

Cruise report of the 2010 cetacean sighting survey by the RV *Yushin-Maru No. 3* in the North Pacific

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ABSTRACT

The systematic vessel sighting survey for cetaceans was conducted in 2010 summer to examine the distribution of sei and Bryde's whales and for abundance estimations in the Western and Central North Pacific. The first cruise was conducted in the area of 35°N-40°N and 157°E-170°W from 9 June to 18 July, and the second cruise was in the area of 32°N-37°N and 145°E-180° E (dateline) from 20 July to 17 August. The main target species was sei whale for the first cruise and was Bryde's whale for the second cruise. The research vessel *Yushin-maru No.3* was engaged for this survey. Distance and angle estimation experiment was conducted for abundance estimation. Concentration areas of sei, Bryde's and blue whales in the first cruise and Bryde's whale in the second cruise were observed, respectively. Biopsy skin samples were successfully collected from sei (7) and Bryde's (6) whales for assessing stock structure. 17 schools of blue whales were photographed.

KEY WORD: SEI WHALES, BRYDE'S WHALE, SURVEY VESSEL, NORTH PACIFIC

BACKGROUND

In the Western North Pacific, dedicated cetacean sighting surveys based on the survey procedures of "the International Whaling Commission / Southern Ocean Whale and Ecosystem Research (IWC/SOWER)" have been conducted since the 1995 season as a part of the Japanese Whale Research Program Under special Permit in the Western North Pacific (JARPN). Distribution patterns of large whales such as blue, fin, sei, Bryde's, minke, humpback, right and sperm whales had been analyzed and abundance estimates of minke, sei and Bryde's whales were also calculated and reported to the IWC/Scientific Committee (SC) (IWC, 2001, 2009, Pastene *et al.*, 2007, 2008, 2009, Matsuoka *et al.*, 2009). The National Research Institute of Far Seas Fisheries (NRIFSF) also has been conducting dedicated sighting survey for cetaceans in the North Pacific since the 1980s (Buckland *et al.*, 1992, Miyashita and Kato, 2004, 2005).

In 2010, the Government of Japan planed to continue the surveys in the North Pacific. The 2010 surveys was focused on the collection of line transect data to estimate abundance and biopsy / photo-identification data, which would make a valuable contribution to the work of the SC on the management and conservation of populations of large whales in the North Pacific (IWC, 2009). The plan had presented to the 62th SC (SC/62/O16) and endorsed by the SC (IWC, 2010). The Institute of Cetacean Research (ICR) conducted the following systematic sighting survey plan based on the IWC/SOWER survey procedures using dedicated sighting survey vessel in the research area.

RESEARCH PLAN

Research vessel

Yushin-Maru No.3 (YS3) was engaged as a dedicated sighting survey vessel (SV). YS3 was equipped with a top barrel platform (TOP) and upper bridge. The ICR research data collecting system was set on the vessel. Specification of the YS3 is shown in Table 1.

Researcher

Isamu Yoshimura who has considerable line transect whale sighting survey experience in the North Pacific, Antarctic and West Africa as well as experience conducting biopsy and photo-id experiments through the IWC/IDCR-SOWER and JARPN II Programs was participated on YS3 through the survey period.

Research schedule

First cruise:

- 8 June, pre-cruise meeting
- 9 June, leave Shimonoseki Port, Yamaguchi Prefecture, Japan
- 18 July, arrive at Ishinomaki Port, Miyagi Pref. (refueling), Japan

Second cruise:

- 20 July leave Sendai-Shiogama Port, Miyagi Pref., Japan
- 17 August arrive at Shimonoseki Port, Yamaguchi Pref., Japan

Research area and track line design

The research area for the first cruise was set from 35° N to 40° N, between 157° E and 170° W in a longitudinal span of 33° in the Western North Pacific. The research area for the second cruise was set from 32° N to 37° N, between 145° E and 180° in a longitudinal span of 35° in the Western North Pacific (Figures 1 and 2). The survey blocks and pre-determined track lines are shown in Figures 1 and 2. The block boundaries are based on the latitudinal / longitudinal lines. Track lines are decided based on the origin longitude line which selected at random, and the number of the line (width in the longitude) is decided by the research schedule.

