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Japanese Whale Research Program under  
Special Permit in the Western North Pacific  
(JARPN II) in 2014 (part I) Offshore  
component

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# Cruise Report of the Second Phase of the Japanese Whale Research Program under Special Permit in the Western North Pacific (JARPN II) in 2014 (part I) – Offshore component –

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## ABSTRACT

The 13th cruise of the full-scale Second Phase of the Japanese Whale Research Program under Special Permit in the Western North Pacific (JARPN II) -offshore component- was conducted in sub-areas 7, 8 and 9 of the western North Pacific. There were two main research components in the 2014 survey: whale sampling survey and dedicated sighting survey. A total of six research vessels was used: two sighting/sampling vessels (SSVs) (whale sampling survey component), one research base vessel (*Nisshin Maru*, NM) (whale sampling survey component) and three dedicated sighting vessels (SVs) (dedicated sighting survey component). The whale sampling survey was carried out from 16 May to 29 July 2014. A total of 3,307n.miles was surveyed in a period of 67 days by the SSVs. A total of two common minke, 346 sei, 116 Bryde's, 69 sperm, eight blue, 19 fin and five humpback whales were sighted by the SSVs. A total of 90 sei and 25 Bryde's whale was sampled by the SSVs. All whales sampled were examined on board of NM. In June and July, sei whales fed mainly on copepods followed by mackerels and Japanese sardine in sub-areas 8 and 9. Bryde's whales fed mainly on Japanese anchovy followed by mackerels in sub-areas 7 and 8. Two dedicated sighting surveys were carried out from 11 May to 29 June in sub-areas 7, 8 and 9, from 1 August to 14 September in western North Pacific. A total of 2,823 and 4,813n.miles was surveyed during those surveys by the SVs, respectively. Data obtained in this research will be used in the elucidation of the role of whales in the marine ecosystem through the study of whale feeding ecology in the western North Pacific.

KEYWORDS: SCIENTIFIC PERMITS; COMMON MINKE WHALE; BRYDE'S WHALE; SEI WHALE; FOOD/PREY; MONITORING

## INTRODUCTION

After the Japanese Whale Research Program under Special Permit in the Western North Pacific (JARPN) was completed in 1999, the second phase of Japanese Whale Research Program under Special Permit in the Western North Pacific (JARPNII) was started in the 2000 summer season as a two-year feasibility study. Based on the success of the feasibility study (Government of Japan, 2002a) and the increasingly strong support from international fisheries organizations, including FAO, for research to improve multi-species approaches to management, JARPN II started as a full-scale research program in 2002. The full-scale study aimed i) to evaluate the feeding ecology and ecosystem studies, ii) to monitor environmental pollutants in cetaceans and the marine ecosystem and iii) to elucidate the stock structure (Government of Japan, 2002b).

The full-scale JARPN II plan involves two survey components: the 'offshore' survey, which is covered by the *Nisshin Maru* research unit and two 'coastal' surveys (Sanriku and Kushiro), which are covered by small type catcher boats. The coastal component was necessary to cover the temporal and spatial gaps, which could not be covered by the *Nisshin Maru* unit (Government of Japan, 2002b).

The research area of the offshore component is set in sub-areas 7, 8 and 9, and the target species and sample sizes for the lethal component of the research were set as follows: 100 common minke whales; 100 sei whales, 50 Bryde's whales and 10 sperm whales (Government of Japan, 2002b). The survey is composed of three main components: whale sampling survey, dedicated sighting survey and whale prey surveys.

In January 2009, IWC/SC conducted the Expert Workshop to review the ongoing JARPN II Programme (IWC, 2009) for the first period (2002-2007). The results presented on the three main objectives of JARPN II were discussed by an Experts Panel. Constructive discussions were conducted and some recommendations were offered by the EP. Some of those recommendations were already responded by Japanese scientists (Pastene, *et al.*, 2010).

Following the March 31, 2014 Judgment of the International Court of Justice (ICJ) in the case Whaling in the Antarctic (Australia v. Japan: New Zealand intervening), the Government of Japan voluntarily reviewed the state of JARPN II. Overall research objectives, the research area and research methodology remain the same as those specified in the original JARPN II research plan (SC/56/01). This voluntary review resulted in the reprioritization of research focus as well as recalculation of sample sizes. The survey concentrated on the study of interactions between whales and fisheries in the coastal area and interactions among whale species in the offshore area as well as a contribution to the management of whales. Sampling of sperm and minke whales in offshore component was suspended because their role in the study of interactions between whales and fisheries in the coastal waters seemed to be limited. Sei whale sample size of 100 (as in the original plan) of which 10 were studied using only non-lethal methods. Bryde's whale sample size of 50 (as in the original plan) of which 25 were studied using only non-lethal methods. A larger number of Bryde's whales were allocated to non-lethal methods because they were better studied than sei whales through the Comprehensive Assessment and the Implementation Review. In coastal component, Minke whale sample size of 114 (57 in each of the spring and autumn season as recalculated with the latest information) of which 12 (6 in each of the periods) were studied using only non-lethal means. A study for verifying the feasibility of using non-lethal methods was carried out.

## MATERIALS AND METHODS

### Whale sampling survey

#### *Research area*

Sub-areas 7, 8 and 9, excluding the EEZ zones of foreign countries, comprised the research area (Figure 1).

#### *Research vessels*

Three research vessels were used. The research base vessel *Nisshin Maru* (NM: 8,145GT) commanded the research and was the platform for biological examination of whale samples and processing of by-products. The *Yushin Maru* (YS1: 724GT) and *Yushin Maru* No.2 (YS2: 747GT) were used as the sighting/sampling vessels (SSVs), which conducted sighting activities, sampling of targeted whale species and various experiments and observations.

