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INTERNATIONAL WHALING COMMISSION

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ABSTRACT

The results of the 2014/15 Japanese dedicated whale sighting survey in the Antarctic Area IV (south of 60^{0}S) are reported. Two dedicated sighting vessels (SV) were engaged and successfully conducted the research for 32 days, from 1 February to 4 March 2015 in Areas IV (70°E - 115°E, 75% of the Area IV) using two survey modes, based on IWC/IDCR-SOWER survey procedures. The total searching distance in the research area was 3,869.9n.miles (7,167km), including 1,835.80n.miles covered in Closing mode (NSC) and 2,034.06n.miles in Independent Observer with passing mode (IO). Survey coverage was 72.0% in the northern strata and 82% in the southern stratum, and 89% in the Prydz Bay. Six baleen whale species: blue (6 schools / 7 individuals), fin (104/236), sei (5/8), Antarctic minke (128/165), southern right (27/43) and humpback (837/1,743) and at least two toothed whale species: sperm (33/33), southern bottlenose (32/65), were sighted in the research area. Antarctic minke whales tended to distribute in the southern stratum, especially south-west stratum and the Prydz Bay. Humpback and fin whales were the most frequently sighted large whale species and were widely distributed in the research area. The Estimated Angle and Distance Training Exercises and Experiments were completed as in previous years. A total of 92 individuals were successfully photographed including data for 8 blue, 39 southern right and 45 humpback whales. A total of 61 biopsy (skin and blubber) samples was also successfully collected from 3 blue, 9 fin, 39 southern right and 10 humpback whales using the Larsen-gun system. A total of 11 objects of marine debris items were observed. The planned survey procedure including IO mode data was in accordance with the SC guidelines. The sighting data were validated and already submitted to the IWC secretary.

KEYWORDS: ANTARCTIC MINKE WHALES, BLUE WHALES, FIN WHALES, HUMPBACK WHALES, SOUTHERN RIGHT WHALES, PRYDZ BAY, LINE-TRANSECT, SURVEY VESSEL

BACKGROUND

JARPAII, which began during the 2005/06 austral summer season (=season) in the Antarctic, had a dedicated sighting survey component aimed mainly to collect sighting data for abundance estimates based on the line transect method. The JARPAII sighting survey research plans were submitted to the International Whaling Commission Scientific Committee (IWC SC) meetings since 2010 (e.g. Matsuoka *et al*., 2014), and were endorsed by the Committee (e.g. IWC, 2013). Unfortunately these dedicated sighting surveys could not be conducted at all due to external violent disturbances by an anti-whaling group (Matsuoka *et al*., 2014).

Since the previous IWC/IDCR (International Decade for Cetacean Research) and IWC/SOWER (Southern Ocean Whale and Ecosystem Research) programs in the Antarctic were stopped at the 2009/10 season (Matsuoka *et al*., 2003, Sekiguchi *et al*., 2010), the JARPAII was the only source of systematic sighting surveys data required for abundance estimates of large whales in the Antarctic. Abundance and abundance trend estimates are very important for the work on conservation and management of large whales by the IWC SC (Branch and Butterworth, 2001a and 2001b, Matsuoka *et al*., 2011, Okamura and Kitakado, 2012, Hakamada *et al.*, 2014, IWC, 2013).

This paper presents the results of the Japanese dedicated sighting survey in the 2014/15 season in the Antarctic Area IV. The original research plan was submitted and endorsed at the 2014 IWC SC meeting, and took into consideration the recommendations from the JARPAII review meeting (IWC, 2014).

RESEARCH OBJECTIVES AND METHODS

Research Objective

The main research objective of this survey was to conduct systematic sighting survey for the abundance estimates of Antarctic minke whales and other baleen whale species in Area IV including to estimates g(0), following the IWC/IDCR-SOWER survey procedure. Also, non-lethal research would be conducted as much as possible within

the available ship time. As recommended at the 2010 IWC SC meeting, a small group was established for the survey design of the present survey (e.g. cruise track design, survey mode, etc.), which took into account of consistency of the previous JARPAII and IWC/SOWER surveys and analyses (IWC, 2013).

Research area

The research area was set south of 60°S in Area IV (70°E-130°E (Figure 1a), which was divided into northern and southern strata (Figure 1b).

Research vessels

Two dedicated sighting vessels (SV), the R/V *Yushin-Maru* (724GT) *and Yushin-Maru No.2* (747GT) were engaged in the research. They were equipped with a top barrel (TOP), Independent Observer Platform (IOP) and an upper bridge platform. Vessels specifications, photos, and a crew lists are provided in Appendix A.