First cruise: origin longitude 166°-44'E, width 10 degrees

Second cruise: origin longitude 146°-23'E, width 11 degrees and 40 minutes

A total research distance in the first cruise and second surveys will be 3,723 n.miles and 3,913 n.miles, respectively.

Primary searching activity

Closing and Passing modes surveys followed the protocol endorsed for the IWC/SOWER cruise (IWC, 2008). The survey modes were changed in each "Way point" in Figure 1 and Figure 4. There were two primary observers in the top barrel (TOP) and the upper bridge (Captain and Helmsman), respectively. On the TOP, two observers conducted searching for cetaceans by using scaled binoculars (7x). On the upper bridge, two primary observers also searched for cetaceans and record sighting information. The survey was conducted 12 hours per day from 7:00 a.m. to 7:00 p.m. basically when the weather conditions were suitable for observations: visibility better than 2.0 n.miles, and the wind speed less than 21 knots. The vessel speed was planned to be 11.5 knots with slight adjustment to avoid vibration of vessel.

Experiments

Distance and angle measurement training was conducted at the first stage of the survey. The experiment to evaluate measurement error was conducted around the last stage of the survey following the protocol for the IWC/SOWER cruise (IWC, 2008). When large cetaceans such as blue, right and humpback whales are found, photographs are to be taken for photo-identification. Biopsy skin sampling of blue, fin, sei, Bryde's, humpback, right and sperm whales was opportunistically collected for assessing stock structure if encountered.

RESULT AND DISCUSSION

Searching effort

Summary of the searching effort (n.miles) in each survey mode is shown in Table 2. During the first cruise, a total of 2,488.47 n.miles were covered on primary effort: passing mode – 1,055.98 n.miles and closing mode – 1,432.49 n.miles. During the second cruise, a total of 2,158.40 n.miles were covered on primary effort: passing mode – 1,105.15 n.miles and closing mode – 1,053.25 n.miles.

Sightings

Lists of the sightings in the research area, by species and by the cruise are presented in Tables 3. Figures 2, 3, 5 and 6 illustrate the location of the sightings. Highlights from the first cruise were included sightings of 35 blue whales, 71 sei whales and 44 Bryde's whales. Blue whales were sighted mainly in the west side of 180E. Numerous sei and Bryde's whales were also observed on the same cruise track line. Highlights from the second cruise were included 101 individual sightings of Bryde's whale, 97 sperm whales. Detailed sightings by each species are as follows:

Blue Whale

High density area of blue whales was observed. They concentrated between 180°E- 170°W (35°N-40°N). A total of 27 groups (35 individuals) of blue whales were observed in the first cruise (Figure 2). While 1 group (2 individuals) of blue whales was observed during the second cruise (Figure 5). Observed mean school size was 1.25 (n=27). One mother and calf pair was observed in 5 July. Range of the estimated body length of blue whales confirmed was 19.2 – 25.5 meters. Range of the sea temperature of the sighting position of blue whales was 14.1°C - 20.6°C. It was known that there were some sightings of this species in this area during July to August between 1964 and 1990 (Miyashita *et al.*, 1995). It is recognized that this area is still important area of this species. This information is important and useful for the future sighting survey planning in the North Pacific (IWC, 2010).

Fin Whale

A total of 5 groups (6 individuals) of fin whales were observed in the first cruise (Figure 2). There were no sightings of fin in the second cruise. Observed mean school size was 1.20 (n=5). No mother and calf pair was observed. Range of the estimated body length confirmed was 16.3 – 18.7 meters. Range of the sea temperature of the sighting position was 17.3°C - 23.4°C.

Sei Whale

Sei whales were most frequently observed species in the first cruise (40 groups, 72 individuals). High density area was observed between 175°E- 170°W (37°N-40°N). There was no distribution boundary among the 180°E (Figure 2). While of 1 group (1 individual) was observed during the second cruise (Figure 5). Observed mean school size was 1.78 (n=41). Ten mother and calf pairs were observed during the first cruise. Range of the

estimated body length confirmed was 7.8 – 14.8 meters except calves. Range of the sea temperature of the sighting position was 13.2°C - 25.8°C.