#### *Methods for setting cruise track line and sighting procedure*

Track lines and allocation of vessels were made as in previous JARPN and JARPN II surveys (Fujise *et al.*, 1995, 1996, 1997, 2000, 2001, 2002, 2003; Ishikawa *et al.*, 1997; Zenitani *et al.*, 1999; Tamura *et al.*, 2004, 2005, 2006, 2009a, 2009b, 2012; Bando *et al.*, 2010, 2013, 2014; Matsuoka *et al.*, 2007; Yasunaga *et al.*, 2011). The zigzag-shaped track line was established on an arbitrary basis in each sub-area. Furthermore, some 'special monitoring surveys' (SMS) were conducted in areas where the abundance of Bryde's and sei whales was expected to be high. Track line in the SMS was designed separately from the original track line. Two SSVs were allocated to these tracks with the allocation being changed every day. The research course for the SSVs consisted of one main track and one parallel track established 7n.miles apart from the main course.

Sighting procedure for the whale sampling survey was similar to the previous surveys of JARPN and JARPN II (Fujise *et al.*, 1995, 1996, 1997, 2000, 2001, 2002, 2003; Ishikawa *et al.*, 1997; Zenitani *et al.*, 1999; Tamura *et al.*, 2004, 2005, 2006, 2007, 2009a, 2009b, 2012; Bando *et al.*, 2010, 2013, 2014; Matsuoka *et al.*, 2008; Yasunaga *et al.*, 2011). In the research area, sighting was conducted mainly under closing mode.

Furthermore two modalities of sighting in closing mode were adopted, *NSC* and *NSS modes*, by taking into consideration weather and sea conditions. The conditions to conduct surveys under *NSC mode* were similar to those established in Japanese sighting surveys conducted by the National Research Institute of Far Seas Fisheries (*i.e.* visibility of two n.miles or more and wind force of four or below). The *NSS mode* was used under bad weather conditions such as strong wind, heavy rain or fog but the collection of whale samples was still possible. These two mode surveys were recorded separately for future analysis. Also an *ASP mode* was used (closing mode survey without sampling activities under normal sighting conditions). Closing was performed mainly on sightings of common minke, Bryde's and sei whales. Furthermore closing was made on sightings of other large baleen whales, such as blue, humpback, right and fin whales. In these cases, closing was done in order to confirm species and school size and to conduct some experiments.

#### *Sampling numbers and procedure of targeted whales*

The target species and sample sizes in the 2014 JARPN II offshore component were set as follows: 90 sei whales and 25 Bryde's whales. Most of the whales sighted on the track line were approached for sampling. Furthermore sampling effort was applied outside the established research hours (main time: 06:30-18:30 (12 hrs) in local time), if collection of whale samples was considered possible. For schools consisting of two or more animals, numbering was made for all the whales in the school; to set sampling order randomly in accordance with the table of random numbers (Kato *et al.*, 1989). Cow and calf pairs were not targeted for sampling. Sampled whales were immediately transported to the research base vessel, where biological measurements and sampling were carried out.

#### *Experiments*

The following experiments and observations were conducted by the SV and SSVs:

1. Sighting distance and angle experiments to examine the precision of sighting data.
2. Biopsy sampling on gray, blue, fin, sei, Bryde's, common minke, humpback, right, bowhead and sperm whales. (SV and SSVs)
3. Photographic records of natural marks on blue, humpback and right whales.
4. Observation of feeding behaviour on blue, fin, sei, Bryde's, common minke, humpback, right and sperm whales.
5. Observation of excretion and vomiting behaviour on sei, Bryde's and common minke whales.

#### *Observation of marine debris*

Observation of marine debris was conducted from the wheelhouse of the research base vessel (*NM*). Marine debris was also investigated in the stomach contents of Bryde's and sei whales sampled.

### **Dedicated Sighting survey**

A report of the dedicated sighting surveys was presented by Matsuoka *et al.* (2015). Here just a brief outline is presented. Two independent surveys were conducted in this season.

#### *Research area*

First survey: Sub-areas 7, 8 and 9

Second survey: 20-30N, 140-170E

#### *Research vessel*

The *YS1*, *YS2* and *Yushin Maru No.3 (YS3: 742GT)* were used as dedicated sighting vessel (SV).

#### *Methods for setting cruise track line and sighting procedure*

An independent track line for dedicated sighting survey was designed in the research area.

#### *Experiments*

The following experiments and observations were conducted by the SVs.

1. Sighting distance and angle experiments to examine the precision of sighting data.

2. Biopsy sampling on gray, blue, fin, sei, Bryde's, common minke, humpback, right, bowhead and sperm whales.
3. Photographic records of natural marks on blue, humpback and right whales.
4. Observation of excretion and vomiting behaviour on sei, Bryde's and common minke whales.

## RESULTS

### Whale sampling survey

*Actual survey periods, track lines and searching distances*

Cruise period: Between 16 May and 29 July (75 days)

Research period: Between 20 May and 25 July (67 days)

Track line: Track line set by the two SSVs is shown in Figure 2.

Searching distance: The total searching distance for SSVs was 3,307 n.miles

*Sightings of common minke, sei, Bryde's and sperm whales*

A total of two schools (two individuals) of common minke, 195 schools (346 ind.) of sei, 94 schools (116 ind.) of Bryde's and 94 schools (116 ind.) of sperm whales was sighted (Table 1, Figure 2)

*Sightings of other large cetacean species*

Table 1 also shows the number of sightings for other large whale species made by the SSVs, such as blue (seven sch./eight ind.), fin (16 sch./19 ind.) and humpback (four sch./five ind.) whales (Figure 2).

*Sampling and biological research on Bryde's and sei whales*

A total of 90 sei whales (male: 38, female: 52 ind.) and 25 Bryde's whales (male: 6, female: 19 ind.) were sampled. Struck and lost did not occur in this survey. Table 2 summarizes the biological data and samples collected from whales. A total of 43 research items was covered. These items are related to the studies conducted under the three main objectives of the JARPN II: study on feeding ecology of whales and marine ecosystem, pollution studies and elucidation of stock structure.

Composition of sex and sexual maturity status of sei and Bryde's whales are shown in Table 3. Statistics of body length of each whale species is shown in Table 4. Mean body length of sei whale was 13.45m and 14.11m for males and females, respectively. For Bryde's whales, those were 11.93m and 12.49m, respectively.

Geographical distribution of sei and Bryde's whale samples is shown in Figure 3 based on the sighting positions.

