

# Cruise Report of the Second Phase of the Japanese Whale Research Program under Special Permit in the Antarctic (JARPAII) in 2011/2012

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## ABSTRACT

The 2011/12 survey of the Second Phase of the Japanese Whale Research Program under the Special Permit in the Antarctic (JARPA II) is reported here. Two dedicated sighting vessels (SV), one sighting and sampling vessels (SSV) and one research base vessel engaged in the research for 66 days, from 1 January to 6 March 2012 in Areas V (130°E - 170°W) and VI West (VIW: 170°W - 145°W). Unfortunately the research activities were interrupted several times by an anti-whaling group which directed violent sabotage activities against Japanese research vessels in previous seasons. As a result the planned dedicated sighting survey was cancelled in the whole research area because the two SV had to dedicate to security tasks. The research activity of the SSV was also interrupted several times. The total searching distance was 3,040.5 n.miles by the SSV, which was approximately one-third of the searching distance in 'normal' years. Eight species including six baleen whales (blue, fin, sei, Antarctic minke, humpback and southern right whale) and two toothed whales (sperm and southern bottlenose whales) were sighted during the research period. A total of 284 schools (684 individuals) of Antarctic minke whales was sighted. It was the dominant species in the research area followed by the humpback whales (112 schools, 208 individuals) and fin whales (11 schools, 31 individuals). The number of sightings of the Antarctic minke whales was about 3.3 times higher than that of humpback whales. A total of 266 Antarctic minke whales (99 males and 167 females) and one fin whale (female) were sampled. All whales sampled were examined on board the research base vessel. Photo-id experiments were conducted on blue, humpback and southern right whales and a total of five blue, six humpback and four southern right whales was photo-identified. A total of six skin biopsy samples were collected from humpbacks (2) and southern right whale (4). Two southern right whales were attached with satellite tags in March. Oceanographic surveys to investigate vertical sea temperature profiles were also implemented using XCTD. The main results of this survey were as follows: 1) whale composition in the research area was stable compared to previous JARPA and JARPA II surveys in the same area; 2) the ice-free extent in Area VIW was substantially larger than in the past seasons. High density areas of Antarctic minke whales were observed near the ice edge; 3) mature females of Antarctic minke whale were dominant in the southern part of Area VIW (66.8%). 4) Antarctic minke whales in the "transition area between 130°E and 165°E" (area of stocks mixing), were successfully sampled.

**KEYWORDS:** ANTARCTIC MINKE WHALES, FIN WHALES, HUMPBACK WHALES, ROSS SEA, SCIENTIFIC PERMITS

## INTRODUCTION

The Japanese Whale Research Program under the Special Permit in the Antarctic (JARPA) was conducted between 1987/88 and 2004/05 austral summer seasons, under Article VIII of the International Convention for the Regulation of Whaling (ICRW). The IWC Scientific Committee (SC) conducted an interim review of JARPA results in 1997 and the final review in 2006. In 2005, another JARPA review meeting called by the Government of Japan was also held. JARPA provided a wide variety of information on biological parameters of Antarctic minke whale (*Balaenoptera bonaerensis*) such as the natural mortality coefficient and changes over time in the age at sexual maturity as well as narrowing down the parameters of relevance for stock management. IWC recognized these results from JARPA have the potential to improve management of minke whales in the Southern Hemisphere (IWC, 1998, 2007). JARPA data also demonstrated that there were at least two Antarctic minke whale stocks in the research area, and that their geographical boundaries were different from those used by the IWC (IWC, 2007).

The review meeting in 2005 agreed that results from JARPA data were consistent with the behavior to be expected for baleen whale populations competing for a dominant single food resource, krill. The meeting also agreed that the JARPA results provided clear support for the need to take species-interaction effects into account in understanding the dynamics of the baleen whale species in the Antarctic ecosystem, and predicting future trends in their abundance and population structure (Government of Japan, 2005, Pastene *et al.*, 2006).

Based on these considerations, the Government of Japan launched a new comprehensive study, the Second Phase of the Japanese Whale Research Program under Special Permit in the Antarctic (JARPA II), which combined lethal and non-lethal methods, starting from the 2005/2006 austral summer season. The full-scale JARPA II started from the 2007/08 season. JARPA II is a long-term research program with the following objectives: 1) Monitoring of the Antarctic ecosystem, 2) Modeling interaction among whale species and developing future management objectives, 3) Elucidation of temporal and spatial changes in stock structure and 4) Improving the management procedure for the Antarctic minke whale stocks. JARPA II focuses on Antarctic minke whale, humpback whale (*Megaptera novaeangliae*), fin whale (*B. physalus*) and possibly other species in the Antarctic ecosystem that are major predators of Antarctic krill.

JARPA II is a perfectly legal activity carried out under the ICRW. Despite this, a violent anti-whaling group (Sea Shepherd, SS) has been continuing violent sabotage activities against the research vessels of JARPA II. The IWC has condemned SS's tactics against Japan's whale research vessels. The International Maritime Organization (IMO) also adopted a resolution that seriously concerned safety and security of vessels, human life and marine environment caused by unlawful protests or confrontations on the high seas (IMO, 2010). In 2011, the IWC adopted the Consensus Resolution 2011-2 on Safety at Sea which condemns any actions that are a risk to human life and property in relation to the activities of vessels at sea.

Despite international criticisms above, the research activities of the JARPA II survey in 2011/12 was again interrupted by the SS first during the transit survey from Japan to the research area and throughout the 2011/12 research period. In order to secure safety for the research vessels and their crew members, the planned sighting vessels had to dedicate many of its planned research time to security tasks. It was very regrettable and disappointing to report that this large investment - dedicated sighting survey in the Antarctic - had to be cancelled in the 2011/12 season. These dedicated sighting surveys were planned according to the IWC survey guideline (IWC, 2005) and were endorsed by the IWC SC in 2011 (IWC, 2011).

The present paper reports the seventh survey of the JARPA II conducted during the austral summer season 2011/12.

## RESEARCH METHODS

### Research vessels

Four research vessels, *Yushin-Maru* (YS1), *Yushin-Maru No. 2* (YS2), and *Yushin-Maru No. 3* (YS3) were engaged in the research activities (Table 1). Two dedicated sighting vessels (SV) were planned to conduct independent sighting survey based on the IWC survey guideline (IWC, 2005), oceanographic survey and some non-lethal experiments. One vessel was engaged in sighting and sampling (SV). A research base vessel (NM: *Nisshin-Maru*) served as a research base on which all biological examinations of sampled whales were conducted.

### Research area

Figure 1 shows the geographic location of the research area for the 2011/12 JARPA II survey. The research area for the 2011/12 survey was the eastern side of the whole JARPA II research area, i.e. Area V (130°E - 170°W) and Area VIW (170°W - 145°W). Area V (130°E - 170°W) was divided into western part (Area VW: 130°E - 165°E) and eastern part (Area VE: 165°E - 170°W). The Area VE was further divided into East-north stratum and Ross Sea (East-south stratum). The Ross Sea was defined as south of 69°S. The southern stratum of the Area VIW was defined as south of 69°S.