For the distribution of this species, it was known that there were some sightings of this species in this area during July to August between 1964 and 1990 (Miyashita *et al.*, 1995). According to the recent results, one is the 2010 IWC/Japan joint Cetacean Sighting Survey in the North Pacific, sei whales were widely distributed between 170°E- 170°W (from 40°N to 47°N) (Matsuoka *et al.*, 2011) during July to August. The other one is the JARPNII dedicated sighting survey data, this species were widely distributed from Japanese coast to 170E during July to August (Hakamada *et al.*, 2009). It is cleared that this species are widely distributed in the North Pacific and these results correspond to the result from the statistical estimates of the distribution pattern of this species without boundary among 180°E (Murase *et al.*, 2009). This information is also important and useful for the future sighting survey planning in the North Pacific (IWC, 2010).

Bryde's Whale

Bryde's whales were most frequently observed species in the second cruise. A total of 45 groups (58 individuals) were observed in the first cruise. And a total of 71 groups (101 individuals) were observed during the second cruise (Figure 5). Observed mean school size was 1.37 (n=116). Sixteen mother and calf pairs were observed during the both cruise. Range of the estimated body length confirmed was 8.8 – 13.6 meters except calves. Range of the sea temperature of the sighting position was 16.0°C - 27.3°C.

Bryde's whales are widely distributed in summer in the western North Pacific south of 40°N based on the recent Japan/NRIFSF and US/NOAA sighting data (Shimada, 2008; Jackson, 2003) and JARPN/JARPN II catches (Pastene *et al.*, 2009). They also occur in the eastern North Pacific but the sighting effort is more limited. Present results of this paper will elucidate for the distribution pattern of this species.

Sperm Whale

Sperm whales were the most frequently encountered toothed whale species in the research area. A total of 21 groups (48 individuals) were observed during the first cruise and a total of 59 groups (106 individuals) were observed during the second cruise. Observed mean school size was 1.92 (n=116). Because of limited closing to the schools, there was no information for body length and calves. Range of the sea temperature of the sighting position was 13.6°C - 27.7°C.

Experiments

Estimated Angle and Distance Training Exercise and Experiment

The Estimated Angle and Distance Training Exercise were conducted during the first cruise. During the exercise the observers familiarized themselves with distance estimates from the TOP and Upper Bridge. The Estimated Angle and Distance Experiment were conducted on 28 June.

Biopsy experiments

All of the biopsy attempts were made using the compound crossbow system. Allocation of research time to biopsy attempts was initially restricted with the aim of maximizing the searching effort to cover the research area. A total of 13 biopsy samples were collected from 13 individuals of sei (7 samples) and Bryde's whales (6 samples) (Table 5). Unfortunately, all samples collected during this survey were washed away in the Ayukawa ICR laboratory by the Tsunami at 11 March 2010.

Photo-ID experiments

A total of 17 sightings of blue whales were photographed for the Photo-ID experiments (Table 4). As a preliminary results, individual photo IDs were obtained for 23 blue whales.

Data entry and analysis

The researcher input data collected (weather, effort, sighting and data from experiments) to the computer on board during the survey. These data stored at the Institute of Cetacean Research (ICR) and necessary data for the abundance estimation were already submitted to the IWC secretariat (confirmed 6 December 2010) for use under the RMP based on the IWC/SC Guidelines (Hammond and Donovan, 2004).

Report of the IWC oversight

The plan of this cruise had presented to the 62th SC (SC/62/O16) and endorsed by the Scientific Committee (IWC, 2010). Koji Matsuoka carried out the oversight work through the planning and the execution of this sighting survey conducted by the Institute of Cetacean Research (ICR) in June-August 2010 on behalf of the SC. The research vessels, *Yushin-Maru No.3* (742 tones), was planned to operate the cruises. All equipments and the survey method were same as the past sighting surveys. The survey areas were composed of first and second cruises in the Western and Central North Pacific. The design of the blocks and track lines was improved to cover each block with uniform probability. The planned sighting procedure was in accordance with the guideline agreed by the SC. As explained the objectives of the survey and its procedure to the vessel, the Captain, officers, crew and researcher fully understood the objectives and methods for operating the survey properly before starting the survey. Sighting data was already sent to the IWC secretary and confirmed at 6th December 2010.