*Distribution and food habits of whales sampled*

In this survey, sei whales were sampled in the sub-areas 8 and 9 and they fed mainly on copepods (46.7%), followed by mackerels (23.3%), Japanese sardine (16.7%), Japanese anchovy (5.0%), Pacific saury (5.0%) and some mesopelagic fishes (3.3%) (Table 5).

In this survey, Bryde's whales were sampled in the sub-areas 7 and 8 and they fed mainly on Japanese anchovy (91.7%), followed by Mackerels (8.3%) (Table 5).

*Experiments*

A detail report of the non-research activity in 2014 JARPN II was presented in Mogue *et al* (2015). In this section, the summary of the results was described.

### Sighting distance and angle experiment

A sighting distance and angle experiment was performed on 3 June by YS1 and YS2. The results of this experiment will be used in calculation of abundance estimates.

### Photo-ID

There was no chance for the Photo-ID by the SSVs.

#### Biopsy sampling

Biopsy samples were collected from 16 sei and 25 Bryde's whales using a compound-crossbow.

#### Feeding behaviour

No case of feeding was observed during the survey.

#### Excretion and vomiting behaviour

A total of two schools of common minke, 195 schools of sei, 94 schools of Bryde's was observed. As a result, 12 cases (11 sei and one Bryde's whales) of excretion behaviour were observed during the survey. Feces samples were collected from three sei whales using a hand net. No case of vomiting was observed during the survey.

#### Observation of marine debris

No large debris was observed in the environment. Small piece of plastic was observed in the stomachs of four Bryde's and 41 sei whales. Small piece of wood was observed in the stomachs of one Bryde's and three sei whales. Small piece of net was observed in the stomachs of one sei whale.

### **Dedicated Sighting survey**

Here just a brief outline of the results is presented. The details are described in Matsuoka (2015).

#### *Actual research periods and searching distance*

##### Cruise period:

First survey : Between 16 May and 29 July (49 days; YS3)

Second survey : Between 1 August and 14 September (45 days; YS1 and YS2)

##### Searching distance:

First survey : 2,823 n.miles (YS3)

Second survey : 2,347 n.miles (YS1); 2,466 n.miles (YS2)

#### *Sightings of common minke, Bryde's, sei and sperm whales*

Sighting number of large cetacean species during each survey was shown in Table 1. A total of two schools (two individuals) of common minke, 135 schools (333 ind.) of sei, 30 schools (42 ind.) of Bryde's and 41 schools (93 ind.) of sperm whales was sighted during first survey. During second survey, a total of 56 schools (72 ind.) of Bryde's and 24 schools (70 ind.) of sperm whales was sighted.

#### *Sightings of other large cetacean species*

Large baleen whales such as fin (15 schools/18 individuals), blue (13 sch./16 ind.), humpback (one sch./one ind.) and right (one sch./one ind.) whales were sighted during the first survey. During the second survey, no case of other large whales were sighted.

#### *Experiments*

##### Photo-ID

A total of one humpback, 12 blue whales and one right whale was photographed during first survey. There was no chance for the Photo-ID during the second survey.

##### Biopsy sampling

During first survey, biopsy sampling was not carried out for logistical reason.

Biopsy samples were collected from 16 Bryde's whales using a compound-crossbow during second survey.

##### Feeding behaviour

One case of feeding behaviour by Bryde's whales (one schools/three individuals) was observed during the first survey. There was no case for the observation of feeding behaviour during the second survey.

##### Excretion and vomiting behaviour

A total of two schools of common minke, 134 schools of sei, 30 schools of Bryde's was observed. As a result, 12 cases (10 sei and two Bryde's whales) of excretion behaviour were observed during the first survey. No case of excretion or vomiting was observed during the second survey.

## DISCUSSION

In this year, survey was conducted in early summer (May- July). Few survey effort was applied to appropriate temperature zone (10-15 °C) for common minke whales and as a result, only low number of common minke whales were sighted. Prey species and food habits of sei and Bryde's whales in this survey are discussed below in the context of previous survey results.

### Sei whale

From our research results of past JARPN II (2002 to 2013), they fed on Japanese anchovy and copepods dominantly during survey season in most of years. During the present survey, sei whales were sampled in early summer in sub-areas 8 and 9. Main prey species of sampled sei whales were mainly copepods, Japanese sardine and mackerels. In recent surveys, mackerels were increasingly appeared in stomach contents, which might indicate recovery of this resource and change of available prey species for sei whales. And Japanese sardine was confirmed as dominant prey species at first in JARPN II. This phenomenon seems to fish species replacement from Japanese anchovy to Japanese sardine in the research area.

### Bryde's whale

From our research results of past JARPN II (2000 to 2013), the dominant prey species of Bryde's whale was Japanese anchovy and krill during May to September. There was seasonal change of prey species. In early season (May and June) the dominant prey species was krill. In late season (from July to September), the dominant prey species was Japanese anchovy in sub-areas 7 and 8. In the south eastern part of sub-area 9, oceanic lightfish were also important prey species in August. During the present survey, Bryde's whale fed mainly on Japanese anchovy followed by mackerels in July in the sub-areas 7 and 8.

### Summary of yearly change of prey species

Recently years, Japanese sardine was increasingly appeared in stomach contents of sei whales sampled offshore and common minke whales sampled Kushiro region (Kishiro *et al.*, 2014; Yoshida *et al.*, 2013, 2015). The dominant prey of common minke whales was Japanese sardine around northern part of Japan's coastal region in 1980's (Kasamatsu and Tanaka, 1992). After depletion of Japanese sardine resources in late of 1980's, common minke whales switched their dominant prey from Japanese sardine to Japanese anchovy. This phenomenon seems to fish species replacement from Japanese anchovy to Japanese sardine in the research areas 8 and 9.

It is reasonable to assume that baleen whale species do not have a strong preference for a particular prey species, changes in the prey of baleen whales probably reflect changes in the abundance of available prey species in the area.

