Cruise report of the Japanese cetacean sighting survey in the western North Pacific in 2012

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ABSTRACT

Three systematic vessel-based sighting surveys were conducted in the spring/summer of 2012 by Japan to examine the distribution and abundance of large whales in the western North Pacific. The research area for 'Survey 1' was set between 35° N and 44° N and between 140° E and 150° E (sub-area 7). The research area for 'Survey 2' was set between 30° N and 40° N and between 140° E and 170° E. The research area for 'Survey 3' was set between 41° N and 44° N, and between 141° E and 147°E (sub-area 7CN). Survey 1 was conducted between 17 May and 30 June. Survey 2 was conducted between 20 August and 3 October and the Survey 3 was conducted between 14 September and 1 October. The research vessels *Yushin-Maru* (Survey 2), *Yushin-Maru No.2* (Survey 2) and *Yushin-Maru No.3* (Surveys 1 and 3) were engaged in these surveys. A total of 2,728.3 n.miles, 5,291.8 n.miles and 727.6 n.miles were searched in Surveys 1, 2 and 3, respectively. Successful coverage of the searching efforts of each survey was 75%, 98% and 86%, respectively. Blue whale was sighted in Survey 2 around 40°N. Fin and humpback whales were mainly sighted in Surveys 1 and 3. Sei whales were mainly sighted in Surveys 1. Common minke whales were sighted in Surveys 1 and 3. Sperm whales were sighted in Survey 2. In total, seven species including six baleen whales, blue (1 school / 1 individual), fin (10/17), sei (12/15), Bryde's (137/183), common minke (61/74) and humpback (32/42) whales (13/20) and one toothed whale, sperm whales (169/426) were sighted during the surveys. Few encounters of common minke whales may be attributed to insufficient allocation of searching effort in the offshore waters in Survey 1 and such a small number of sightings appear not to be suitable for estimating abundance of this species. Concentration areas of common minke whales in the coastal waters of Surveys 1 and 3, Bryde's whales in Surveys 2 were observed, respectively. Photo-ID photographs were successfully taken from blue (1 individual) and humpback (10 individuals) whales. Biopsy skin samples were also successfully collected from blue (1), fin (1) and Bryde's (42) whales.

KEY WORD: SEI WHALES, BRYDE'S WHALE, COMMON MINKE WHALES, BLUE WHALES, SPERM WHALES, SURVEY VESSEL, NORTH PACIFIC

INTRODUCTION

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 1995 as a part of the Japanese Whale Research Program under Special Permit in the Western North Pacific (JARPN/JARPNII). Based on the collected data the distribution patterns of large whales such as blue, fin, sei, Bryde's, common minke, humpback, North Pacific right and sperm whales, and abundance estimates of common minke, sei and Bryde's whales were investigated and reported to the IWC SC (IWC, 2001, 2010, Pastene *et al*., 2007, 2008, 2009, Hakamada *et al.*, 2009, Matsuoka *et al*., 2009). The National Research Institute of Far Seas Fisheries (NRIFSF) also conducts dedicated sighting survey for cetaceans in the North Pacific since the 1980s (Buckland *et al.,* 1992; Miyashita and Kato, 2004; 2005, Kanaji, 2011). In 2012 the Government of Japan planned to continue the sighting surveys in the North Pacific. The collection of sighting data to estimate abundance and biopsy/photo-identification data to examine stock structure will contribute to the work on management and conservation of large whales by the IWC SC (IWC, 2010).

This paper reports the results of the Japanese dedicated sighting surveys conducted in spring/summer of 2012. The plan of these three 'Surveys' had been presented to the 2012 IWC/SC meeting (Matsuoka *et al*., 2012) and endorsed by the SC (IWC, 2012).

MATERIALS AND METHODS

Research vessels

'Survey 1' was conducted by the research vessel *Yushin-Maru No.3* (YS3), 'Survey 2' by *Yushin-Maru (YS1)* and *Yushin-Maru No.2* (YS2) and 'Survey 3' by *Yushin-Maru No.3* (YS3). The vessels were equipped with a top barrel platform (TOP) and upper bridge. Specifications of these vessels are shown in Table 1.