Cruise track-line

In the northern and southern strata, the survey track line consisted of a zigzag course changing direction at 2°30' longitudinal degree intervals (Figures 1c, 1d and 1e). In the Prydz Bay, the survey tracklines was consisted of a mesh designed zigzag course changing direction at 1° latitudinal and 30° longitudinal degree intervals, respectively. A randomised start point for survey tracks was used, as for all previous IWC-SOWER cruises based on the IWC/SC survey guidelines (IWC, 2005).

Research hours, acceptable weather conditions and number of observers on effort

The schedule for research hours was consistent with previous SOWER survey procedure. Research effort began 60 minutes after sunrise and ended 60 minutes before sunset, with a maximum 12-hour research per day (approximately 06:00-18:00). Time-zone changes was recorded at 30-minute intervals, effective from 01:00h. Schedules were adhered to local 'ship' time ranging between +9.0 and +12.0 GMT. Data collected throughout the survey and all associated reporting was in accord with the local 'vessel' time. The searching activity was conducted when the weather conditions were suitable for observations: visibility (minke whale visibility) better than 1.5 n. miles and the wind speed less than 21 knots (northern strata) or 26 knots (southern strata).

The vessel speed during the sighting survey was 11.5 knots with slight adjustment to avoid vibration of the vessels.

Sighting effort was conducted by the boatswain and topmen from the TOP (there will be always two primary observers in the TOP) and the upper bridge where the helmsman, captain or officer-on-watch, researchers, and the chief engineer (or second engineer) were also present (always two primary observers and four secondary observers).

Survey modes

The survey modes were consistent with previous SOWER survey procedures. Sighting activities were classified into two principal types: 'On-effort' and 'Off-effort'. In the sightings survey portion of the research, On-effort activities were times when full search effort was being executed and conditions (such as weather and sea state) were within acceptable parameters to conduct research. Off-effort activities were all activities that were not On-effort. All sightings recorded while the vessel was On-effort were classified as 'Primary sightings'. All other sightings were considered to be 'Secondary sightings'. Sighting effort was conducted by the boatswain and topmen from the TOP and by observers at the upper bridge. The sighting survey was conducted using (1) Closing mode (NSC) and (2) Passing with Independent Observer (IO) mode. Both survey modes followed the protocol endorsed for the IWC/SOWER surveys (e.g. Matsuoka *et al.*, 2003, IWC, 2008).

For NSC mode, there were two primary observers on the TOP. These observers conducted searching for cetaceans by using angle board and binoculars (7x), which include the distance estimate scales. Members of the two observer teams on TOP were fixed and operated in one or two hours shifts. There was open communication between the upper bridge and the TOP. These observers reported sighting-information to researchers and other observers on the upper bridge for data recording.

For IO mode, there were two primary observers on the TOP and one primary observer on the IOP. These observers on TOP and IOP platforms also conducted searching for cetaceans by using angle board and binoculars (7x). Members of the two observer teams on TOP were fixed and operated in one or two hours shifts. There was no open communication between the IOP and the TOP. The observers on the upper bridge communicated to the TOP (or IOP) independently, with the topmen only to clarify information and did not distract the topmen from their normal search procedure. These observers report sighting-information to researchers and other observers on the upper bridge for data recording. For encounters of very rare species (e. g. blue and southern right whales), it was

decided that the vessel would approach whales immediately to avoid losing them due to the delay of closing (IWC, 2008).

Identification of species

Guidelines for species identification were based on the IWC-SOWER methods for classification of identification (IWC, 2008):

'Positive identification of species was based on multiple cues and usually required clear observation of the whale's body. Occasionally, repeated observations of the shape of the blow, surfacing and other behavioural patterns were sufficient; this judgement was made only by the Cruise leader or other designated researcher. Identification of species was recorded as 'probable' based on multiple cues, which were nevertheless insufficient to be absolutely confident of identification. This usually occurred when blows and surfacing patterns could be confirmed, but the whale's body could not be clearly seen. Details of recording procedures during sightings can be found in 'Information for Researchers''.

Determination of group size

The following guidelines were used in determining group size (IWC, 2008):

'Schools where the number of animals, or an accurate estimated range of the number of animals was determined, were classified as confirmed schools. Data from the confirmed schools can be used to determine a mean school size. Therefore, it is critical that the confirmed schools accurately represent the size of schools in the survey area. Normally, schools believed to be confirmed for school size are approached to within 1 n. mile for large whales and to within 0.3 n. miles for minke whales. Allowing for context-specific differences (i.e. environmental conditions and animal behaviour), every effort was made to be consistent with regard to the maximum time spent on identification of species and confirmation of numbers. Normally, if the sighting was thought to be minke whales, no more than 20 minutes (after closure has been completed) should be spent on confirmation, this reduces the potential for confusion with other sightings in the vicinity. Counts of individuals provided in the Sighting summary represent best estimates of school sizes in the research area, except when indicated otherwise'.