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## REFERENCES

- Bando, T., Kiwada, H., Mogoe, T., Isoda, T., Mori, M., Tsunekawa, M., Yoshimura, I., Nakai, K., Sato, H., Tanaka, H., Inagaki, M., Tamahashi, K., Yoshida, K., Morine, G., Watanabe, H., Fujiwara, G., Eguchi, K. and Tamura, T. 2010. Cruise Report of the second phase of the Japanese Whale Research Program under Special Permit in the Western North Pacific (JARPN II) in 2009 (part I) - Offshore component – Paper SC/62/O4 presented to the IWC Scientific Committee, June 2010 (unpublished). 34pp.
- Bando, T., Mogoe, T., Isoda, T., Wada, A., Mori, M., Tsunekawa, M., Tamahashi, K., Moriyama, R., Miyakawa, N., Kadowaki, I., Watanabe, H. and Ogawa, T. 2013. Cruise Report of the second phase of the Japanese Whale Research Program under Special Permit in the Western North Pacific (JARPN II) in 2012 (part I) - Offshore component – Paper SC/65a/O03 presented to the IWC Scientific Committee, June 2013 (unpublished). 33pp.
- Bando, T., Konishi, K., Wada, A., Oikawa, H., Sato, H., Tsunekawa, M., Yoshimura, I., Konagai, T., Ueda, E., Murase, H. and Ogawa, T. 2014. Cruise Report of the second phase of the Japanese Whale Research Program under Special Permit in the Western North Pacific (JARPN II) in 2013 (part I) - Offshore component – Paper SC/65b/SP02 presented to the IWC Scientific Committee, June 2014 (unpublished). 23pp.
- Fujise, Y., Kishiro, T., Zenitani, R., Matsuoka, K., Kawasaki, M. and Shimamoto, K. 1995. Cruise report of the Japanese whale research program under a special permit for North Pacific minke whales in 1994. Paper SC/47/NP3 presented to the IWC Scientific Committee, May 1995 (unpublished). 29pp.
- Fujise, Y., Iwasaki, T., Zenitani, R., Araki, J., Matsuoka, K., Tamura, T., Aono, S., Yoshida, T., Hidaka, H., Nibe, T. and Tohyama, D. 1996. Cruise report of the Japanese whale research program under a special permit for North Pacific minke whales in 1995 with the results of a preliminary analysis of data collected. Paper SC/48/Np13 presented to the IWC Scientific Committee, June 1996 (unpublished). 39pp.
- Fujise, Y., Shimada, H., Zenitani, R., Goto, M., Tamura, T., Lindström, U., Uchida, A., Yoshida, H., Shimamoto, K., Yuzu, S., Kasai, H., Kinoshita, T., Iwata, T. and Tohyama, D. 1997. Cruise report of the Japanese Whale Research Program under a Special Permit in the North Pacific (JARPN) in 1996 with some preliminary analysis of data collected during the 1994-1996 JARPN surveys. Paper SC/49/NP8 presented to the IWC Scientific Committee, September 1997 (unpublished). 38pp.
- Fujise, Y., Zenitani, R., Tamura, T., Bando, T., Ohtani, S., Takeda, S., Kitajima, A., Kimura, T., Masaki, T. and Tohyama, D. 2000. Cruise report of the Japanese whale research program under special permit in the North Pacific (JARPN) in 1999. Paper SC/F2K/J9 presented to the JARPN review meeting, February 2000 (unpublished). 32pp.
- Fujise, Y., Pastene, L.A., Tamura, T., Bando, T., Murase, H., Kawahara, S., Watanabe, H., Ohizumi, H., Mogoe, T., Kiwada, H., Nemoto, K. and Narita, H. 2001. Progress Report of the Feasibility study of the Japanese whale research program under special permit in the western North Pacific-Phase II (JARPN II) in 2000. Paper SC/53/O10 presented to the IWC Scientific Committee, July 2001 (unpublished). 77pp.
- Fujise, Y., Tamura, T., Bando, T., Hikaru Watanabe, Hiroshi Kiwada, Otani, S., Kanda, N., Yasunaga, G., Mogoe, T., Konishi, K., Inamori, M., Shigemune, H. and Tohyama, D. 2002. Cruise report of the feasibility study of the Japanese whale research program under special permit in the western North Pacific – Phase II (JARPNII) in 2001. Paper SC/54/O16 presented to the IWC Scientific Committee, May 2002 (unpublished). 51pp.
- Fujise, Y., Tamura, T., Bando, T., Yasunaga, G., Konishi, K., Murase, H., Yoshida, T., Itoh, S., Ogawa, R., Oka, T., Sasaki, T., Fukutome, K., Isoda, T., Birukawa, N., Horii, N., Zharikov, K.A., Park, K.J., Tohyama, D. and Kawahara, S. 2003. Cruise report of the Japanese whale research program under special permit in the western North Pacific – Phase II (JARPNII) in 2002 (Part I). Paper SC/55/O7 presented to the IWC Scientific Committee, May 2003 (unpublished). 41pp.
- Government of Japan. 2002a. Report of the 2000 and 2001 feasibility study of the Japanese whale research program under special permit in the western North Pacific-phase II (JARPN II). Paper SC/54/O17 presented to the IWC Scientific Committee, May 2002 (unpublished). 202pp.
- Government of Japan. 2002b. Research Plan for Cetacean Studies in the Western North Pacific under Special Permit (JARPN II) Paper SC/54/O2 presented to the IWC Scientific Committee, May 2002 (unpublished). 115pp.
- International Whaling Commission. 2009. The report of the Expert Workshop to review the ongoing JARPN II Programme. Paper SC/61/Rep 1 presented to the IWC Scientific Committee, May 2009 (unpublished). 57pp.
- Ishikawa, H., Yuzu, S., Shimamoto, K., Bando, T., Ohshima, K., Kasai, H., Kinoshita, T., Mizushima, Y., Iwakami, H., Nibe, T., Hosoyama, T., Kuramochi, T., Numano, K. and Miyamoto, M. 1997. Cruise report of the Japanese Whale Research Program under a Special Permit in the North Pacific (JARPN) in 1997. Paper SC/49/NP9 presented to the IWC Scientific Committee, September 1997 (unpublished). 28pp.
- Kato, H., Hiroshima, H., Fujise, Y. and Ono, K. 1989. Preliminary report of the 1987/88 Japanese feasibility study of the special permit proposal for Southern Hemisphere minke whales. *Report of the International Whaling Commission*, 39: 235-248.
- Kishiro, T., Yoshida, H., Ito, N., Nakamura, G., Miyakawa, N., Tamai, N., Kadowaki, I., Fukumoto, A., Takahashi, M., Furuyama, Y., Oota, Y., Maeda, H., Miyashita, T., Kumagai, S., Hara, T., Kimura, Y., Sakamoto, N., Kobayashi, N., Suzuki, N., Kanaji, Y., Mogoe, T., Nakai, K. and Kato, H. 2014. Cruise report of the second phase of the Japanese Whale Research Program under Special Permit in the western North Pacific (JARPN II) in 2013 (Part III) – Coastal component off Kushiro. Paper SC/65b/SP04 presented to the IWC Scientific Committee, May 2014, 13pp.
- Mogoe, T., ... 2015. Preliminary evaluation on biopsy and fecal sampling efficiency and working plan for non-lethal methods in JARPNII. Paper SC/66a/SP\*\* presented to the IWC Scientific Committee, May 2015, \*\*pp.