### Survey track line design

In Area VIW, East-North stratum of Area V and Area VW, the survey track line consisted of a zigzag course changing direction at 1°40' longitudinal degree intervals. Two parallel track lines were set at 7 n. miles apart. Two legs of track line for the northern stratum were set every six legs for southern stratum, in principle. The interval of legs and number of legs for the northern stratum could be changed by sub-area according to progress of the survey. In these areas, the southern stratum was defined from ice edge to 45 n. miles north in principle. For this survey, as same as IWC-SOWER (Southern Ocean Whale and Ecosystem Research), our best estimate of the position of the ice edge was based on our visual and radar observations of the ice edge using the DMSP SSM/I daily polar gridded sea ice concentration data set available from the National Snow and Ice Data Center (NSIDC) (Matsuoka *et al.*, 2003, Cavalieri *et al.*, 1999).

In the Ross Sea and the southern stratum of the Area VIW, the survey track line consisted of a mesh designed zigzag course changing direction at 2° latitudinal and 10° longitudinal degree intervals.

### Sighting method

Sighting procedures followed the previous JARPA surveys (*e.g.* Nishiwaki *et al.* 2007) in principle. The sighting survey

using SSVs was conducted under closing mode (when a sighting of target species was made on the predetermined track line, the vessel approached the whales and species and school size were confirmed). One SSV advanced along parallel track lines at a standard speed of 11.5 knots.

The survey by SSV was operated under optimal research conditions (when the wind speed was below 25 knots in the south strata or 20 knots in the north strata and visibility was over 2 n. miles). In addition to the sightings of Antarctic minke whales and fin whales, the SSV approached blue whales (*Balaenoptera musculus*) and southern right whales (*Eubalaena australis*) for conducting experiments. Humpback whales and other whales were also approached for conducting experiments.

#### **Low and middle latitudinal sighting survey**

During transit, sighting surveys were planned in the area between 30°S and 60°S outside of national EEZs to and from the research area.

#### **Sampling methods and biological survey for whales (lethal research)**

Sampling of 850 Antarctic minke whales (with 10 % of allowance) and 50 fin whales was planned in the research area south of 62°S. Although the original plan included 50 humpback whales (Government of Japan, 2005), Government of Japan decided to suspend the sampling of humpback whales. One to two Antarctic minke whales were sampled randomly from each primary sighted school within 3n.miles of the track line. Dwarf minke whales were not a target for sampling. Sampling of fin whales was restricted to those animals with an estimated body length in principal 19m or less due to logistic limitations at the NM. Only one fin whale was planed to be sampled from each primary sighted school within 3n.miles of the track line. If two or more animals (less than 12m in body length) were found in a school, only one of them was randomly selected and sampled. Biological research on all sampled whales was conducted on the NM.

#### **Experiments**

##### *Sighting distance and angle experiment*

This experiment was conducted in order to evaluate the accuracy of sighting distance and angle given by observers on the SV and SSV. Observers on each vessel were required to assess eight sets of angles and distance from two platforms (top barrel and upper bridge). All trials were conducted under good sighting condition.

##### *Photo-identification*

The following species were targeted for photographic record of natural markings: blue, humpback and southern right whales.

##### *Biopsy sampling*

In addition to the species targeted for the photo-identification experiment, pygmy right whale (*Caperea marginata*), fin whale, sei whale (*B.borealis*), Antarctic minke whale, sperm whale (*Physeter macrocephalus*), and southern bottlenose whale (*Hyperoodon planifrons*) were targeted for biopsy skin sampling using a compound-crossbow.

##### *Satellite tag*

Antarctic minke, blue and southern right whales were the target species for this experiment by the SV, which used the ICR air gun (Kasamatsu *et al.*, 1991).

##### *Vomiting and fecal observation*

The SSV was engaged in observations of vomits and faeces of sighted whales.

##### *Oceanographic survey*

The SV planned the following oceanographic survey; 1) consecutive measuring of vertical water temperature profile by Expendable XCTD system and 2) marine debris recording in the research area. All marine debris found in the stomach of whales taken was also recorded on the NM.

## **RESULTS AND DISCUSSIONS**

### **Outline of the research activities**

Table 2 shows an outline of the research activities. Research vessels were frequently attacked by the anti-whaling group and the survey was interrupted in several opportunities. As a consequence vessels YS3 and YS2 had to dedicate to search and monitor the anti-whaling group vessels most of the research period. Total research period was 66 days from 1 January to 6 March 2012. Unfortunately the research activity was interrupted for over 15 days by directed violent sabotage activities of the SS. Therefore the research of most part of Ross Sea in Area V, East-North Area V, West-North

Area VI and some other parts had to be cancelled (Figure 2a).

## **Sighting**

### *Low and middle latitudinal sighting survey*

During transit, sighting surveys were conducted from 22 December 2011 in the area between 30°S and 60°S outside of national EEZs. However, the research activity was first interrupted during the transit survey by an anti-whaling group. In order to secure safety of the research vessels and their crew members, the planned sighting surveys to the research area were cancelled after 23 December. Total searching distance of the transit survey to the research area was 106.0 n.miles. Sperm whales (1 school / 3 individuals) were sighted. The total searching distance from the research area was 741.8 n.miles. Sei whales (1 school / 2 individuals) were sighted (Table 3).

### *Antarctic research area*

In the research area the sighting survey by the SV was planned to operate independently. However the survey by the SV was cancelled because of obstruction from the anti-whaling group. There was no searching effort of the SV. The total searching distance was 3,040.5 n.miles by the SSV, which was approximately one-third of the searching distance in a normal year (Table 4a).

Eight species including six baleen whales and two toothed whales were identified during the research period. The following six species of baleen whales were identified: Antarctic minke whales, humpback, fin, blue, sei and southern right whales. Two toothed whale species were identified; sperm and southern bottlenose whales. Table 4b shows the number of sightings for eight large whale species and Figures 2a, 2b and 2c show sighting position of Antarctic minke, humpback, fin, blue, sei and southern right whales, respectively. Antarctic minke whale was the most abundant species in the research area, followed by humpback whale.

The number of sightings of Antarctic minke whales (284 schools and 684 individuals in total) was about 3.3 times higher (individuals) than that of humpback whales (112 schools and 208 individuals) and was considerably higher than those of other species. Both Antarctic minke and humpback whales were widely distributed in the entire research area, but density was different among strata. No mother and calf pair of Antarctic minke whale was observed in the research area. Humpback whales were widely distributed in Area V even at ice edge north of the Ross Sea. Most of them were found in Area VW (Figure 2b). These distribution patterns were almost same as in previous surveys (Matsuoka *et al.*, 2011).