Attending scientists and responsibilities

The original research plan welcomed the participation of international researchers. No official application for participation was received from international researchers. Four experienced Japanese researchers were selected for this survey. These researchers had enough experience conducting line transect surveys, biopsy sampling and photo-id experiments in the Antarctic through the IWC/IDCR-SOWER, JARPA/JARPAII Programs or other research programs. Koji Matsuoka (Institute of Cetacean Research) was the responsible person for this survey, and same as in recent seasons, acted as the oversight person on behalf of the IWC SC.

Yushin-Maru (YS1)
Koji Matsuoka - Cruise Leader /Chief Scientist, sighting, biopsy
Futoshi Yamaguchi – sighting data, photo-ID,
Yushin-Maru No.2 (YS2)
Masaomi Tsunekawa – sighting, photo-ID
Hideto Honma (Japan) – sighting data, biopsy

Experiments

The sighting distance and angle experiment was conducted in order to evaluate the accuracy of sighting distance and angle provided by primary observers. Observers on each vessel were required to assess eight sets of angles and distance from two platforms (TOP and IO) and upper bridge. All trials were conducted under acceptable sighting condition.

Research time was allocated for biopsy sampling of blue, fin, sei, Antarctic minke, southern right, humpback, sperm and killer whales, with higher priority given to the blue and southern right whales. The Larsen-gun system was used to collect samples. Priority species for photo-ID were blue, southern right and humpback whales, although photos of all other species, including killer whales would be obtained opportunistically (e.g. Matsuoka and Pastene, 2014, Kanda *et al*., 2014).

Data entry system and analysis

Researchers input the data collected during the survey (weather, effort, sighting and experiments data) into the computer onboard the vessel using the 'onboard data collecting system' (ICR, 2013). Survey modes and effort codes definitions for this survey correspond to those used in the IWC/SOWER surveys (Table 1a). The data validated and stored at the Institute of Cetacean Research (ICR), and all sighting data for abundance estimates submitted to the IWC based on the IWC SC Guidelines (IWC, 2005, 2008).

SHORT NARRATIVE OF THE CRUISE

The cruise itinerary;

The duration of this cruise was 80 days for each vessel. The YS1 and YS2 departed from Shimonoseki, Japan on 8 January and started the transit survey on 19 January, which was completed on 31 January. They started survey in the research area on 1 February and completed the survey in the research area 4 March. The vessels left the research area and started the transit survey on 4 March, and arrived at Shimonoseki in 28 March (Table 1b).

SUMMARY OF SIGHTINGS

Sighting summary

Antarctic research area

The two dedicated sighting vessels (SV) were engaged in the research for 32 days, from 1 February to 4 March 2015 in part of Area IV (70°E - 115°E, 75% of the Area IV, see Figure 1a). There was an un-surveyed sector between 115°E and 130°E due to bad weather conditions (Figure 1b).

The track-line design was set using consistent protocols over time to make these data of previous IWC/SOWER cruises a valuable resource, not least for analyzing ice effect (an important point to allow for when studying long-term trends in abundance). Figures 1c, 1d and 1e illustrates track line design and location of the searching effort.

Tabulations of all track line Waypoint (WP) are shown in Tables 1c, 1d and 1e, the searching effort in Table 1f and the sightings recorded in the research area, by species and by stratum is presented in Table 2a.

The total searching distance in the research area was 3,869.9 n.miles (7,167km), including 1,835.80 n.miles in NSC and 2,034.06 n.miles in the IO modes, respectively. The searching effort coverage was 72.0% in the northern strata and 82% in the southern stratum, and 89% in the Prydz bay.

Figures from 2a to 2h show the geographical distribution of sightings in the research area. Six baleen whale species and at least two toothed whale species were sighted in the research area (see figures in Table 2a).

The number of sightings of humpback whales was about 10.0 times higher (individuals) than that of Antarctic minke whales and was considerably higher than those of other species. Both humpback and Antarctic minke whales were widely distributed in the entire research area, but density was different among strata. Antarctic minke whales tended to distribute in the southern stratum, especially south-west stratum and the Prydz Bay (Figure 2d). Same as in previous surveys no mother and calf pair of Antarctic minke whale was observed in the research area. Humpback whales were widely distributed in Area IV even at the ice edge (Figure 2e). These distribution patterns were almost same as in recent surveys (e.g. Matsuoka *et al*., 2014, Murase *et al*., 2014).