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Table 1. Specification of the YS3.

<i>Yushin-Marui No.3</i>	
Call sign	7JCH
Length overall [m]	69.61
Gross tonnage (GT)	742
Barrel height [m]	19.5
Upper bridge height [m]	11.5
Bow height [m]	6.5
Engine power [PS / kW]	5280 / 3900

Table 2. Summary of the searching effort (n.miles) in each survey mode.

Effort	Period	Passing	Closing	Total
First	2010.6.11-7.17	1,055.98	1,432.49	2,488.47
Second	2010.7.20-8.16	1,105.15	1,053.25	2,158.40
Total		2,161.13	2,485.74	4,646.87

Table 3. Number of sightings for the species observed during the survey in each survey cruise.

Species	First period				Second period				Total	
	Primary		Secondary		Primary		Secondary			
	Sch.	Ind.	Sch.	Ind.	Sch.	Ind.	Sch.	Ind.	Sch.	Ind.
Blue whale	27	35	0	0	1	2	0	0	28	37
Fin whale	4	5	1	1	0	0	0	0	5	6
Sei whale	39	71	1	1	1	1	0	0	41	73
Bryde's whale	44	57	1	1	70	100	1	1	116	159
Sperm whale	17	40	4	8	54	97	5	9	80	154
Unid. Large cetacean	34	44	19	20	25	33	12	12	90	109
Unid. Cetacean	5	5	0	0	5	5	0	0	10	10

Table 4. Results of photo-id experiment in each survey cruise.

Photo-ID	blue	
	sch.	ind.
First	16	21
Second	1	2
Total	17	23

Table 5. Results of biopsy sampling experiment in each survey cruise.

Biopsy	blue			Sei			Bryde's		
	sch.	ind.	sample	sch.	ind.	sample	sch.	ind.	sample
First	16	21	0	11	14	7	12	14	6
Second	1	2	0	0	0	0	0	0	0
Total	17	23	0	11	14	7	12	14	6

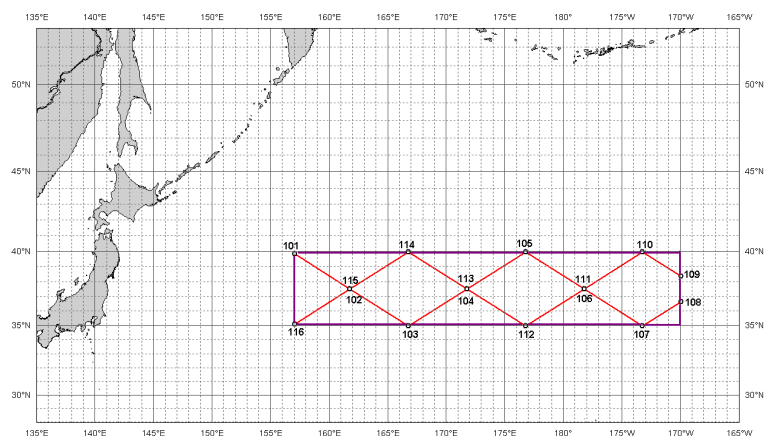


Figure 1. Pre-determined track line for the first cruise in 2010.