- Matsuoka, K., Otani, S., Isoda, T., Wada, A., Kumagai, S., Ohshima, T., Yoshimura, I., Sugiyama, K., Aki, M., Kato, K., Bhuiyan M.M.U., Funasaka, N., Suzuki, Y., Sudo, R., Motohashi, Y., Mori, M., Tsunekawa, M., Inagake, D., Murase, H. and Ogawa, T. 2008. Cruise report of the second phase of the Japanese Whale Research Program under Special Permit in the Western North Pacific (JARPN II) in 2007 - Offshore component -. Paper SC/60/O5 submitted to the 60<sup>th</sup> IWC Scientific Committee Meeting.
- Matsuoka, K. *et al.* 2015. Cruise report of the Japanese cetacean sighting surveys in the western North Pacific in 2014. Paper SC/66a/\*\* presented to the IWC Scientific Committee, May 2015 (unpublished). \*pp.
- Tamura, T., Fujise, Y., Bando, T., Yasunaga, G., Konishi, K., Kiwada, H., Isoda, T., Itoh, S. Machida, S., Tsunekawa, M., Konagai, T., Takamatsu, T., Ohshima, T., Honjo, K., Matsuoka, T., Zharikov, K.A., Yong, Rock AN, Tohyama, D. and Kawahara, S. 2004. Cruise Report of the Japanese Whale Research Program under Special Permit in the western North Pacific -Phase II (JARPN II) in 2003 (part I) – Offshore component –. Paper SC/56/O13 presented to the IWC Scientific Committee, June 2004 (unpublished). 46pp.
- Tamura, T., Fujise, Y., Mogoe, T., Kanda, N., Yasunaga, G., Konishi, K., Kiwada, H., Ogihara, M., Hasegawa, A., Kitajima, M., Sugiyama, T., Sasaki, T., Mori, M., Teraoka, T., Tsunekawa, M., Fukutome, K., Zharikov, K.A., NA, Jong-Hun., Tohyama, D., Inagake, D. and Kawahara, S. 2005. Cruise Report of the Japanese Whale Research Program under Special Permit in the western North Pacific -Phase II (JARPN II) in 2004 (part I) – Offshore component –. Paper SC/57/O3 presented to the IWC Scientific Committee, June 2005 (unpublished). 33pp.
- Tamura, T., Otani, S., Kiwada, H., Mori, M., Konishi, K., Isoda, T., Wada, A., Ogihara, M., Hasegawa, A., Kumagai, S., Komatsu, W., Hayasaka, K., Fukutome, M., Siozaki, M., Zharikov, K.A, NA, Jong-Hun., Ogawa, T., Watanabe, H., Yonezaki, S., Inagake, D. and Kawahara, S. 2006. Cruise report of the second phase of the Japanese Whale Research Program under Special Permit in the Western North Pacific (JARPN II) in 2005 – Offshore component –. Paper SC/58/O8 presented to the IWC Scientific Committee, June 2006 (unpublished). 52pp.
- Tamura, T., Otani, S., Isoda, T., Wada, A., Yonezaki, S., Mori, M., Tsunekawa, M., Fukutome, K., Nakai, K., Satoh, H., Nomura, I., Nagatsuka, S., Umatni, M., Koyanagi, T., Takamatsu, T., Kawabe, S., Kandabashi, S., Watanabe, H, Kumagai, S., Sato, H. and Ogawa, T. 2009a. Cruise Report of the second phase of the Japanese Whale Research Program under Special Permit in the Western North Pacific (JARPN II) in 2008 (part I) - Offshore component –. Paper SC/61/O4 presented to the IWC Scientific Committee, May 2009 (unpublished). 49pp.
- Tamura, T., Matsuoka, K. and Fujise, Y. 2009b. Methodology and survey procedure under the JARPN II - offshore component- with special emphasis on whale sampling procedures. Paper SC/J09/JR4 presented to the JARPN II review meeting, January 2009 (unpublished). 36pp.
- Tamura, T., Kubodera, T., Ohizumi, H., Konishi, K. And Isoda, T. 2009d. Feeding habits of sperm whales and their impact on neon flying squid resources in the western North Pacific. Paper SC/J09/JR17 presented to the JARPN II review meeting, January 2009 (unpublished). 22pp.
- Tamura, T., Mogoe, T., Nakai, K., Mori, M., Tsunekawa, M., Yoshimura I., Ishikawa, Y., Kawabe, S., Yamaguchi, F., Yamazaki, M., Ueta, E., Watanabe, H. and Eguchi, K. 2012. Cruise Report of the Second Phase of the Japanese Whale Research Program under Special Permit in the Western North Pacific (JARPN II) in 2011 (part I) – Offshore component –. Paper SC/64/O3 presented to the IWC Scientific Committee, May 2013 (unpublished). 28pp.
- Yasunaga, G., Kiwada, H., Mogoe, T., Wada, A., Nakai, K., Mori, M., Tsunekawa, M., Kasai, H., Ohshima, T., Yoshimura, I., Sato, H., Sakamoto, N., Watanabe, H., Fujiwara, G., Tamura, T. and Ogawa, T. 2011. Cruise report of the Second Phase of the Japanese Whale Research Program under Special Permit in the Western North Pacific (JARPN II) in 2010 (part I) - Offshore component –. Paper SC/63/O2 presented to the IWC Scientific Committee, June 2011 (unpublished). 38pp.
- Yoshida, H., Kishiro, T., Ito, N., Nakamura, G., Miyakawa, N., Tamai, N., Kadowaki, I., Fukumoto, A., Takahashi, M., Furuyama, Y., Oota, Y., Maeda, H., Miyashita, T., Kumagai, S., Hara, T., Kimura, Y., Sakamoto, N., Kobayashi, N., Suzuki, N., Kanaji, Y., Mogoe, T., Nakai, K. and Kato, H. 2015. Cruise report of the second phase of the Japanese Whale Research Program under Special Permit in the western North Pacific (JARPN II) in 2014 (Part III) – Coastal component off Kushiro. Paper SC/66a/SP\*\* presented to the IWC Scientific Committee, May 2015, \*\*pp.
- Zenitani, R., Fujise, Y., Matsuoka, K., Tamura, T., Bando, T., Ichihashi, H., Shimokawa, T., Krasnenko, A.S., Taguchi F., Kinoshita, T., Mori, M., Watanabe, M., Ichinomiya, D., Nakamura, M., Sakai, K., Matsuzaka, K., Kamei, H. and Tohyama, D. 1999. Cruise report of the Japanese Whale Research Program under a Special Permit in the North Pacific in 1998. Paper SC/51/RMP7 presented to the IWC Scientific Committee, May 1999 (unpublished). 20pp.