Fin whales (11 schools and 31 individuals) were also found in the Areas VW and VIW. There were no sightings of fin whales in the Ross Sea (Figure 2b). Although sightings of blue whales were small (9 schools and 12 individuals), they were found in all of the research area even in the Ross Sea (Figure 2c). Sei whales were only distributed in the northern part of Area VE (Figure 2c). Southern right whales were also only distributed near ice-edge in Area VW between 130°E-135°E as same as previous cruises (Figure 2c). Solitary large male sperm whales were found between near ice edge and the northern strata (18 schools and 18 individuals). Single southern bottlenose whale was found in the East-North stratum. Table 4c shows the summary of whole whale sightings including transit survey in the middle latitude in this cruise.

## **Experiments**

### *Sighting distance and angle experiment*

This experiment was performed on 12 March by YS1 and on 9 March 2012 by YS2 and YS3. The results of this experiment will be used in the calculation of abundance estimates.

### *Photo-ID and biopsy sampling*

Natural markings of five individuals of blue, six individuals of humpback, and four of southern right whales were recorded by photograph. Four biopsy samples were obtained from southern right whales and two from humpback whales (Table 5a and 5b).

### *Satellite tagging*

Satellite tags were attached to southern right whales on 28 February (two animals) and Antarctic minke whale on 1 March (one animal). Result of these experiments will be reported to the JARPAII review meeting.

### *Vomiting and faeces observation*

There was no chance for the observation of vomiting. One faecal behavior of fin whale was observed on 12 February in Area VIW.

### *Oceanographic survey*

Oceanographic survey using XCTD was conducted only at 9 stations due to external interruptions. No marine debris

was observed.

#### *Sampling of Antarctic minke whales*

Out of 232 schools (562 individuals) in the primary sightings of Antarctic minke whales, 224 schools (542 individuals) were targeted for sampling. A total of 266 individuals were sampled. Sampling efficiency (the rate of successful sampling for targeted individuals) was 93.8 % for solitary schools, 99.2 % for the first targeted individual from schools with more than one animal. A total of 98 individuals were sampled as the second targeted individual from the schools with more than one animal. No struck and lost case occurred.

#### *Sampling of fin whales*

The SSV made six primary sightings (21 individuals) of fin whales. One individual was targeted and sampled from a school composed of twelve individuals. The estimated body length of this animal was 18.5 meters. No struck and lost case occurred.

#### *Biological research*

Biological research was conducted on the research base vessel for all whales sampled. Of 266 Antarctic minke whales, 99 were male (37.2 %) and 167 were female (62.8 %). The single fin whale sampled was an immature female.

#### *Biological information of sampled whales*

Figures 3a and 3b show the distribution of sighting position of sampled Antarctic minke whales by sex and sexually mature status. Mature females were especially dominant in the southern part of Area VIW. Whales were sampled from the 'transition area between 130°E and 165°E', and area of stocks mixing (99 individuals).

Table 6 shows the summary of biological data and samples collected from Antarctic minke and fin whales. Table 7 shows the sex and reproductive status of sampled Antarctic minke whales by stratum. Immature rate of both females and males was high in the northern strata of Area VW and Area VE. On the other hand, the mature rate of females was high in the southern stratum of Area VIW. The ratio of pregnant mature females was high in the southern stratum of Area VIW. One of sampled Antarctic minke whale was lactating.

Figure 4 shows the body length distribution of Antarctic minke whales sampled in this survey. Maximum length was 9.53 m for females and 9.12 m for males. Minimum length was 5.30 m and 5.01 m for female and male, respectively. Maximum body length of immature animals was 8.67 m and 7.84 m for female and male, whereas minimum body length of mature animals was 7.96 m and 7.26 m for female and male, respectively.

Table 8 shows biological data of the fin whale (immature female). Body length was 18.34 m and weight was 36.63 tons. Prey species was *Euphausia superba*.

Results of past JARPA/JARPAII surveys strongly suggested that Antarctic minke whales, especially mature females tend to concentrate in the ice free area beyond the ice edge where research vessels could not enter (Ishikawa *et al.*, 1998, 2008, Ishikawa, 2003). It was also suggested that recent drastic expansion of humpback whale distribution in the Areas IV and V may force Antarctic minke whales to move in the pack ice (Ishikawa *et al.*, 2004, Fujise *et al.*, 2006).

Distribution of blue whales was not separated from those of the three rorquals and they were found within and outside of the Ross Sea. These observations were almost the same as in past JARPA/JARPAII surveys (Nishiwaki *et al.* 2009 and 2010).

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## **REFERENCES**

- Cavaleri, D., P. Gloerson and J. Zwally. 1999, updated regularly. Near real-time DMSP SSM/I daily polar gridded sea ice concentrations. Edited by J. Maslanik and J. Stroeve. Boulder, CO: National Snow and Ice Data Center. Digital media.
- Fujise, Y., Hatanaka, H. and Ohsumi, S. 2006. What has happened to the Antarctic Minke Whale Stocks? -An

