Cruise report of the Japanese cetacean sighting survey in the western North Pacific in 2013

KOJI MATSUOKA[1], TAKAHIRO KONAGAI [2], TORU TAKAMATSU [2]AND TOMIO MIYASHITA[3]

[1]*Institute of Cetacean Research, Toyomi 4-5, Chuo-ku Tokyo, 104-0055, JAPAN*
[2]*Kyodo Senpaku Co. Ltd., Toyomi 4-5, Chuo-ku Tokyo, 104-0055, JAPAN*
[3]*National Research Institute of Far Seas Fisheries, Fukuura 2-12-4, Kanazawa, Yokohama, Kanagawa 236-8648, JAPAN*

Contact e-mail: matsuoka@cetacean.jp

ABSTRACT

A systematic vessel-based sighting survey was conducted in 2013 by Japan to examine the distribution and abundance of large whales in the western North Pacific. The research area was set between 35° N and 44° N and between 140° E and 157° E (sub-areas 7W, 7E and 8 for common minke whale). Survey was conducted between 18 May and 26 June. The research vessels *Yushin-Maru* and *Yushin-Maru No.2* were engaged in this survey. A total of 3,470.1 n.miles was searched in this survey. Successful coverage of the searching efforts of each sub-area was 74% for sub-area 7W&7E and 73% for sub-area 8, respectively. In total, eight species including seven baleen whales, blue (2 school / 2 individual), fin (26/35), sei (33/56), Bryde's (39/55), common minke (7/7), North Pacific right (1/1) and humpback (66/88) whales and sperm whale (75/225) were sighted during the survey. Concentration areas of sei, Bryde's and humpback whales were observed. Photo-ID photographs were successfully taken from blue (2 individuals), North Pacific right (1) and humpback (22) whales. Biopsy skin samples were also successfully collected from blue (1) and humpback (6) whales including a mother and calf pair of humpback whale.

KEY WORD: BLUE WHALES, FIN WHALES, SEI WHALES, BRYDE'S WHALE, COMMON MINKE 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, Murase *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 2013 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 result of the Japanese dedicated sighting surveys conducted in 2013. The plan of this survey had been presented to the 2012 IWC/SC meeting (Matsuoka *et al*., 2013) and endorsed by the SC (IWC, 2012).

MATERIALS AND METHODS

The surveys were conducted in 2013 in the western North Pacific by the research vessel *Yushin-Maru (YS1)* and *Yushin-Maru No.2* (YS2). 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 was set between 35° N and 45° N and between 140° E and 157° E in May to June (Table 2 and Figure 1).

Track line design
The Survey blocks and pre-determined track lines are shown in Figures 1. The Latitudinal start point of the track lines are decided at random using the "Distance program (ver.6.0) " and the number of the line (width in the longitude) is decided by the research schedule based on the IWC survey 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 North Pacific 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
Research vessels (YS1 and YS2) departed from Shimonoseki, Japan on 18 May and started survey in the research area on 21 May. The vessel finished research area on 21 June and arrived at Shiogama on 26 June (Table 2).

Searching effort
A summary of the period covered and sighting effort in each Survey is shown in Table 2. A total of 3,470.1 n.miles were searched (73.5% covered).

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

Blue Whale
Two schools and two individuals of blue whales were sighted in the northern part of sub-area 8 (Table 3 and Figure 2). Estimated body lengths of blue whales confirmed were 20.5 and 20.7 meters, respectively. The sea temperatures of the sighting position of these whales were 12.0°C and 16.6 °C, respectively. One mother and calf pair was observed. 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 July. These information are important and useful for the future sighting survey planning in the North Pacific.

Fin Whale
Fin whales were mainly sighted in the northern part of sub-area 7E and 8 (Figure 2). A total of 26 schools (35 individuals) of this species were sighted (Table 3). High density was observed between 147°E- 150°E (38°N-41°N). Observed mean school size was 1.35 (n=26). No mother and calf pair was observed. Range of the estimated body length confirmed was 11.7 – 23.0 meters. Range of the sea temperature of the sighting position was 4.9°C – 18.1°C.

Sei Whale
Sei whales were mainly sighted (33 schools, 56 individuals) in sub-area 8 (Table 3 and Figure 3). Six mother and calf pairs were observed. Observed mean school size was 1.70 (n=33). Range of the estimated body length was 9.5 - 14.6 meters except calves. Range of the sea temperature of the sighting position was 13.0°C - 20.4°C.