Table 1. Whale species and number of sightings in the 2014 JARPN II survey (no. schools/no. individuals)

**Sighting/Sampling vessels (YS1 and YS2)**

Cetacean species	Primary		Secondary		Total	
	Sch.	Ind.	Sch.	Ind.	Sch.	Ind.
Common minke whale	2	2	0	0	2	2
Sei whale	68	106	127	240	195	346
Bryde's whale	56	68	38	48	94	116
Sperm whale	33	45	18	24	51	69
Blue whale	2	2	5	6	7	8
Fin whale	9	11	7	8	16	19
Humpback whale	1	1	3	4	4	5

**Sighting vessels (YS, YS2 and YS3)**

Cetacean species	First suvey (YS3)						Second suvey (YS1 and YS2)					
	Primary		Secondary		Total		Primary		Secondary		Total	
	Sch.	Ind.	Sch.	Ind.	Sch.	Ind.	Sch.	Ind.	Sch.	Ind.	Sch.	Ind.
Common minke whale	2	2	0	0	2	2	0	0	0	0	0	0
Sei whale	134	332	1	1	135	333	0	0	0	0	0	0
Bryde's whale	30	42	0	0	30	42	56	72	0	0	56	72
Sperm whale	37	85	4	8	41	93	24	70	0	0	24	70
Blue whale	12	15	1	1	13	16	0	0	0	0	0	0
Fin whale	14	16	1	2	15	18	0	0	0	0	0	0
Humpback whale	1	1	1	1	2	2	0	0	0	0	0	0
Right whale	1	1	0	0	1	1	0	0	0	0	0	0

Table 2. Summary of biological data and samples collected during the 2014 JARPN II survey.

Research items	Sei whale			Bryde's whale		
	F	M	Total	F	M	Total
Measurement of body length	52	38	90	19	6	25
Measurement of external body proportion	52	38	90	19	6	25
Photographic record of external characters	52	38	90	19	6	25
Record of Diatom film	52	38	90	19	6	25
Standard measurement of blubber thickness (five points)	52	37	89	18	6	24
Detailed measurement of blubber thickness (eleven points)	0	1	1	1	0	1
Measurement of body weight	52	38	90	19	6	25
Measurement of body weight by parts	0	1	1	1	0	1
Collection of skin tissue for genetic study	52	38	90	19	6	25
Collection of blubber, muscle, liver and kidney tissues for organochlorines analysis	52	38	90	19	6	25
Collection of blubber and muscle tissues for nutritional component analysis	3	2	5	3	2	5
Collection of lung tissue for atmospheric analysis	–	10	10	–	4	4
Collection of tissues for various analyses	52	38	90	19	6	25
Observation of lactation status	52	–	52	19	–	19
Measurement of mammary gland	52	–	52	19	–	19
Collection of ovary	52	–	52	19	–	19
Photographic record of foetus	18	12	30	4	6	11*
Identification of foetal sex (by visual observation)	18	12	30	4	6	11*
Measurement of foetal length and weight	18	12	30	4	6	11*
Collection of foetal blubber tissue for genetic study	18	12	30	4	6	11*
Collection of testis (weight and histological sample)	–	38	38	–	6	6
Collection of testis for bacterial inspection	–	38	38	–	6	6
Photographic record of testis	–	38	38	–	6	6
Collection of plasma sample	51	38	89	19	6	25
Observation of stomach contents (conventional record)	52	38	90	19	6	25
Measurement of stomach content weight in each compartment	52	38	90	19	6	25
Collection of stomach contents for feeding study	40	28	68	10	4	14
Collection of stomach contents for various analyses	9	8	17	4	1	5
Measurement of stomach contents (prey body length and weight)	17	7	24	5	1	6
Collection of intestines contents for feeding study	52	38	90	19	6	25
Observation of appearance of marine debris	52	38	90	19	6	25
Photographic record of marine debris	27	16	43	4	1	5
Record of appearance of external parasites	52	38	90	19	6	25
Collection of external parasites	1	0	1	1	1	2
Record of appearance of internal parasites	52	38	90	19	6	25
Collection of earplug for age determination	52	38	90	19	6	25
Collection of lens for age determination	52	38	90	19	6	25
Collection of baleen plate for morphological study and age determination	0	1	1	1	0	1
Collection of vertebral epiphyses	52	38	90	19	6	25
Measurement of brain weight	0	1	1	1	0	1
Measurement of skull length and breadth	49	34	83	18	5	23
Collection of testis for morphological study	–	–	–	–	1	1
Collection of tissue for pathological study	2	0	2	0	0	0

\*: including a fetus of sex unidentified.