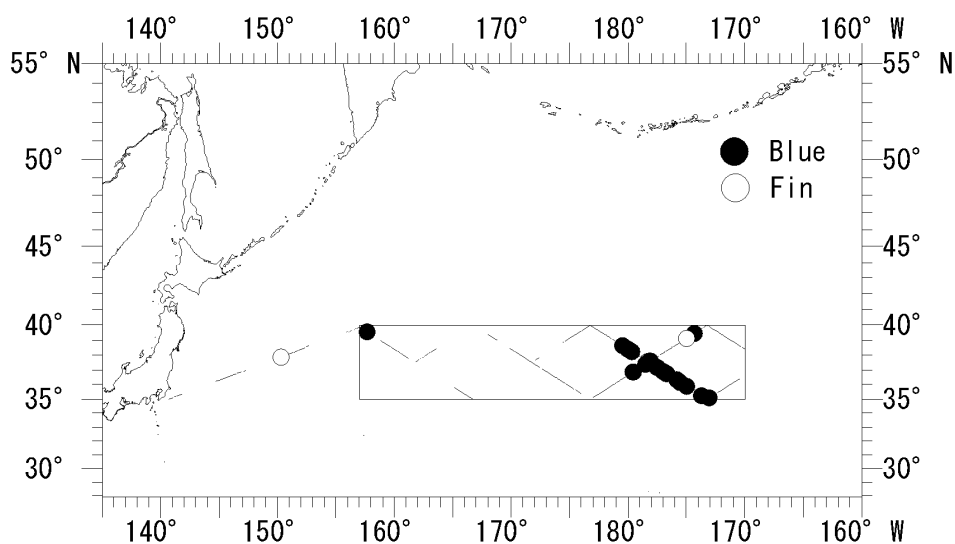


Figure 2. Positions of blue (black circle) and fin (white circle) whales observed in the first cruise.

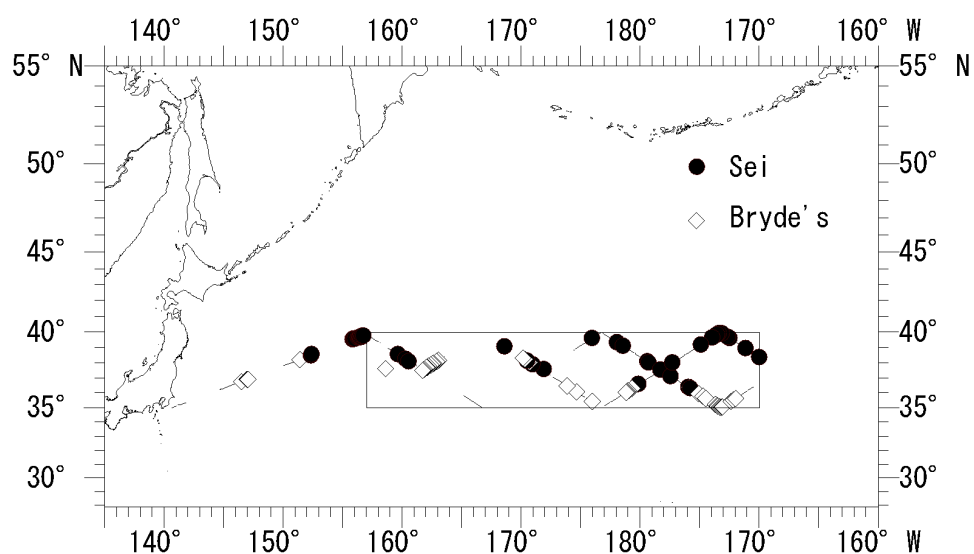


Figure 3. Positions of sei (black circle) and Bryde's (triangle) whales observed in the first cruise.

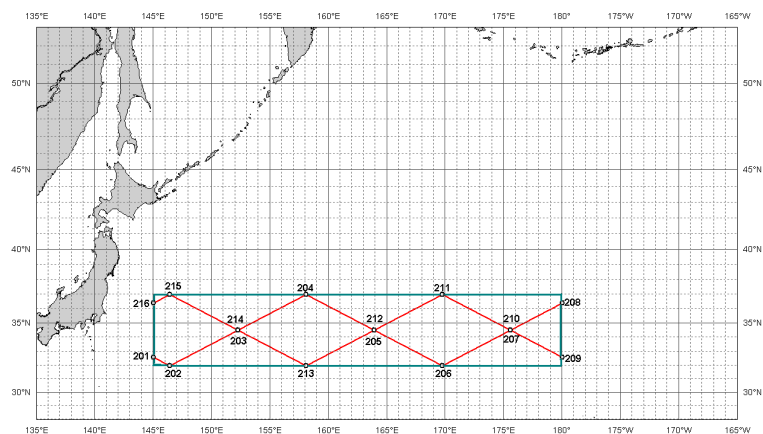


Figure 4. Pre-determined track line for the second cruise in 2010.