- interpretation of results from JARPA-. Paper SC/D06/J26 presented to the IWC JARPA Review Meeting, December 2006 (unpublished).15pp. [Paper available at the IWC Office].
- Government of Japan. 2005. Plan for the Second Phase of the Japanese Whale Research Program under Special Permit in the Antarctic (JARPA II) -Monitoring of the Antarctic Ecosystem and Development of New Management Objectives for Whale Resources. Paper SC/57/O1 presented to the IWC Scientific Committee, June 2005 (unpublished). 99pp. [Paper available at the IWC Office].
- IMO, 2010. Assuring Safety during Demonstrations, Protests or Confrontations on the High Seas. Resolution MSC.303(87).
- Ishikawa, H., Matsuoka, K., Tohyama, D., Yuzu, S., Shimokawa, T., Ohshima, K., Mizushima, Y., Nibe, T., Kido, T., Asada, M., Nakamura, M., Ichinomiya, D. and Kinoshita, T. 1998. Cruise report of the Japanese Whale Research Program under a Special Permit in the Antarctic (JARPA) Area IV and eastern part of Area III in 1997/98. Paper SC/50/CAWS8 presented to the IWC Scientific Committee, September 1998 (unpublished). 26pp. [Paper available at the IWC Office].
- Ishikawa, H. 2003. Relationship between ice condition and number of sightings of Antarctic minke whales –comparison between 1997/98 and 2001/2002JARPA surveys in Area III and IV. Report of the Scientific Committee, Annex G, Appendix 6, *J. Cetacean Res. Manage.* 5(SUPPL.):278-282.
- Ishikawa, H., Otani, S., Kiwada, K., Isoda, T., Tohyama, D., Honjo, K., Hasegawa, A., Terao, T., Kushimoto, T., Ohshima, T., Sugiyama, K., Sasaki, T., Itoh, S., Takamatsu, T. and Yoshida, T. 2004. Cruise Report of the Japanese Whale Research Program under Special Permit in the Antarctic (JARPA) Area IV and Eastern Part of Area III in 2003/2004. Paper SC/56/O12 presented to the IWC Scientific Committee, July 2004 (unpublished). 18pp. [Paper available at the IWC Office].
- Ishikawa, H., Goto, M., Ogawa, T., Bando, T., Kiwada, H., Isoda, T., Kumagai, S., Mori, M., Ohsawa, T., Fukutome, K., Koyanagi, T., Kandabashi, S., Kawabe, S., Sotomura, N., Matsukura, R., Kato, K., Matsumoto, A., Nakai, K., Hasegawa, M., Mori, T., Yoshioka, S. and Yoshida, T., 2008. Cruise Report of the Second Phase of the Japanese Whale Research Program under Special Permit in the Antarctic (JARPA II) in 2007/2008. Paper SC/60/O4 submitted to the IWC Scientific Committee, 2008 (unpublished). 19pp. [Paper available at the IWC Office].
- IWC. 1998. Report of the Intersessional Working Group to Review Data and Results from Special Permit Research on Minke Whales in the Antarctic, Tokyo, 12-16 May 1997. *REP. INT. WHAL. COMMN*, 48, p377-412.
- IWC. 2005. Report of the Scientific Committee. Annex D. Report of the sub-committee on the Revised Management Procedure. Appendix 3. Requirements and Guidelines for Conducting Surveys and Analysing Data within the Revised Management Scheme. *J. Cetacean Res. Manage.* 7 (Supp.):92-101.
- IWC, 2007. Report of Intersessional Workshop to Review Data and Results from Special Permit Research on Minke Whales in the Antarctic, Tokyo 4-8 December 2006. *J. Cetacean Res. Manage.* 10 (Supp.):449-510.
- IWC. 2011. Report of the Scientific Committee. Annex G. 24pp. Toromso, 2011. [Paper available at the IWC Office].
- Kasamatsu F., Iwata S. and Nishiwaki S. 1991. Development of biopsy skin sampling system for fast swimming whales in pelagic waters. *Rep. Int. Whal. Commn* 41. 555-557.
- Kato, H. 1986. Year to year changes in biological parameters and population dynamics of southern minke whales. Doctoral Thesis, Hokkaido University. 145pp.
- Matsuoka, K., P. Ensor, T. Hakamada, H. Shimada, S. Nishiwaki, F. Kasamatsu, and Kato, H. 2003. Overview of minke whale sightings surveys conducted on IWC/IDCR and SOWER Antarctic cruises from 1978/79 to 2000/01. *J. Cetacean. Res. Manage.* 5(2):173-201.
- Matsuoka, K., Hakamada, T., Kiwada, H., Murase H. and Nishiwaki, S., 2011. Abundance estimates and trends for humpback whales (*Megaptera novaeangliae*) in Antarctic Areas IV and V based on JARPA sighting data. *J. Cetacean Res. Manage. (SPECIAL ISSUE)* 3, 75-94.
- Nishiwaki, S., Ishikawa, H., and Fujise, Y. 2007. Review of general methodology and survey procedure under the JARPA. IWC Paper SC/D06/J2 presented to the JARPA Review meeting, December 2006. June 2007 (unpublished). 47pp.
- Nishiwaki S., Ogawa, T., Matsuoka, K., Bando, T., Mogoe, T., Otani, S., Konishi, K., Sato, H., Nakai, K., Nomura, I., Tanaka, H., Kiwada, H., Mori, M., Tsunekawa, M., Wada, A., Yoshimura, I., Yonezaki, S., Nagamine, M., Yoshida, K., Fukutome, K., Tamahashi, K., Morine, G. and Yoshida, T. 2009. Cruise report of the second phase of the Japanese Whale Research Program under Special Permit in the Antarctic (JARPA II) in 2008/09. SC/61/O3 presented to the IWC Scientific Committee, June 2009 (unpublished). 18pp.
- Nishiwaki, S., Ogawa T, Bando, T., Isoda, T., Wada, A., Kumagai, S., Yoshida T., Nakai, K., Kobayashi, T., Koinuma, A., Mori, M., Yoshimura, I., Ohshima, T., Takamatsu, T., Konagai, S., Aki, M., and Tamura, T. 2010. Cruise Report of the second phase of the Japanese Whale Research Program under Special Permit in the Antarctic (JARPA II) in 2009/2010. SC/62/O3 presented to the IWC Scientific Committee, June 2010 (unpublished). 13pp. [Paper available at the IWC Office].
- Pastene, L.A., Goto, M. and Kanda, N., 2006. Genetic analysis on stock structure in the Antarctic minke whales from the JARPA research area based on mitochondrial DNA and microsatellites. SC/D06/J9 submitted to the JARPA REVIEW meeting called by the International Whaling Commission (2006) December, 2006. Tokyo, (unpublished). 22pp. [Paper available at the IWC Office].

Table1. Specifications of the research vessels YS1, YS2 and YS3.

	<i>Yushin-Maru</i>	<i>Yushin-Maru No.2</i>	<i>Yushin-Maru No.3</i>
Call sign	JLZS	JPPV	7JCH
Length overall [m]	69.61	69.61	69.61
Gross tonnage (GT)	720	747	742
Barrel height [m]	19.5	19.5	19.5
IO platform height [m]	13.5	13.5	13.5
Upper bridge height [m]	11.5	11.5	11.5
Bow height [m]	6.5	6.5	6.5
Engine power [PS / kW]	5280 / 3900	5280 / 3900	5280 / 3900

Table2. Outline of the research activities of JARPA II in 2011/12 season.

Event	Date
Departure from Japan	6/ Dec/ 2011
Low and middle latitudinal sighting survey	22/ Dec./ 2011 ~ 23/ Dec./ 2012
Survey in Antarctic research area	1/ Jan./ 2012 ~ 6/ Mar./ 2012
Low and middle latitudinal sighting survey	7/ Mar./ 2012 ~ 13/ Mar./ 2012
Arrival at Japan	31/ Mar./ 2012

Table 3. Summary of low and middle latitudinal whale sightings during transit to and from the research area in the 2011/12 JARPAII survey.

Species	Transit to research area		Transit from research area		Total	
	sch.	ind.	sch.	Ind.	sch.	ind.
Sei whale	0	0	1	2	1	2
Sperm whale	1	3	0	0	1	3

Table 4a. Summary of the searching distances (n. miles) of the 2011/12 JARPAII survey, research stratum. ASP mode represents sighting survey and NSC mode represents sighting and sampling survey.

Area	Stratum		ASP	NSC	Total
V	West	North	---	748.4	748.4
		South	---	1,204.0	1,204.0
	East	North	---	404.2	404.2
		Ross Sea	---	72.8	72.8
VI	West	North	---	---	0.0
		South	96.9	514.2	611.1
Total			96.9	2,943.6	3,040.5

Table 4b. Summary of sightings by species and research stratum in the 2011/12 JARPAII survey.