Research area and period

The research area for Survey 1 was set between 35° N and 44° N and between 140° E and 150° E in May to June. The research area for Survey 2 was set between 30° N and 40° N and between 157° E and 170° E in August to September. The research area for Survey 3 was set between 41° N and 44° N, and between 141° E and 147°E in September (Table 2 and Figure 1).

Track line design

The Survey blocks and pre-determined track lines are shown in Figures 1. Waypoint (WP) for each sub-areas were calculated by the PROGRAM DISTANCE ver. 6.0 (option; equal spaced zigzag) (Thomas *et al.*, 2010). Start point of the Track lines are decided at random, and the number of the line (width in the longitude) is decided by the research schedule based on the IWC guideline (IWC, 2005).

Sighting procedure

Passing mode with closing during the abeam was used, which followed the protocol endorsed for the IWC/SOWER cruise (IWC, 2008). 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 recorded 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 wind speed less than 21 knots. The vessel searching speed was planned to be 11.5 knots with slight adjustment to avoid vibration of vessel.

Research personnel

One researcher was on board of each research vessel. The researchers had considerable experience on whale line transect surveys in the North Pacific, Antarctic and West Africa as well as experience conducting photo-id and biopsy experiments through participation in the IWC/IDCR-SOWER and JARPN II Programs. Koji Matsuoka (Institute of Cetacean Research) was the oversight persons on behalf of the IWC/SC.

Experiments

Distance and angle experiments were conducted earlier in the Surveys. The experiment to evaluate measurement error was conducted late in the survey following the protocol of the IWC/SOWER cruise (IWC, 2008). When large cetaceans such as blue, humpback and right whales were found, photo-id experiments were conducted. Biopsy skin sampling of blue, fin, Bryde's, humpback, North Pacific right and sperm whales was opportunistically collected.

RESULT AND DISCUSSION

Brief narrative of the Surveys

For Survey 1, vessel (YS3) departed Shiogama, Japan on 17 May and started survey in the research area on 18 May. The vessel finished completed research on 29 June and arrived at Shiogama on 30 June. Vessels (YS1 and YS2) departed Shimonoseki, Japan on 20 August for Survey 2 and started survey in the research area on 23 August. The vessel finished research on 24 September and arrived at Shimonoseki on 3 October. For Survey 3, vessel (YS3) departed Shiogama, Japan on 14 September and started survey in the research area on 15 September. The vessel finished research on 27 September and arrived at Shiogama on 1 October (Table 2).

Searching effort

A summary of the period covered and sighting effort in each Survey is shown in Table 2. During Survey 1 a total of 2,728.3 n.miles was searched (74.8% covered); during Survey 2 a total of 5,415.9 n.miles was searched (97.7 % covered). During Survey 3 a total of 843.7 n.miles was searched (86.2 % covered).

Sightings

Sightings made are summarized in Table 3, by Survey and species. Figures 2, 3 and 4 show the location of these sightings.

Blue Whale
One blue whale was sighted on 18 September in Survey 2 at 39°-38'N, 164°-36'E (Table 3 and Figure 3). Estimated body length was 20.3 meters. The sea temperature of the sighting position of this whale was 22.8°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 in September. This information is important and useful for the future sighting survey planning in the North Pacific.

Fin Whale
Fin whales were mainly sighted in Surveys 1 and 3. A total of 10 schools (17 individuals) of this species were sighted (Table 3). High density was observed between 157°E- 170°E (45°N-50°N). Observed mean school size was 1.35 (n=23). One mother and calf pair was observed. Range of the estimated body length was 14.2 – 22.1 meters except calf. Range of the sea temperature of the sighting position was 2.9°C – 16.3°C.

Sei Whale
Sei whales were mainly sighted in Surveys 1 (12 schools, 15 individuals). Two mother and calf pairs were observed. Observed mean school size was 1.25 (n=12). Range of the estimated body length was 11.0 – 14.1 meters except calves. Range of the sea temperature of the sighting position was 16.6°C - 22.6°C.