Bryde's Whale
Bryde's whales were most second sighted frequently for baleen whales and widely distributed in the southern part of the whole research area (Figure 3). A total of 39 schools (55 individuals) were observed (Table 3). Observed mean school size was 1.41 (n=39). 10 schools were mother and calf pairs. Range of the estimated body length was 8.0 – 13.4 meters except calves. Range of the sea temperature of the sighting position was 16.0°C - 21.5°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 sighted (7 schools and 7 individuals) in the northern part of the research area (Figures 3). No mother and calf pair was observed. Range of the sea temperature of the sighting position was 7.9°C – 17.1°C. In general, common minke whales were tended to distribute in the coastal area as surveyed in 2012 surveys (42 schools and 52 individuals sighted during 44 days coastal survey area, Matsuoka *et al*., 2012). The few encounters were attributed to insufficient allocation of searching effort in these waters and anomalous condition of the ocean (high swell due to storms and heavy fogs).

North Pacific right whale
North Pacific right whale was most rare species for baleen whales in the research area (1 school and 1 individual). This was sighted in the western part of sub-area 8 (Figure 2). Estimated body length was 11.6 meters. Range of the sea temperature of the sighting position was 13.4°C. Head of this animal was photographed as Photo-ID data. Biopsy sampling was also conducted but no sample was collected.

Humpback whale
Humpback whales were most sighted frequently for baleen whales in the research area (66 schools and 88 individuals). They were mainly sighted in the western part of sub-area 8 (Figure 2). Observed mean school size was 1.33 (n=66). Five mother and calf pairs were observed. Range of the estimated body length was 11.2 – 14.3 meters except calves. Range of the sea temperature of the sighting position was 5.6°C – 16.7 °C.

Sperm Whale
Sperm whales were most frequently sighted and widely distributed in the whole research are (Table 3 and Figure 4). A total of 75 schools (225 individuals) were observed during the Survey. Observed mean school size was 3.00 (n=75). At least one mother and calf pair was observed. 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 3.7°C - 21.4°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 4 June by YS1, and 5 June by YS2.

Photo-ID experiments
Photographs were taken from 1 blue and 11 humpback whales by YS1, from 1 blue whale, 1 North Pacific right whale and 11 humpback whales by YS2. A total of 2 individual of blue, 1 individual of North Pacific right and 22 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 7 biopsy samples were collected from 1 blue and 6 humpback whales including one mother and calf pair (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-June 2013 on behalf of the SC. The research vessels, *Yushin-Maru* and *Yushin-Maru No.2* were used for the cruises. All equipment and the survey method were the same as in 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. Sighting data was already sent to the IWC secretary and confirmed on 24 April.

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Table 1. Specification of the research vessels.

Vessel name	*Yushin-Maru*	*Yushin-Maru No.2*
Call sign	JLZS	JPPV
Length overall [m]	69.61	69.61
Gross tonnage (GT)	720	747
Barrel height [m]	19.5	19.5
Upper bridge height [m]	11.5	11.5
Bow height [m]	6.5	6.5
Engine power [PS / kW]	5,280 / 3,900	5,280 / 3,900

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

Research vessels	Cruise period	Research area period	Planned cruise track (n.miles)	Searching effort (n.miles)	Coverage of effort (n.miles)
YS1	2013.5.18-6.26	2013.5.21- 6.21	2,231.2	1,646.2	73.8%
YS2	2013.5.18-6.26	2013.5.21- 6.21	2,491.2	1,823.9	73.2%
Total	2013.5.18-6.26	2013.5.21- 6.21	4,722.4	3,470.1	73.5%

Table 3. Number of sightings by species and vessel.

Survey	YS1				YS2				Total			
Species	Primary		Secondary		Primary		Secondary		Primary		Secondary	
	sch.	ind.	sch.	ind.	sch.	ind.	sch.	ind.	sch.	ind.	sch.	ind.
Blue whale	1	1	0	0	1	1	0	0	2	2	0	0
Fin whale	10	14	0	0	15	20	1	1	25	34	1	1
Sei whale	7	12	1	2	23	40	2	2	30	52	3	4
Bryde's whale	21	29	1	1	16	24	1	1	37	53	2	2
Common minke whale	1	1	0	0	5	5	1	1	6	6	1	1
North Pacific right whale	1	1	0	0	0	0	0	0	1	1	0	0
Humpback whale	13	17	1	2	47	61	5	8	60	78	6	10
Sperm whale	44	166	2	2	29	57	0	0	73	223	2	2

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

Photo-ID	YS1	YS2	Total
Blue whale	1	1	2
North Pacific right	0	1	1
Humpback whale	11	11	22

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

Biopsy	YS1	YS2	Total
Blue whale	0	1	1
Humpback whale	4	2	6

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.