Area	V								VI				transit in research area		Total	
	West-South		West-North		East-South (Ross Sea)		East-North		West-South		West-North					
Stratum	sch.	ind.	sch.	ind.	sch.	ind.	sch.	ind.	sch.	ind.	sch.	ind.	sch.	ind.	sch.	ind.
Blue whale	2	2	1	2	2	3	0	0	1	1	0	0	3	4	9	12
Fin whale	3	15	0	0	0	0	1	2	3	5	0	0	4	9	11	31
Sei whale	1	1	0	0	0	0	2	5	0	0	0	0	1	2	4	8
Antarctic minke whale	77	226	9	35	18	66	21	23	112	258	0	0	47	76	284	684
Like minke whale	5	5	0	0	0	0	1	1	5	5	0	0	0	0	11	11
Humpback whale	68	117	26	52	1	2	10	15	2	4	0	0	5	18	112	208
Southern right whale	5	5	0	0	0	0	0	0	0	0	0	0	2	2	7	7
Sperm whale	11	11	3	3	0	0	3	3	0	0	0	0	1	1	18	18
Southern bottlenose whale	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1

Table 4c. Summary of whole whale sightings in the 2011/12 JARPAII survey.

Species	Primary		Secondary		Total	
	sch.	ind.	sch.	ind.	sch.	ind.
Blue whale	3	4	6	8	9	12
Fin whale	6	21	5	10	11	31
Sei whale	2	4	2	4	4	8
Antarctic minke whale	232	561	52	123	284	684
Like minke whale	11	11	0	0	11	11
Humpback whale	105	186	7	22	112	208
Southern right whale	5	5	2	2	7	7
Sperm whale	17	17	1	1	18	18
Southern bottlenose whale	3	8	0	0	3	8



Table 5a. Number of whales photo-identified during the 2011/12 JARPAII survey, by species and research vessel.

Photo-ID	YS1	YS2	YS3	NM	Total
Blue whale	3	0	0	2	5
Humpback whale	4	0	0	2	6
Right whale	2	2	0	0	4
Total	9	2	0	4	15

Table 5b. Number of biopsy samples collected during the 2011/12 JARPAII survey, by species and research vessel.

Biopsy	YS1	YS2	YS3	Total
Blue whale	0	0	0	0
Humpback whale	2	0	0	2
Right whale	2	2	0	4
Total	4	2	0	6

Table 5c. Details of the photo-ID and biopsy experiments. LD: Left dorsal; LL: Left lateral; RD: Right dorsal; RL: Right lateral; HD: Head; OT: Other.

Vessel	Date	Sighting No.	Species	School size	Number of individuals photographed	Photo-ID result	Number of Biopsy samples	Biopsy Sample Number
YS1	20120127	1	Blue	1	2	LD, RD, OT	0	-
YS1	20120212	2	Humpback	2	2	LD, RD	1	J11YS1H001
YS1	20120216	5	Blue	2	2	LL, LD	0	-
YS1	20120220	3	Humpback	2	2	LD, RD, OT	1	J11YS1H002
YS1	20120228	7	Right	1	1	HD, OT	2	J11YS1R003
YS1	20120305	3	Right	1	0	-	1	J11YS1R004
YS2	20080228	6	Right	1	1	LD, HD	1	J11YS2R001
YS2	20080228	8	Right	1	1	HD	1	J11YS2R002
NM	20120219	1	Humpback	2	1	FL	-	-
NM	20120219	2	Humpback	4	1	FL	-	-
NM	20120222	1	Blue	3	3	LD, LD	-	-

Table 6. Summary of biological data and samples collected from Antarctic minke whales and fin whales in the 2011/12 JARPAII survey.

Samples and data	Antarctic minke whale			Fin whale		
	Male	Female	Total	Male	Female	Total
Photographic record of external character	99	167	266	0	1	1
Diatom film observation	99	167	266	0	1	1
Record of external parasites	99	167	266	0	1	1
Body length and sex identification	99	167	266	0	1	1
Measurement of external body proportion	99	167	266	0	1	1
Body weight	99	167	266	0	1	1
Standard measurement of blubber thickness (two points)	99	167	266	0	1	1
Detailed measurement of blubber thickness (fourteen points)	-	-	-	0	1	1
Lactation status	-	167	167	-	1	1
Measurement of mammary gland	-	167	167	-	1	1
Measurement of uterin horn	-	-	-	-	1	1
Record of ovary	-	167	167	-	1	1
Photographic record of fetus	-	97	97	-	0	0
Fetal length and weight	-	97	97	-	0	0
Testis weight	99	-	99	0	-	0
Record of stomach contents	99	167	266	0	1	1
Weight of stomach content	99	167	266	0	1	1
Record of marine debris	99	167	266	0	1	1
Record of internal parasites	99	167	266	0	0	0
Macro pathological observation (thyroid, lung and liver)	99	167	266	0	1	1
Skull measurement (length and breadth)	98	166	264	0	1	1
Number of ribs	-	-	-	0	1	1
Number of vertebra	-	-	-	0	1	1
Body weight by total weight of parts	0	1	1	0	1	1
Blood plasma for physiological study	28	39	67	0	1	1
Ovary sample	-	167	167	-	1	1
Histological sample of endometrium	-	-	-	-	1	1
Histological sample of mammary gland	-	-	-	-	1	1
Fetal skin for genetic study	-	97	97	-	0	0
Small fetus sample	-	3*	3*	-	0	0
Histological sample of testis	99	-	99	0	-	0
Skin and liver tissues for genetic study	99	167	266	0	1	1
Blubber, muscle and liver tissues for environmental monitoring	99	167	266	0	1	1
Lung and liver tissue for air monitoring	10	-	10	0	1	1
Muscle and blubber tissues for various analysis	3	3	6	0	1	1
Muscle liver and blubber tissues for chemical analysis	-	-	-	0	1	1
Tissues for histopathological study	2	2	4	0	0	0
Stomach contents for feeding study	15	25	40	0	1	1
Stomach contents for environmental monitoring	6	14	20	0	0	0
Earplug for age determination	99	167	266	0	1	1
Ocular lens for age determination	99	167	266	0	1	1
Largest baleen plate for various analysis	14	36	50	0	1	1
Tympanic bone for various analysis	-	-	-	0	1	1
Vertebral epiphyses sample	85	131	216	0	1	1
External parasites sample	1	1	2	0	1	1
Tissue samples for constraction of monitoring system of infectious disease	28	37	65	0	1	1
Tissues for functional food study	3	2	5	0	1	1
Uterus and placenta tissues for histological study	-	18	18	-	-	-
Uterus and placenta tissues for histological study	20	-	20	-	-	-

\*: Two samples are carcass of small fetus

Table 7. Reproductive status of Antarctic minke whales sampled in the 2011/12 JARPAII survey. Maturity of males was tentatively defined by testis weight according to Kato (1986). "Resting" represents non-pregnant mature female without corpus luteum.