Bryde's Whale
Bryde's whales were most sighted in the Surveys 1 and 2. A total of 137 schools (183 individuals) were observed (Table 3). Observed mean school size was 1.33 (n=137). A total of ten schools were mother and calf pairs. Range of the estimated body length was 12.0 – 12.6 meters except calves. Range of the sea temperature of the sighting position was 19.0°C - 28.2°C. Bryde's whales are widely distributed in summer in the western North Pacific south of 40ºN based on the recent Japan/NRIFSF and JARPN/JARPN II catches ((Shimada, 2004; Pastene *et al*., 2009).

Common minke whale
Common minke whales were the second most sighted baleen whales in the Surveys 1 and 3 (Figures 2 and 4). No mother and calf pair was observed. Range of the sea temperature of the sighting position was 5.2°C - 23.0°C. Few minke whales were observed in offshore waters (7W and 7E) during June 2012 (5 schools / 5 individuals) The few encounters were attributed to insufficient allocation of searching effort in these waters and anomalous condition of the ocean (storms and heavy fogs).

Humpback whale
Humpback whales were mainly sighted in Surveys 1 and 3 in the coastal waters and were the third most sighted baleen whale species (32 schools, 42 individuals). Observed mean school size was 1.31 (n=32). Two mother and calf pairs were observed. Range of the estimated body length was 11.1 – 13.3 meters except calves. Range of the sea temperature of the sighting position was 7.1°C – 21.2 °C.

Sperm Whale
Sperm whales were widely sighted in the whole research area and were the most frequently encountered toothed whale species in the research area (Table 3). A total of 169 schools (426 individuals) were observed during the Surveys. Observed mean school size was 2.52 (n=169). 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 22.9°C - 28.6°C.

Experiments
Estimated Angle and Distance
The Estimated Angle and Distance Training Exercise were conducted earlier in the Surveys. 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 16 June in Surveys 1 and 3, 27 August (YS2) and 13 September (YS1) in Survey 2.

Photo-ID experiments
Photographs were taken from 10 humpback whales in Survey 1, from 1 blue whale in Survey 2. A total of 1 individual of blue and 10 individuals of humpback whales were photographed (Table 4 and 6). All photographs

were stored at the ICR catalogue.

Biopsy
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 44 biopsy samples were collected from one blue, two fin and 42 Bryde's whales (Table 5 and 6). All samples were stored at the ICR laboratory.

Report of the IWC oversight
The plan of the Surveys was presented to the 2012 IWC/SC meeting (Matsuoka *et al*., 2012) and endorsed by the Scientific Committee (IWC, 2012). 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 May-September 2012 on behalf of the SC. The research vessels, *Yushin-Maru*, *Yushin-Maru No.2* and *Yushin-Maru No.3* was planned to operate the Surveys. All equipment and the survey method were same as the past sighting surveys. The design of the Survey blocks and track lines was improved to cover each Survey block with uniform probability. The planned sighting procedure was in accordance with the guideline agreed by the SC (IWC, 2005). Objectives and procedure of the survey were explained to the captains, officers, crew and researcher in advance. Few encounters of common minke whales may be attributed to insufficient allocation of searching effort in the offshore waters (7W and 7E) in Survey 1 and such a small number of sightings appear not to be suitable for estimating abundance of this species. Sighting data was already sent to the IWC secretary and confirmed on 4th April 2013.

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Table 1. Specification of the research vessels.

	Yushin-Maru	*Yushin-Maru No.2*	*Yushin-Maru No.3*
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
Upper bridge height [m]	11.5	11.5	11.5
Bow height [m]	6.5	6.5	6.5
Engine power [PS / kW]	5,280 / 3,900	5,280 / 3,900	5,280 / 3,900

Table 2. Summary of the survey periods and searching effort (n.miles), by the Survey.

Survey	Research period	Cruise period	Research area period	Planned cruise track (n.miles)	Searching effort (n.miles)	Coverage of effort (n.miles)
Survey 1 (YS3)	Sub-area 7	2012.5.17-6.30	2012.5.18-6.29	3,645.4	2,728.3	74.8%
Survey 2 (YS1 & YS2)	30° N -40° N and 140° E-170° E	2012.8.20-10.3	2012.8.23-9.24	5,415.9	5,291.8	97.7%
Survey 3 (YS3)	Sub-area 7	2012.9.14-10.1	2012.9.15-9.27	843.7	727.6	86.2%
Total	-	-	-	9,905.0	8,747.7	88.3%

Table 3. Number of sightings by species and Survey.