Vessels	Date	Sighting No.	Species	School size	Number of individuals photographed	Photo-ID result	Number of biopsy	Remarks/Sample ID
YS1	21-May	1	Humpback	2	2	LD, RD, FL	0	-
	12-June	11	Humpback	1	1	LD	0	-
	12-June	13	Humpback	1	1	LD, RD, FL	0	-
	13-June	1	Humpback	1	1	RD	0	-
	13-June	4	Humpback	2	2	RD, LD	2	Mother & calf pair/ J13NYS1H01 (Mother), J13NYS1H02 (Calf)
	13-June	10	Humpback	2	2	LD, RD, FL	2	J13NYS1H03, J13NYS1H04
	17-June	14	Humpback	2	2	RD, LD	0	Mother & calf pair/-
	21-June	4	Blue	1	1	RD, LD	0	-
	21-June	6	North Pacific right	1	1	HD, OT	0	-
YS2	26-May	20	Humpback	4	3	RD, LD	0	-
	27-May	16	Humpback	1	1	FL	0	-
	27-May	24	Humpback	2	2	LD, RD	1	Mother & calf pair/ J13NYS2H01(Mother)
	27-May	25	Humpback	1	1	FL, OT	0	-
	14-June	4	Blue	1	1	LD	1	J13NYS2B01
	15-June	5	Humpback	1	1	FL, RD	0	-
	18-June	1	Humpback	2	2	FL	0	-

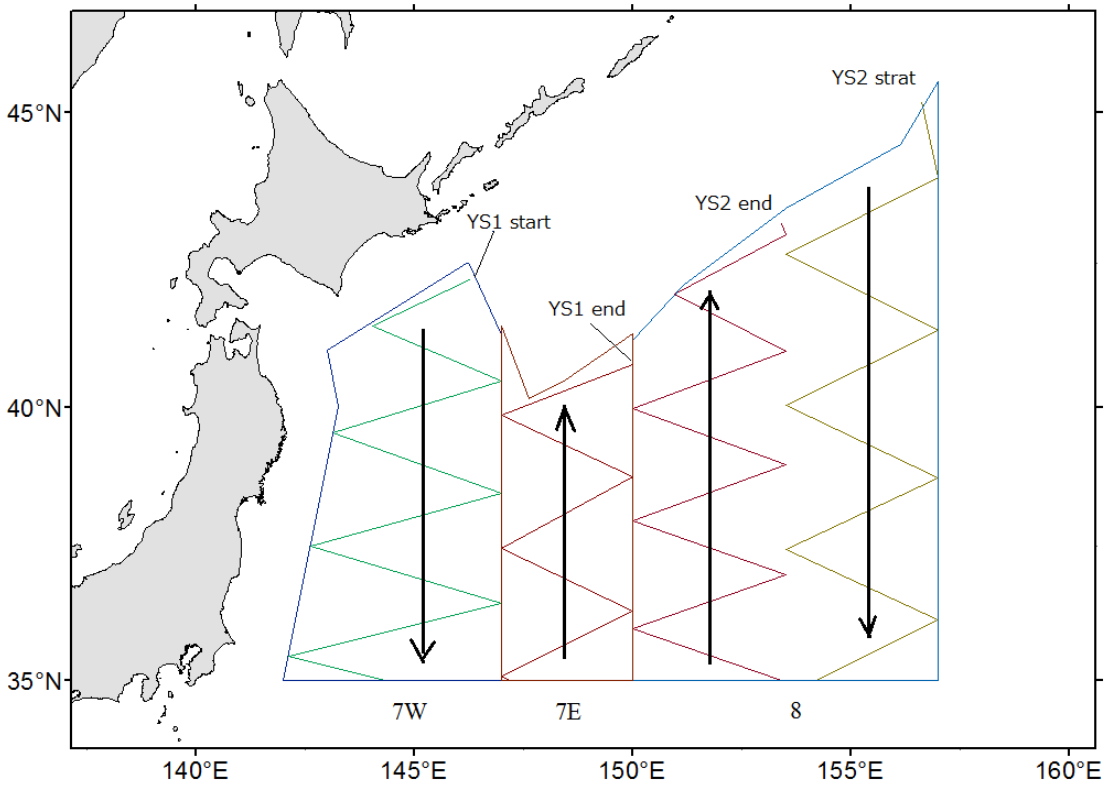

Figure 1. Pre-determined track line and survey directions for each sub-area (7W, 7E and 8) for this survey.

