ii) Incidental catches in 2002 to 2008 are as those reported under the new regulation.
- iii) Past incidental catches are estimated based on a BPUE analysis (Appendix 1). The estimates from 1955 to 2000 were obtained (Table 5 of Appendix 1).
- iv) Incidental catches before 1955 are set as the average of those in 1955 to 1978.
- v) Future incidental catches will be taken in proportion to population size with a fixed number corresponding to the average of the last five years.

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# Appendix 1

A trial for estimation of the incidental catch of common minke whales in a period 1955 – 2000 by Japanese set net fishery in the coasts of Japan.

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## ABSTRACT

In this paper we examined the reported incidental catches of common minke whales (*Balaenoptera acutorostrata*) in the Japanese coasts in relation to the number of set nets. We estimated a yearly trend of by-catches per unit effort (BPUE). Using this BPUE trend, we estimated incidental catch for the period from 1955 to 2000 which was believed to be under-reported. It is suggested that these estimates are more plausible than assuming the constantly 100 animals in this period.

## INTRODUCTION

The common minke whales have been incidentally taken by set net fisheries. During 1955 to 2000 the number of the incidental catch was reported (IWC, 2004) but it was believed to be under-reported (Tobayama *et al.*, 1992). At the *Implementation Simulation Trials (ISTs)* of this species in 2003, the Jii option that assumes 100 animals incidentally taken every year from 1900 was adopted (IWC, 2004). A new regulation which allows that meat of by-caught whales can be sold after genetic registration, was started at 2001. It was assumed that this regulation will improve reporting substantially. Hakamada and Ishikawa (2009) conducted BPUE analysis using a GLM. Their analysis can be used to estimate the number of the incidental catches in the period 1955 – 2000.

## MATERIALS AND METHOD

Set net fisheries have been continued for a long time and are one of the traditional fisheries in Japan. Although the method of set net fisheries has not changed through the time, the number of the set nets

(both ‘large size’ and ‘salmon’ nets) has been decreasing gradually from 1994 to 2006 (Table 1). Table 2 shows the number of incidental catches of the common minke whales in the coasts of Japan from 1994 to 2000 which were reported in the Japan Progress Report on cetacean research 1995-2001. These numbers possibly include incidental catches by ‘small-type’ set net. However, these numbers were believed to be under-reported (e. g. Tobayama *et al.*, 1992). A new regulation on incidental catches was started in 2001. Table 3 shows the number of the common minke whales incidentally caught by the ‘large-size’ and ‘salmon’ set net from 2001 to 2006 (ICR, 2008). These data are applied to the model (1) described below.

The BPUE is defined by the annual number of incidental catches of the common minke whales divided by the total number of ‘large-size’ and ‘salmon’ set nets. In previous analysis (Hakamada and Ishikawa, 2009), the period 2001-2005 was selected to examine BPUE because the new regulation that started in 2001 brought better reporting of incidental catch to local governments. In order to obtain data for longer period to estimate the trend of the BPUE, we added the data for 1994 – 2000 to those for 2001-2006. To estimate the trend of the BPUE from 1994 to 2006, we use the generalized linear model with Poisson error distribution expressed by

$$\log[E(C_y)] = \log(E_y) + \alpha y + P + \beta \quad (1)$$

where  $E(C_y)$  is the expected number of the incidental catches in year  $y$ ,  $E_y$  is the number of the total number of the ‘large’ and ‘salmon’ set nets (i.e. Effort) in year  $y$ ,  $\alpha$  is the trend of the BPUE to be estimated,  $\beta$  is the intercept and  $P$  is a categorical variable of the period during 1994-2000 comparing to that during 2001-2006. The first term on the right-hand-side is offset.

## RESULT AND DISCUSSION

Estimated parameters in the model (1) are shown in Table 4. The exponential increase in BPUE is estimated as 4.2% (SE=0.024, p-value=0.082). The estimated reporting ratio of the number of the incidental catch in the coasts of Japan during 1994-2000 to that during 2001-2006 was 0.265. By multiplying this figure to the number of the incidental catches reported from 1955 to 2000, the corrected number was obtained (Table5). It is suggested that these estimates are more plausible than assuming the constantly 100 animals in this period.

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**Table 1. The number of ‘large-size’ and ‘salmon’ set nets off Japan during 1994-2006 (Statistics Department, MAFF, 2007; 2008).**

year	'large-size'	'salmon'	total
1994	814	968	1782
1995	790	965	1755
1996	799	941	1740
1997	787	917	1704
1998	787	914	1701
1999	786	916	1702
2000	781	911	1692
2001	775	914	1689
2002	781	891	1672
2003	781	874	1655
2004	757	876	1633
2005	729	878	1607
2006	703	886	1589

**Table2. The number of the common minke whales incidentally caught during 1994-2000 as reported in Japan progress report. (Possibly including the incidental catches from the ‘O’ stock and/or by ‘small-type’ set net.)**

year	bycatch
1994	16
1995	19
1996	27
1997	27
1998	24
1999	19
2000	28

**Table 3. The number of the common minke whales incidentally caught by ‘large-size’ and ‘salmon’ set nets during 2001-2006.**

year	bycatch
2001	104*
2002	96
2003	106
2004	103
2005	116
2006	138

**\*: The figure is the double of the number of the incidental catches during the second half of 2001 because the new regulation was started on 1<sup>st</sup> July 2001.**

**Table 4. Results of estimated parameters in the model (1).**

	Estimate	SE	z value	Pr(> z )
Intercept	-87.680	48.865	-1.794	0.0728
year	0.042	0.024	1.738	0.0822
Period	-1.328	0.171	-7.783	7.10E-15

**Table 5. Corrected number of the incidental catches.**

year	reported	corrected
1955-78	3.8	14
1979	0	0
1980	3	11
1981	0	0
1982	0	0
1983	8	30
1984	4	15
1985	2	8
1986	13	49
1987	4	15
1988	8	30
1989	8	30
1990	20	75
1991	5	19
1992	8	30
1993	14	53
1994	16	60
1995	20	75
1996	27	102
1997	27	102
1998	24	91
1999	19	72
2000	28	106

**\*: The catches during 1955-78 are taken to equal the average of the number during 1979-87.**