Table 3. Sex and sexual maturity composition of whales sampled during the 2014 JARPN II survey.

Species	Sub area	Male			Female						Total
		Imm.	Mat.	Total	Imm.	Mat.				Total	
					Ovu.	Rest.	Preg.	Lact.	Total		
Sei	SA7	0	0	0	0	0	0	0	0	0	0
	SA8	1	7	8	2	0	0	10	2	12	14
	SA9	9	21	30	9	2	4	20	3	29	38
	Combined	10	28	38	11	2	4	30	5	41	52
Bryde's	SA7	2	3	5	3	0	0	3	1	4	7
	SA8	0	1	1	2	0	0	7	1	8	10
	SA9	0	0	0	1	0	0	1	0	1	2
	Combined	2	4	6	6	0	0	11	2	13	19

Table 4. Body length (m) of whales sampled during the 2014 JARPN II survey.

Species	Sub area	Male					Female				
		n	mean	S.D.	min	max	n	mean	S.D.	min	max
Sei	SA7	0	NA	NA	NA	NA	0	NA	NA	NA	NA
	SA8	8	13.87	0.61	12.91	14.58	13	14.28	0.95	12.77	15.56
	SA9	30	13.34	0.82	11.02	14.33	39	14.05	0.91	12.60	15.65
	Combined	38	13.45	0.80	11.02	14.58	52	14.11	0.91	12.60	15.65
Bryde's	SA7	5	11.79	1.22	9.81	12.64	8	11.78	2.04	7.70	14.18
	SA8	1	12.65	NA	12.65	12.65	9	13.16	0.84	11.59	14.10
	SA9	0	NA	NA	NA	NA	2	12.31	1.22	11.44	13.17
	Combined	6	11.93	1.14	9.81	12.65	19	12.49	1.57	7.70	14.18

Table 5. Prey species and stomach contents weight (1st. + 2nd. stomachs) in whales sampled during the 2014 JARPN II survey.

Species	Dominant prey species		N	%	Range of weight (kg)	
Sei	Copepods	<i>Neocalanus</i> spp.	28	46.7	0.12	- 155.39
	Fish	Japanese anchovy	3	5.0	4.50	- 328.66
		Japanese sardine	10	16.7	5.98	- 433.02
		Mackerels	14	23.3	1.94	- 570.83
		Pacific saury	3	5.0	0.82	- 19.22
		Others	2	3.3	2.06	- 5.80
Bryde's	Fish	Japanese anchovy	11	91.7	5.94	- 438.43
		Mackerels	1	8.3	0.60	- 0.60

Table 7. Summary of biopsy skin sampling for some baleen whale species in the 2014 JARPN II offshore component.

Species	Ship	Targeted individuals sch./inds. (A)	Number of shoots (B)	Number of hits (C)	Number of samples (D)	Effort (minute) (E)	sample per trial (D)/(B)	sample per hit (D)/(C)
Sei	SSVs	42	63	21	16	1,275	0.25	0.76
Bryde's	SSVs	39	67	31	25	789	0.37	0.81

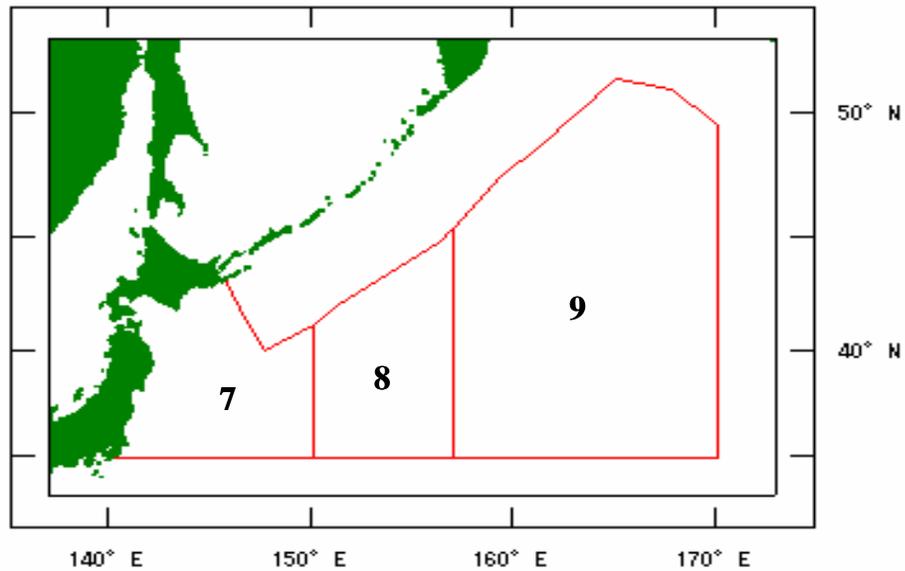


Figure 1. Research area of the JARPN II full-scale program.