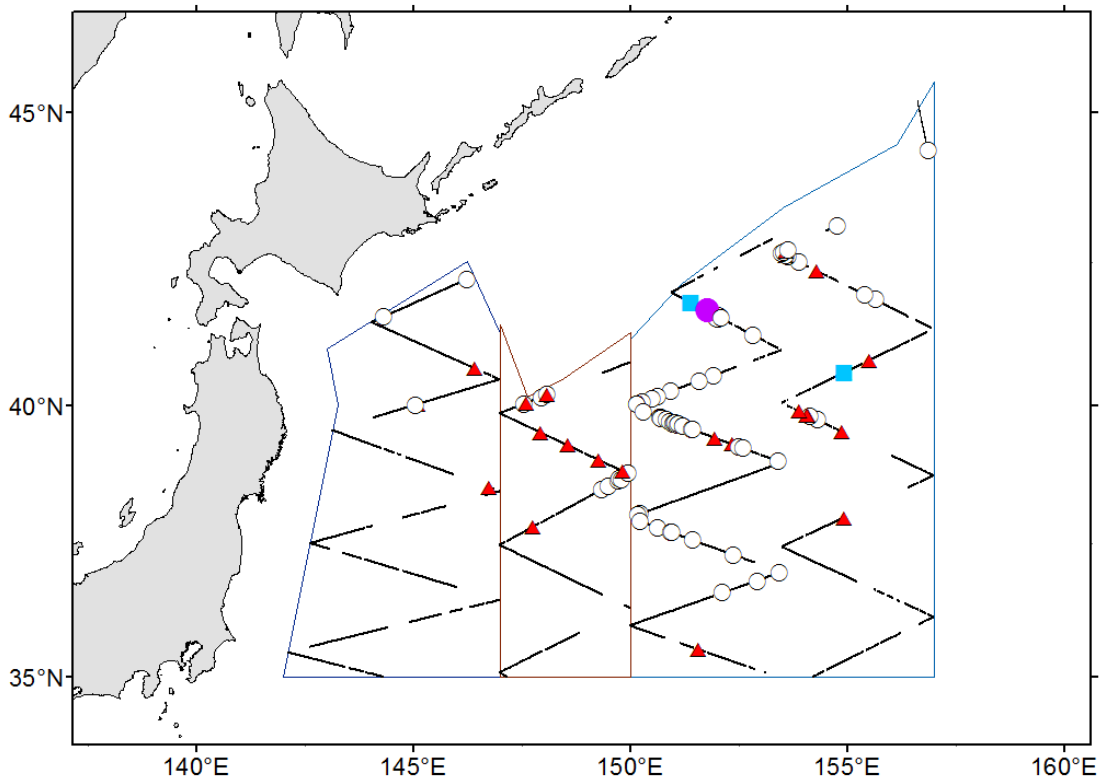

Figure 2. Positions of blue (blue square), fin (red triangle), North Pacific right (purple circle) and humpback (white circle) whale sightings including searching effort (black line).