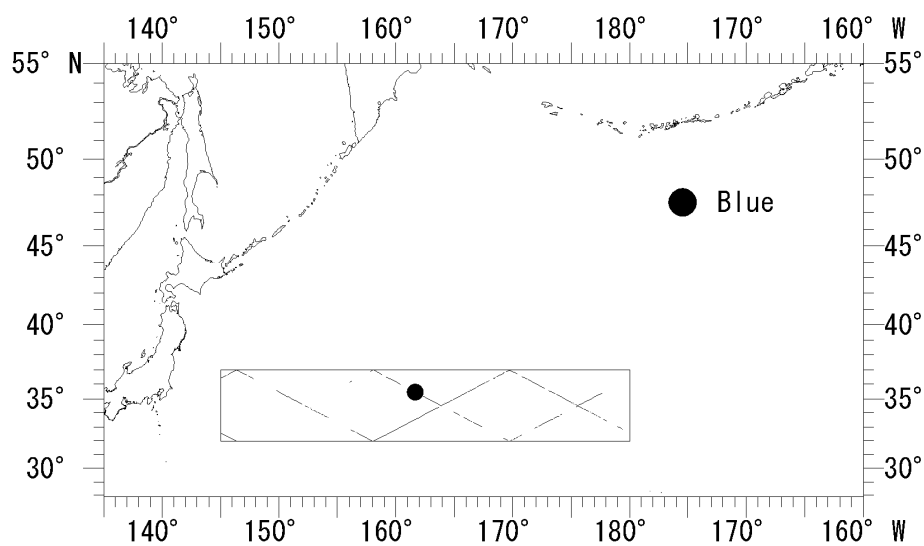


Figure 5. Positions of blue (black circle) whale observed in the second cruise.

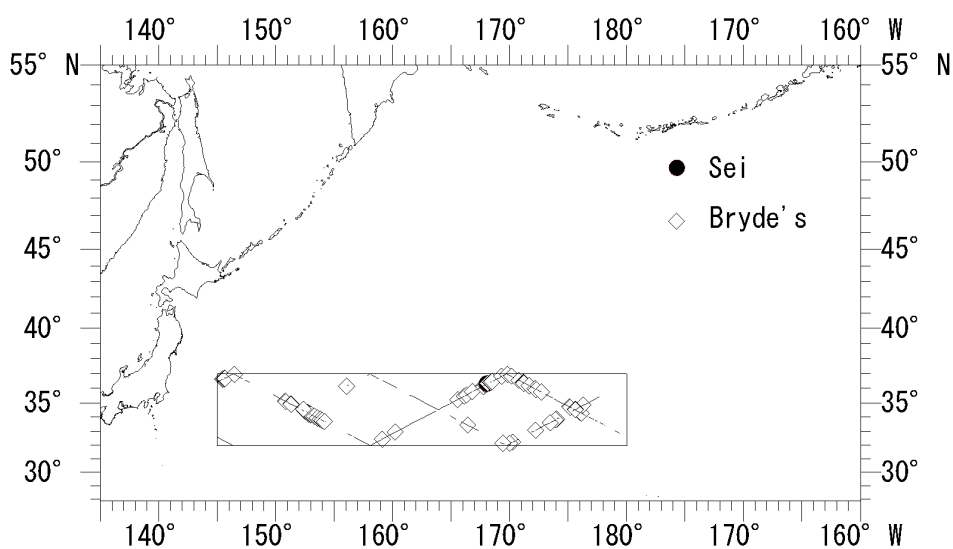


Figure 6. Positions of sei (black circle) and Bryde's (triangle) whales observed in the second cruise.