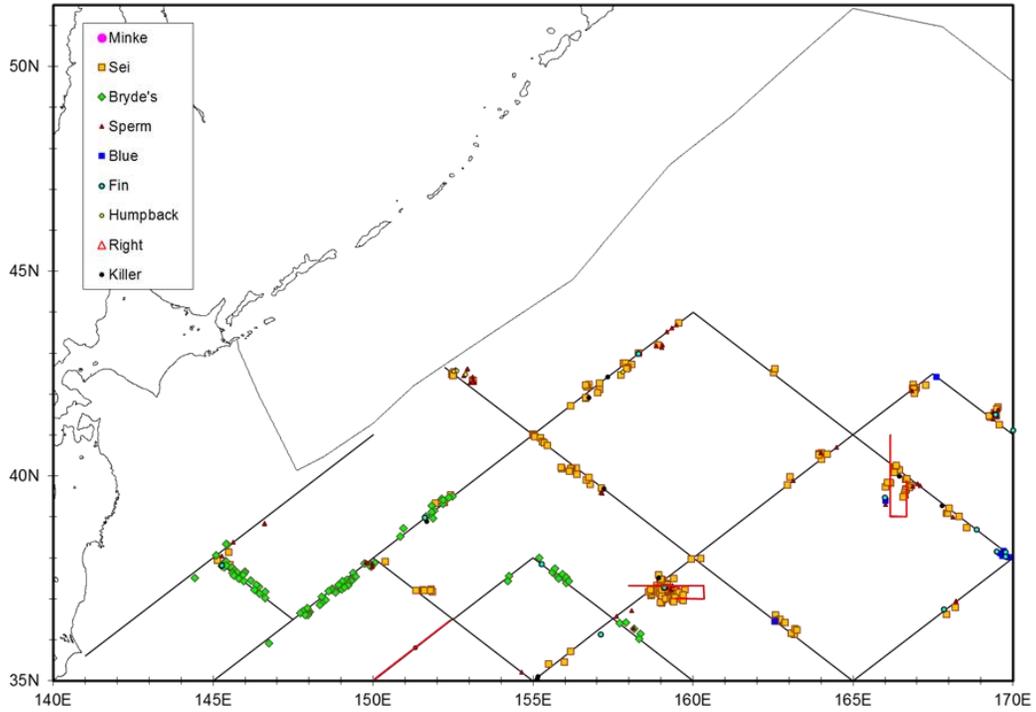


Figure 2. Track-lines and sighting positions of large whales made by the sighting/sampling vessels (SSVs).  
 Black line: Normal survey, Red line: SMS survey

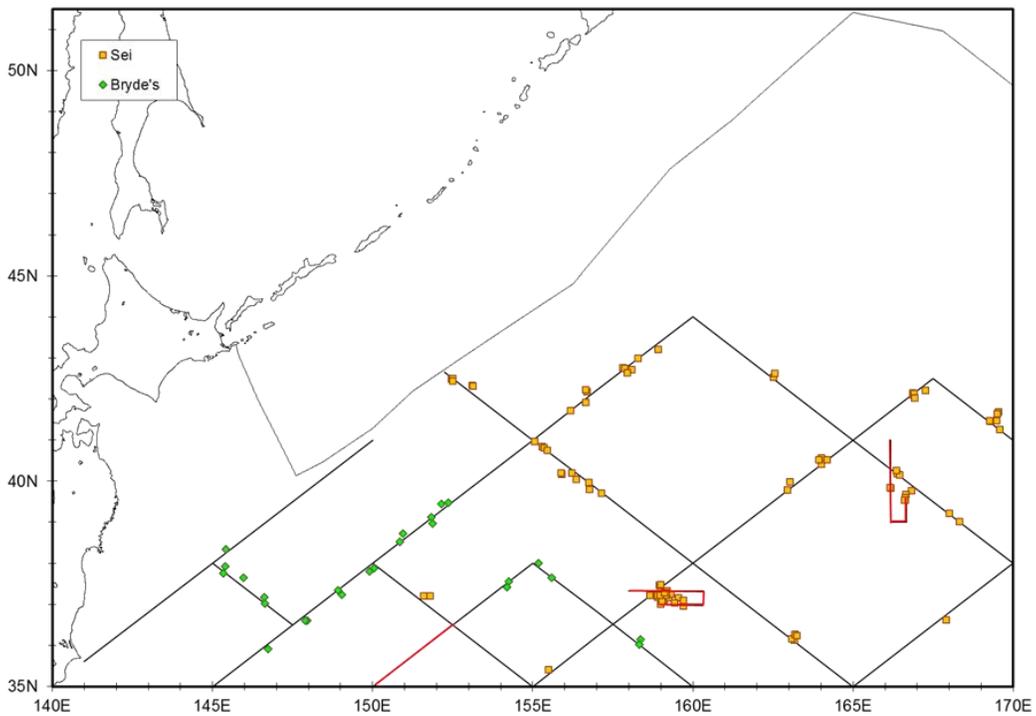


Figure 3. Sighting positions of the sampled sei (orange square) and Bryde's (green diamond) whales.  
 Black line: Normal survey, Red line: SMS survey

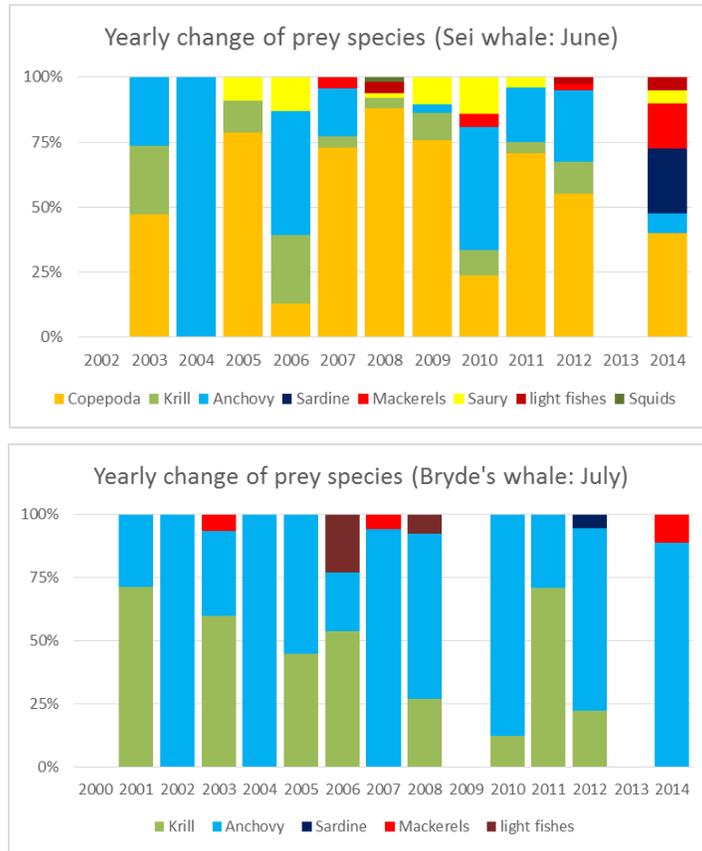


Figure 4. Yearly changes of prey species (Above: sei whale, Below: Bryde's whales).