One of the characteristics of this survey was the wide occurrence of 'soft pack-ice areas (under 50% Sea Ice Concentration from Satellite data, see Figure 3)' and large "polynia", in the research area, especially in the West-South stratum (Figures 1b and 3). It was impossible to survey these area using research vessels. It should be noted that Antarctic minke whales were widely distributed inside of the 'soft pack-ice areas' and 'polynias', where vessel cannot access there. It was hypothetical in previous SC meetings (Murase *et al,* 2013, Kelly *et al*., 2014, Helena *et al.*, 2014).

Fin whales were also found widely in the research area. They tended to distribute in the northern stratum, and especially in the south-west stratum, north of the Prydz Bay (Figure 2b). Although the number of sightings of blue whales was small, they were found in all of the research area (Figure 2a). These observations were almost the same as in past JARPA/JARPAII surveys (Hakamada *et al.*, 2014). Sei whales were only distributed in the East-North stratum (Figure 2c). Solitary large sperm whales were found between near ice edge and the northern strata (Figure 2g). Southern bottlenose whales were found in all of the stratum in the research area (Figure 2h).

The present sighting survey complements the work of the IDCR/SOWER programme that has now finished. The importance of monitoring trends in abundance in cetacean species is of general conservation and management importance especially in the context of documenting the recovery of species/populations that had been extensively depleted by commercial whaling, as well as investigating variation in species mix compared to the period prior to exploitation (IWC, 2014) (Figure 4).

Figure 5a shows the breakdown of research time, in hours by effort code in the research area. Figures 5b and 5c show the breakdown of research time, in hours by wind speed and visibility in the research area, respectively.

Low and middle latitudinal sighting survey

During transit from Japan to the research area, the sighting surveys were conducted from 19 to 31 January 2015 in the area between 10°S and 60°S outside of national EEZs. The searching effort was 1,525.55 n.miles. From the research area to Japan, the sighting survey was conducted from 4 to 15 March 2015 in the area between 10°S and 60°S outside of national EEZs. The searching effort was 1,577.92 n.miles. Four baleen whale species (blue, fin, sei, humpback whales) and two toothed whale species (sperm and southern bottlenose whales) were observed. Table 2b summarizes all sightings observed during transit to and from the research area.

Experiments

Sighting distance and angle experiment

A training was conducted on 24 January for both vessels, and the actual experiments were successfully conducted on 9 February by YS1, and 19 February by YS2. The results of this experiment will be used for the calculation of abundance estimates.

Photo-ID

A total of 8 blue, 45 humpback, and 39 southern right whales were successfully photo-identified during this cruise (Tables 3a and 3b). A total of 10 individuals of blue whale, 5 of southern right whale and 13 of humpback whale were photographed between 2011/12 and 2013/14 JARPAII surveys. These data will be registered to the ICR catalogue and submission of photographs to relevant international catalogues (e.g. Matsuoka and Pastene, 2014).

Biopsy sampling

A total of 61 biopsy samples were collected, including 3 blue, 9 fin, 10 humpback and 39 southern right whales (Tables 4a and 4b). There was a plan to conduct biopsy sampling of Antarctic minke whales in offshore waters, however such plan could not be executed due to bad weather conditions, especially in the northern strata. However, experiments on feasibility of biopsy sampling from Antarctic minke whales are planned from the start of the NEWREP-A, which will start from the 2015/16 season.

Every biopsy encounter was recorded and all samples for molecular genetic analysis were frozen. A total of 4 biopsy samples of southern right whale, 5 of humpback whale were collected between 2011/12 and 2013/14 JARPAII surveys. These data registered to the ICR database and analysed for genetic research (e.g. Pastene *et al*., 2014, Kanda *et al*, 2014).

Marine debris observation

A total of 11 marine debris objects were observed during the survey in the research area (Table 5). These data will be registered to the ICR database and reported (e.g. Isoda *et al*., 2014).

Report of the IWC oversight

One of us (KM) carried out the oversight work through the planning and the execution of this survey on board YS1 from 8 January to 28 March 2015 on behalf of the SC. All equipment and the survey method of each vessel were the same as in the past sighting surveys. The design of the survey strata and track lines were improved to cover each strata completely. 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. Detailed report of the IWC oversight was shown in Appendix B.

Sighting data storage

The sighting data were already submitted to the IWC secretary and receipt confirmed by 11 May 2015.