Survey	Survey 1 (YS1)				Survey 2 (YS1)				Survey 2 (YS2)				Survey 3 (YS3)				Total			
Species	Primary		Secondary		Primary		Secondary		Primary		Secondary		Primary		Secondary		Primary		Secondary	
	sch.	ind.	sch.	ind.	sch.	ind.	sch.	ind.	sch.	ind.	sch.	ind	sch.	ind.	sch.	ind.	sch.	ind.	sch.	ind.
Blue whale	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0
Fin whale	4	10	0	0	1	1	0	0	0	0	0	0	5	6	0	0	10	17	0	0
Sei whale	11	14	0	0	0	0	0	0	0	0	0	0	1	1	0	0	12	15	0	0
Bryde's whale	35	49	0	0	90	122	5	5	7	7	0	0	0	0	0	0	132	178	5	5
Common minke whale	40	49	2	2	0	0	0	0	0	0	0	0	19	23	0	0	59	72	2	2
Like minke	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	0	0
Humpback whale	29	39	3	3	0	0	0	0	0	0	0	0	0	0	0	0	29	39	3	3
Sperm whale	71	168	0	0	58	186	1	2	33	62	1	1	5	7	0	0	167	423	2	3
Unid. large whale	5	5	18	21	4	4	1	1	0	0	0	0	0	0	0	0	9	9	19	22

Table 4. Number of individuals photographed, by species and Survey.

Photo-ID	Survey 1 (YS3)	Survey 2 (YS1 &YS2)	Survey 3 (YS3)	Total
Blue whale	0	1	0	1
Humpback whale	10	0	0	10

Table 5. Number of biopsy samples collected, by species and Survey.

Biopsy	Survey 1 (YS3)	Survey 2 (YS1 & YS2)	Survey 3 (YS3)	Total
Blue whale	0	1	0	1
Fin whale	0	1	0	1
Bryde’s whale	0	42	0	42
Total	0	44	0	44

Table 6. Summary of the photo-ID and biopsy experiments. LD: Left dorsal; LL: Left lateral; RD: Right dorsal; RL: Right lateral; HD: Head; OT: Other.