Area	Stratum	Male			Female					All combined
		Immature	Mature	Total	Immature	Mature			Total	
						Maturing	Resting	Pregnant		
V	West-North	2	1	3	6	0	0	0	6	9
		22.2%	11.1%	33.3%	66.7%	0.0%	0.0%	0.0%	66.7%	100.0%
	West-South	13	33	46	29	1	0	14	44	90
		14.4%	36.7%	51.1%	32.2%	1.1%	0.0%	15.6%	48.9%	100.0%
East-North	7	6	13	7	0	0	0	7	20	
	35.0%	30.0%	65.0%	35.0%	0.0%	0.0%	0.0%	35.0%	100.0%	
East-South (Ross sea)	0	6	6	6	0	0	5	11	17	
	0.0%	35.3%	35.3%	35.3%	0.0%	0.0%	29.4%	64.7%	100.0%	
VI	West-South	4	27	31	12	5	2	80	99	130
		3.1%	20.8%	23.8%	9.2%	3.8%	1.5%	61.5%	76.2%	100.0%
Total		26	73	99	60	6	2	99	167	266
		9.8%	27.4%	37.2%	22.6%	2.3%	0.8%	37.2%	62.8%	100.0%

Table 8. Biological information on fin whales sampled in the 2011/12 JARPAII survey.

\* Body weight was represented by total weight of body parts.

No	Body length (m)	Body weight (ton)*	Sex and maturity	Prey species
F001	18.34	36.63	Immature female	<i>Euphausia superba</i>

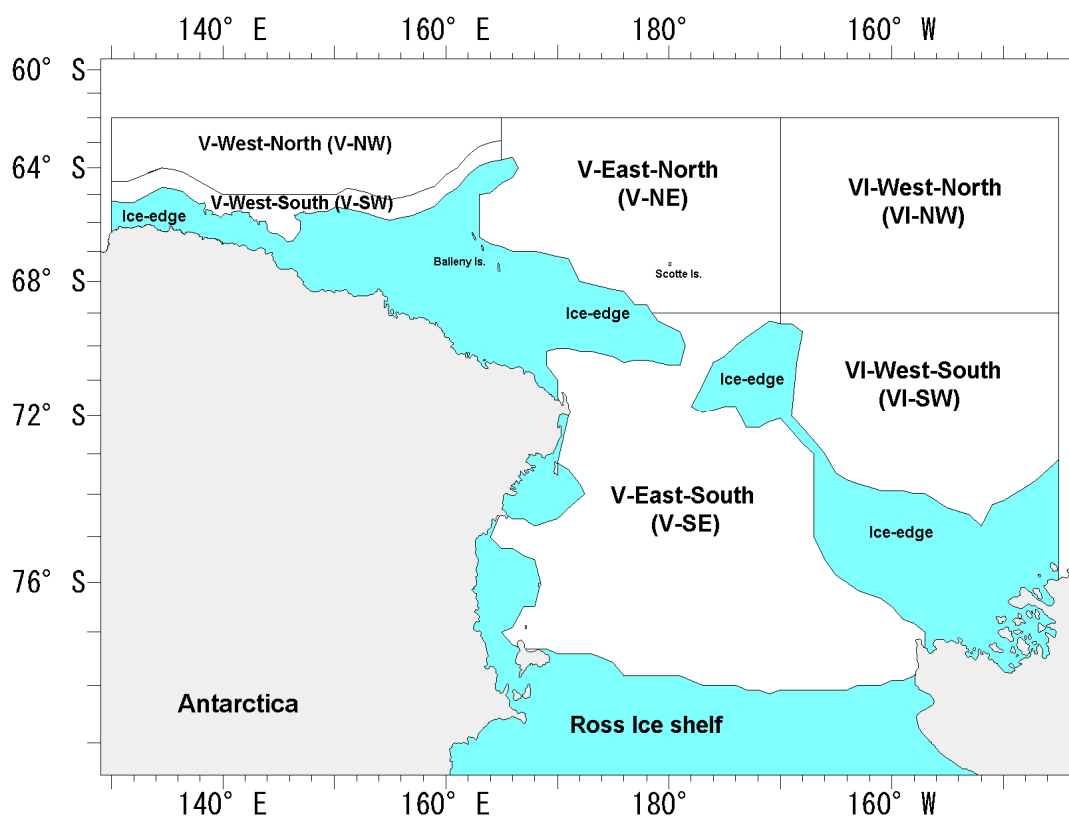


Figure 1. Research area of the 2011/12 JARPAII survey.

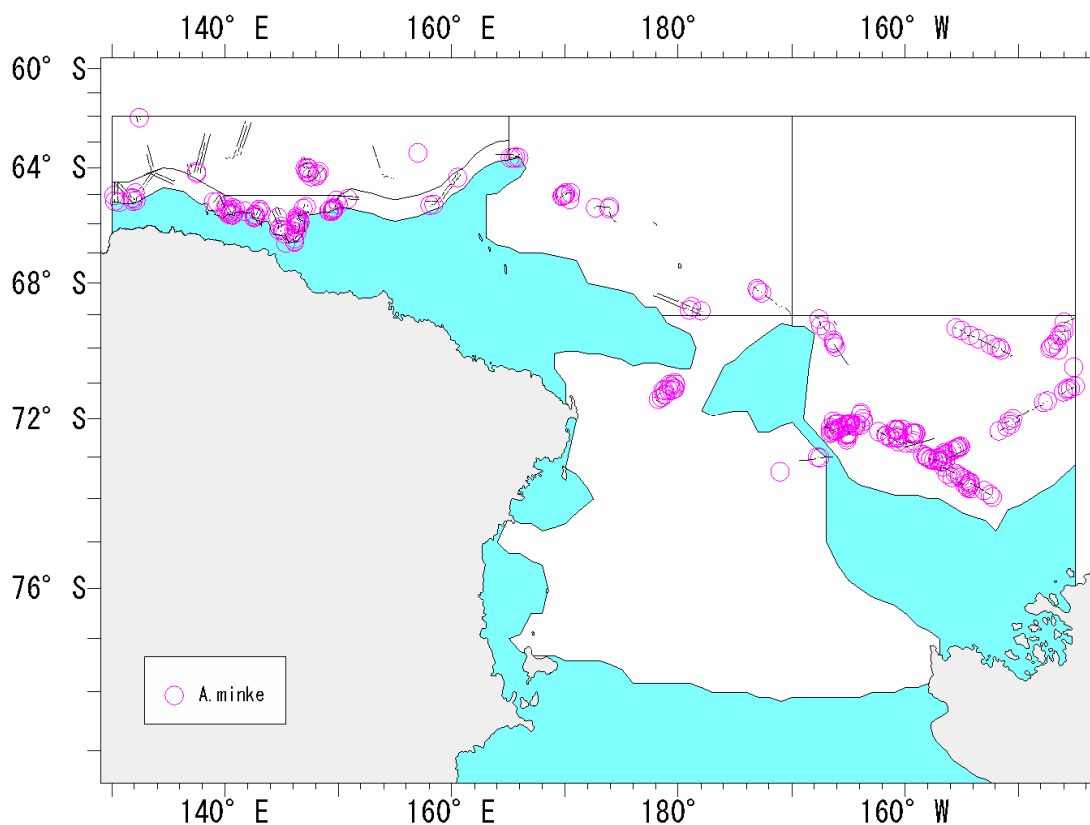


Figure 2a. Distribution of sightings of Antarctic minke whales in the 2011/12 JARPAII survey.