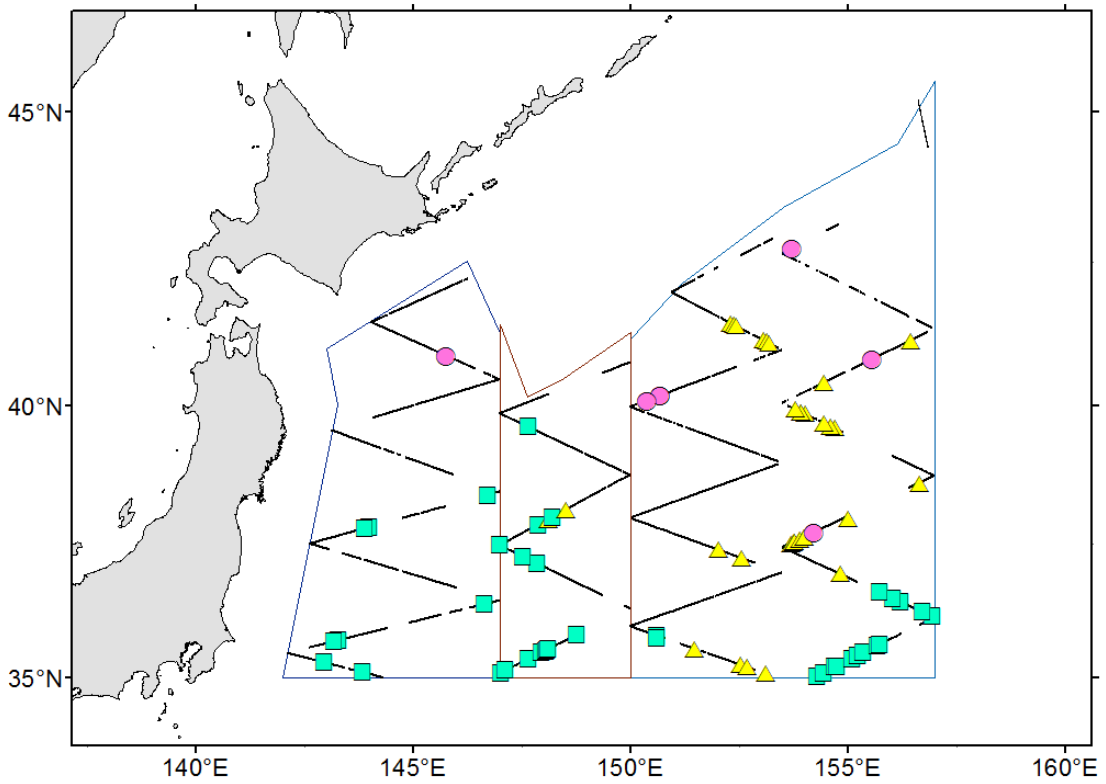

Figure 3. Positions of common minke (pink circle), sei (yellow triangle) and Bryde's (green square) whale sightings including searching effort (black line).

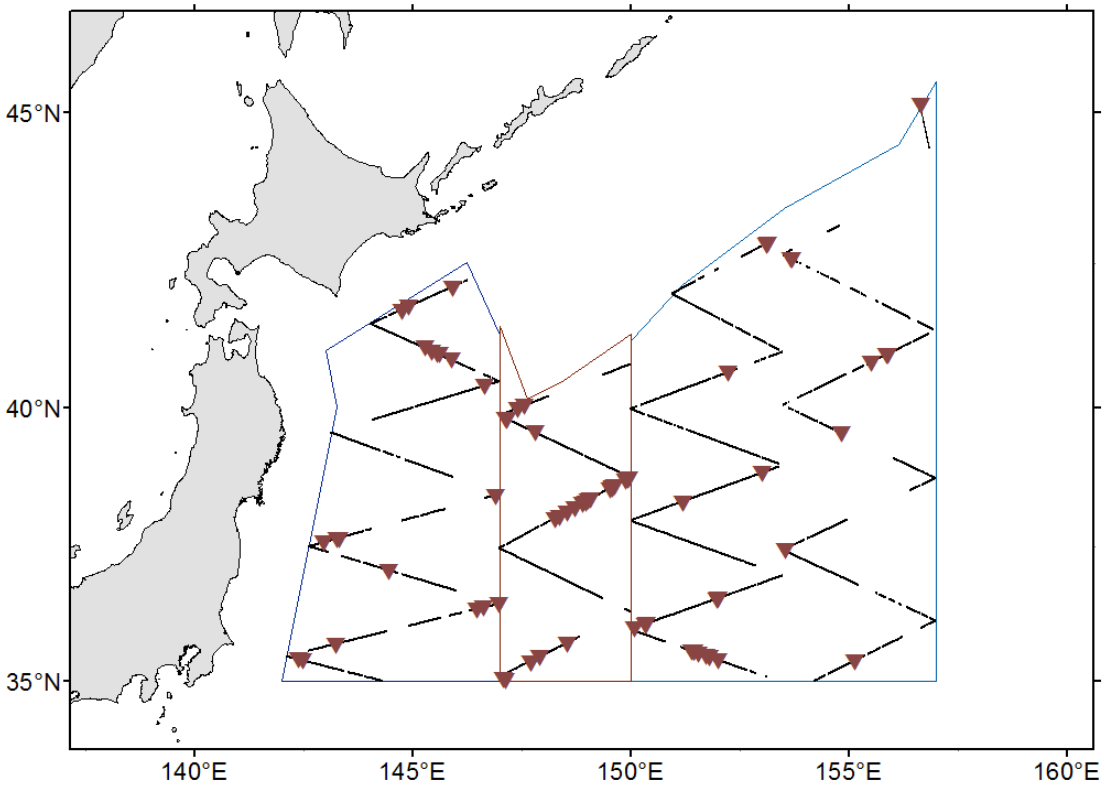

Figure 4. Positions of sperm (brown triangle) whale sightings including searching effort (black line).