Survey	Date	Sighting No.	Species	School size	Number of individuals photographed	Photo-ID result	Number of biopsy	Sample ID
Survey 1 (YS3)	21-May	3	Humpback	2	2	LD	0	-
	21-May	5	Humpback	1	1	LD, RD, FL	0	-
	27-May	1	Humpback	2	2	LD, RD, FL	0	-
	27-May	2	Humpback	1	1	LD, RD	0	-
	8-Jun	26	Humpback	1	1	RD	0	-
	9-Jun	4	Humpback	2	2	LD, RD, FL	0	-
	24-Jun	9	Humpback	1	1	RD, HD, OT	0	-
Survey 2 (YS1 & YS2)	24-Aug	2	Bryde's	1	0	-	1	J12NYS1Br01
	24-Aug	8	Bryde's	1	0	-	1	J12NYS1Br02
	26-Aug	8	Bryde's	1	0	-	1	J12NYS1Br03
	26-Aug	10	Bryde's	1	0	-	1	J12NYS1Br04
	26-Aug	14	Bryde's	1	0	-	1	J12NYS1Br05
	26-Aug	15	Bryde's	1	0	-	1	J12NYS1Br06
	27-Aug	3	Bryde's	1	0	-	1	J12NYS1Br07
	27-Aug	5	Bryde's	1	0	-	1	J12NYS1Br08
	27-Aug	6	Bryde's	1	0	-	1	J12NYS1Br09
	27-Aug	8	Bryde's	1	0	-	1	J12NYS1Br10
	27-Aug	14	Bryde's	1	0	-	1	J12NYS1Br11
	28-Aug	1	Bryde's	1	0	-	1	J12NYS1Br12
	28-Aug	9	Fin	1	0	-	1	J12NYS1F01
	28-Aug	12	Bryde's	1	0	-	1	J12NYS1Br13
	28-Aug	13	Bryde's	1	0	-	1	J12NYS1Br14
	28-Aug	14	Bryde's	1	0	-	1	J12NYS1Br15
	28-Aug	19	Bryde's	1	0	-	1	J12NYS1Br16
	29-Aug	6	Bryde's	1	0	-	1	J12NYS1Br17
	29-Aug	8	Bryde's	1	0	-	2	J12NYS1Br18,19
	29-Aug	13	Bryde's	1	0	-	2	J12NYS1Br20,21
	29-Aug	14	Bryde's	1	0	-	2	J12NYS1Br22,32
	29-Aug	16	Bryde's	1	0	-	1	J12NYS1Br24
	30-Aug	2	Bryde's	1	0	-	1	J12NYS1Br25
	4-Sep	2	Bryde's	1	0	-	1	J12NYS1Br26
	5-Sep	7	Bryde's	1	0	-	1	J12NYS1Br27
	5-Sep	8	Bryde's	1	0	-	1	J12NYS1Br28
	5-Sep	10	Bryde's	1	0	-	1	J12NYS1Br29
	5-Sep	11	Bryde's	1	0	-	1	J12NYS1Br30
	5-Sep	13	Bryde's	1	0	-	1	J12NYS1Br31
	6-Sep	2	Bryde's	1	0	-	1	J12NYS1Br32
	6-Sep	8	Bryde's	1	0	-	1	J12NYS1Br33
	6-Sep	9	Bryde's	1	0	-	1	J12NYS1Br34
	7-Sep	1	Bryde's	1	0	-	1	J12NYS1Br35
	12-Sep	1	Bryde's	1	0	-	2	J12NYS1Br36,37
	12-Sep	2	Bryde's	1	0	-	1	J12NYS1Br38
	13-Sep	2	Bryde's	1	0	-	1	J12NYS1Br39
	18-Sep	5	Blue	1	0	-	1	J12NYS1B01
	18-Sep	6	Bryde's	1	0	-	1	J12NYS1Br40

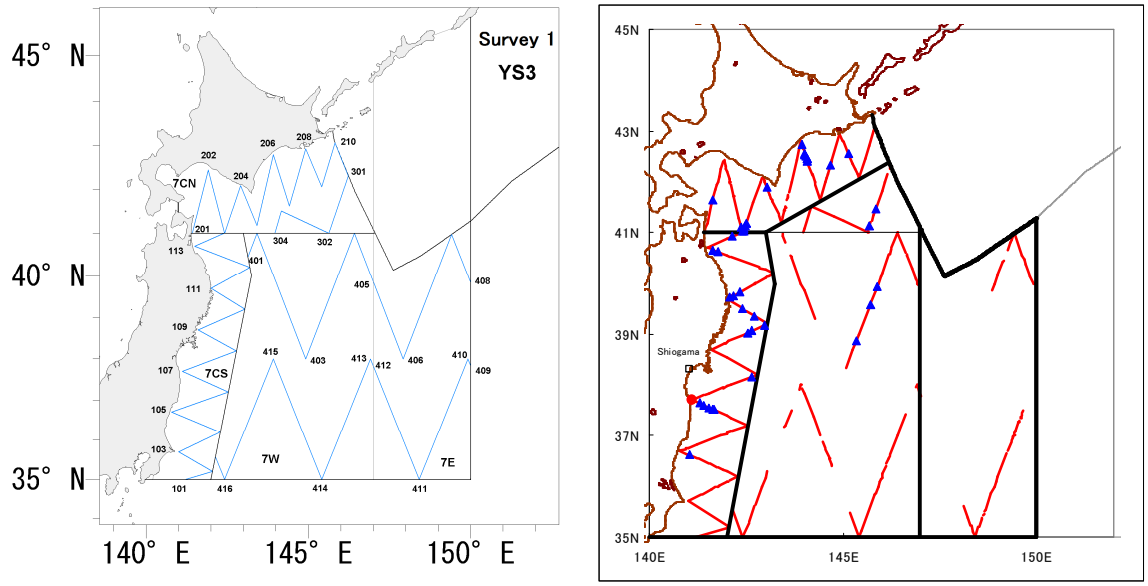

Figure 1. Pre-determined track line (left) and positions of common minke whale sightings during 'Survey 1' including searching effort in May to Jun 2012 (right).