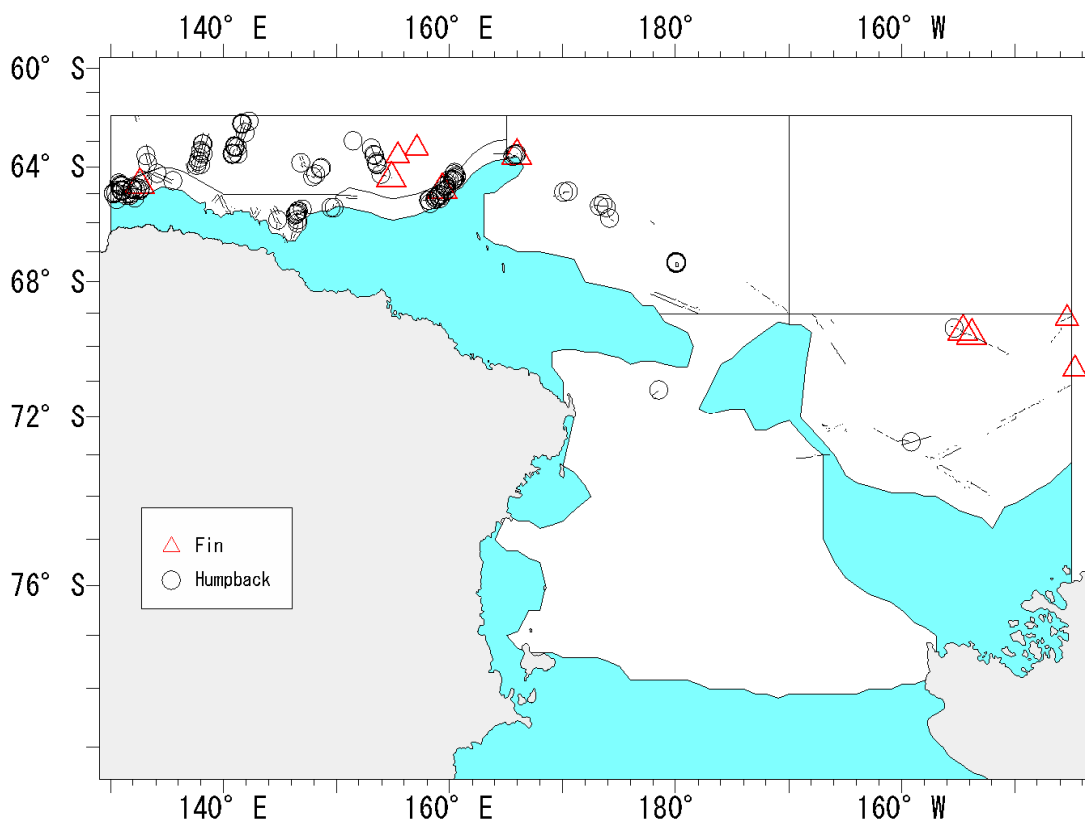


Figure 2b. Distribution of sightings of fin and humpback whales in the 2011/12 JARPAII survey.

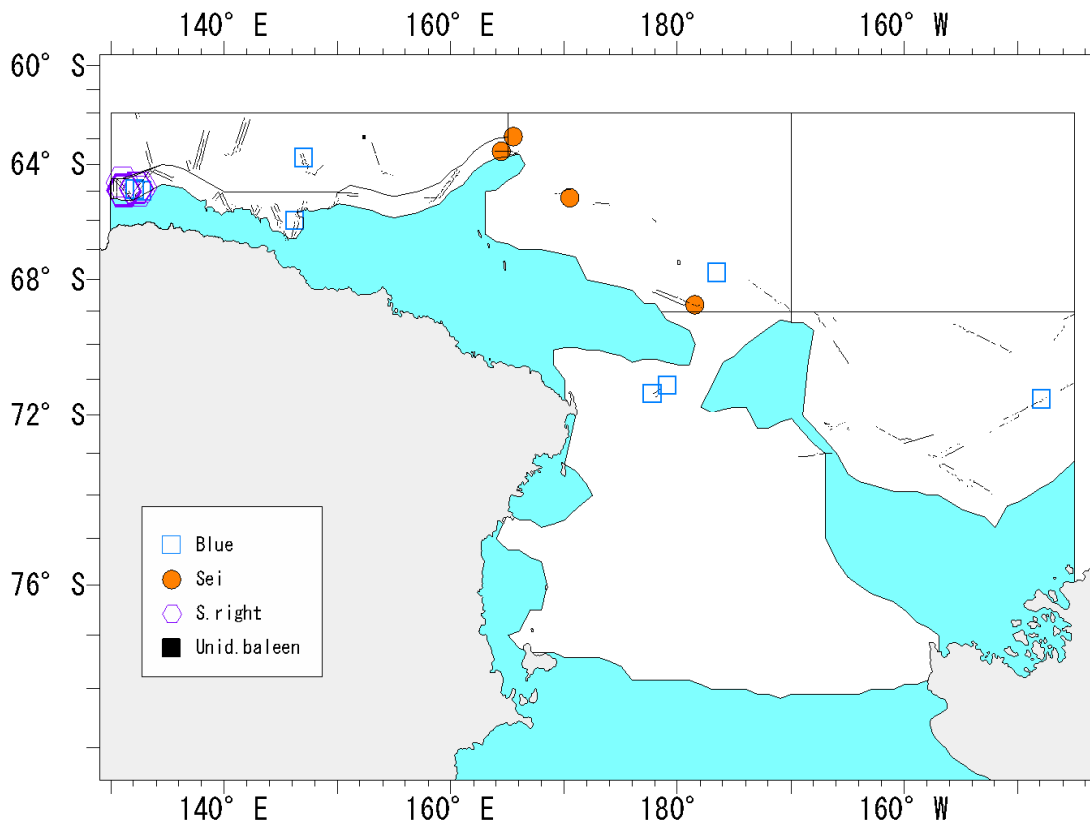


Figure 2c. Distribution of sightings of other baleen whales in the 2011/12 JARPAII survey.