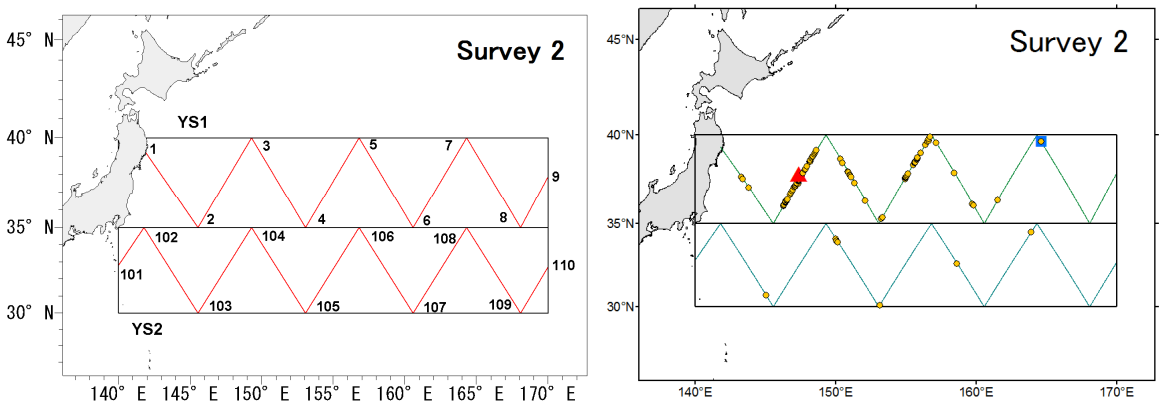

Figure 2. Pre-determined track line (left) and positions of Bryde's whale (circle) sightings during 'Survey 2' including searching effort in August to September 2012 (right). Blue whale: square, Fin whale: triangle.

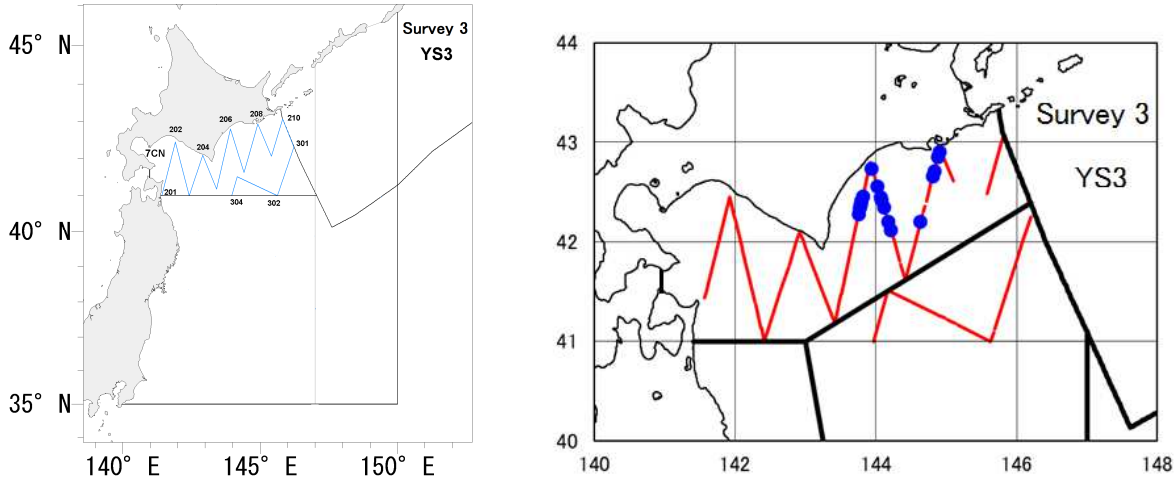

Figure 3. Pre-determined track line (left) and positions of common minke whale sightings during 'Survey 3' including searching effort in September 2012 (right).