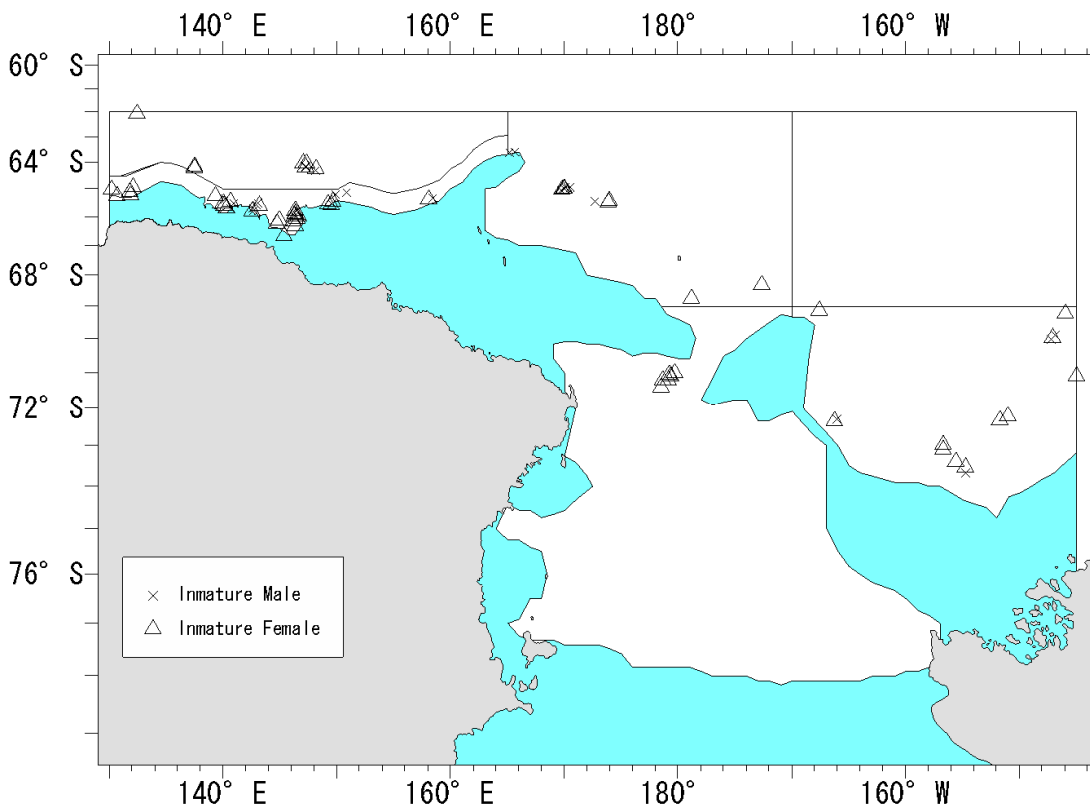


Figure 3a. Distribution of immature Antarctic minke whale sampled in the 2011/12 JARPAII survey, by sex.

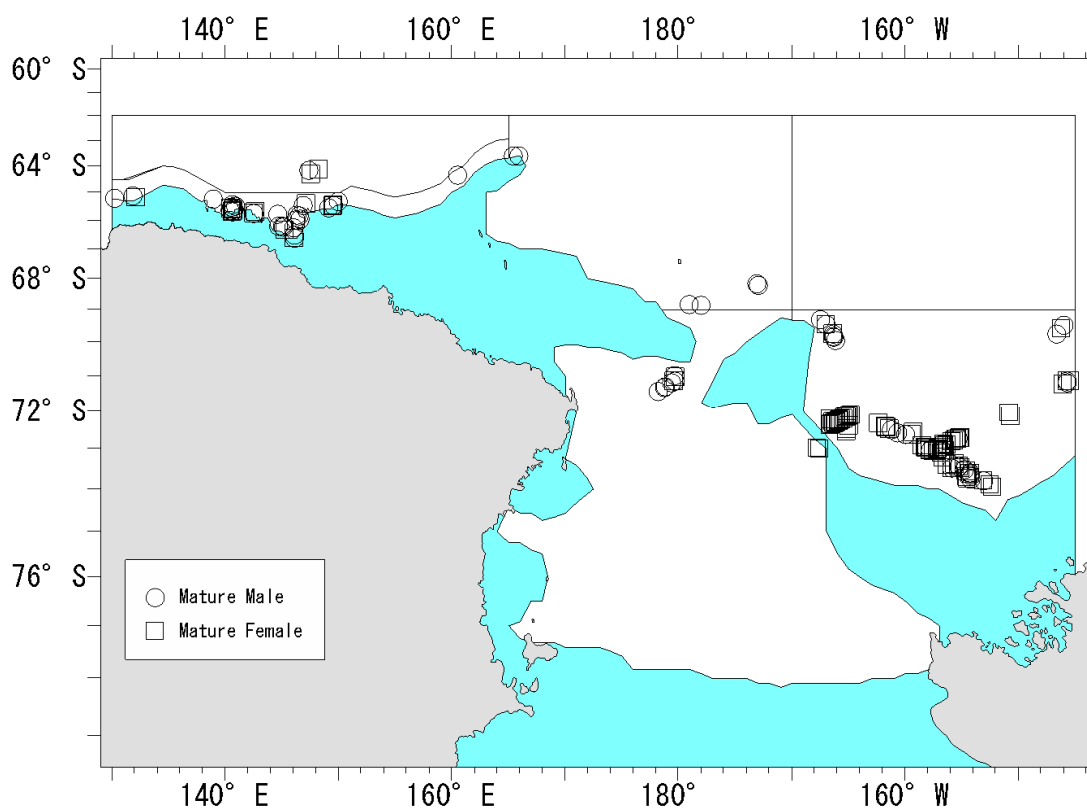


Figure 3b. Distribution of mature Antarctic minke whale sampled in the 2011/12 JARPAII, by sex.

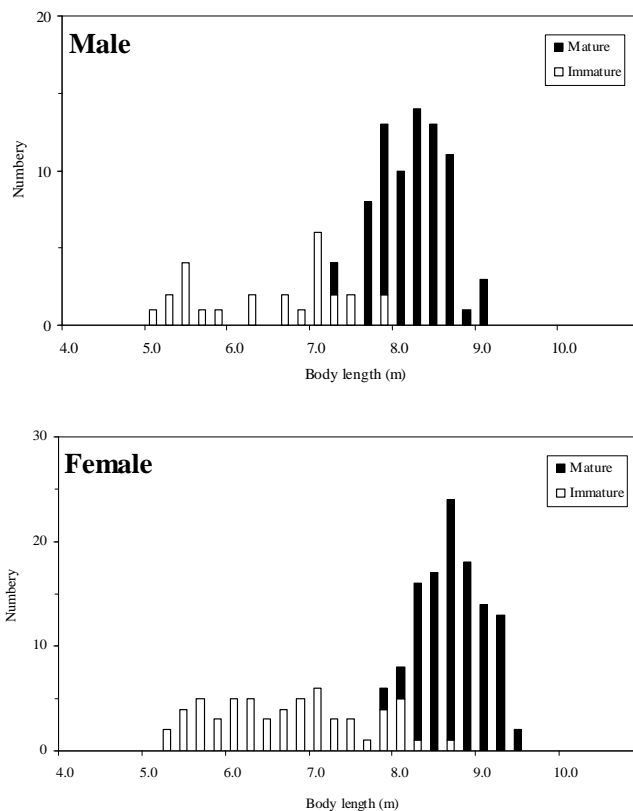


Figure 4. Body length distribution of Antarctic minke whales sampled during the 2011/12 JARPAII survey, by sex.