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TABLES AND FIGURES

Table 1a. Survey modes and effort codes definitions for this cruise and correspond to the IWC-SOWER codes.

Survey mode definition for this cruise	Effort code definition for this cruise	Correspond to IWC-SOWER	
		Mode code	Effort code
Normal Closing mode in transit to the research area (ASP)	Begin searching in Closing Mode in transit to the research area (BC)	NSC	BC
Normal Closing mode (NSC)	Begin searching in Closing Mode (BC)	NSC	BC
Normal Closing mode (NSC)	Begin searching in closing mode with assisted ice navigation (BR)	NSC	BA
Independent Obserber with passing mode (NSP)	Begin searching in IO Passing Mode (BP)	IO	BO
Independent Obserber with passing mode (NSP)	Begin searching in IO mode with assisted ice navigation (BI)	IO	BI
Normal Closing mode in transit from the research area (NSC)	Begin searching in Closing Mode in transit from the research area (BC)	NSC	BC

Table 1b. Cruise itinerary.

Date	Event
7 January 2015	Pre-cruise meeting
8 January	Vessel departed Shimonoseki, Japan
19 January	Start transit survey
1 February	Vessel arrives at the research area (32 days in the research area)
4 March	Vessel completes surveys in the research area and begins return transit.
13 March	Finish transit survey
28 March	Vessel arrives Shimonoseki, Japan, Post-cruise meeting

Table 1c. Way Points (WP) in the southern strata.

WP	Latitude			Longitude			Leg no.	mode	course	plan	effort	covered (%)	area code	vessel
101	65	21.4	S	70	00.0	E	101	C	234	10.90	9.18	84%	41	YS2
102	65	15.0	S	70	21.0	E	102	IO	293	33.85	32.99	97%	41	YS2
103	65	28.0	S	71	35.7	E	103	C	293	33.85	31.77	94%	41	YS2
104	65	41.0	S	72	51.0	E	104	IO	180	11.00	11.00	100%	41	YS2
104A	65	30.0	S	72	51.0	E	104	IO	235	38.80	38.80	100%	41	YS2
105	65	07.5	S	74	06.4	E	105	C	235	38.90	34.10	88%	41	YS2
106	64	45.0	S	75	21.0	E	106	IO	115	35.00	32.99	94%	41	YSI
107	65	00.0	S	76	35.6	E	107	C	115	35.00	8.44	24%	41	YSI
108A	65	15.0	S	77	51.0	E	107	C	360	30.00	0.00	0%	41	YSI
108	64	45.0	S	77	51.0	E	108	IO	43	48.00	31.38	65%	41	YSI
109	64	10.0	S	79	06.8	E	109	C	43	48.00	35.04	73%	41	YSI
110	63	35.0	S	80	21.0	E	110	IO	132	44.60	42.46	95%	41	YS2
111	64	05.1	S	81	35.5	E	111	C	132	44.50	21.48	48%	41	YS2
112A	64	35.0	S	82	51.0	E	112	IO	132	0.00	0.00	-	41	YS2
112	64	25.0	S	82	51.0	E	112	IO	50	43.00	39.70	92%	41	YS2
113	63	57.5	S	84	06.6	E	113	C	50	43.00	41.94	98%	41	YS2
114A	63	30.0	S	85	21.0	E	114	-	180	-	-	-	41	YS2
114	64	40.0	S	85	21.0	E	114	IO	128	40.40	40.04	99%	41	YS2
115	65	05.0	S	86	35.4	E	115	C	128	40.40	27.05	67%	41	YS2
116A	65	30.0	S	87	51.0	E	115	C	180	10.00	10.00	100%	41	YS2
116	65	40.0	S	87	51.0	E	116	IO	54	38.20	37.32	98%	41	YS2
117	65	17.5	S	89	06.5	E	117	C	54	38.20	36.73	96%	41	YS2
118	64	55.0	S	90	21.0	E	118	IO	58	38.00	31.97	84%	41	YSI
119	64	35.0	S	91	36.5	E	119	C	58	38.00	35.99	95%	41	YSI
120A	64	15.0	S	92	51.0	E	119	C	180	6.00	5.48	91%	41	YSI
120	64	21.0	S	92	51.0	E	120	IO	360	6.00	5.91	99%	41	YSI
120	64	15.0	S	92	51.0	E	120	IO	44	48.40	46.71	97%	41	YSI
121	63	40.0	S	94	06.8	E	121	C	44	48.40	29.20	60%	41	YSI
122	63	05.0	S	95	21.0	E	122	IO	110	36.00	29.71	83%	41	YSI
123	63	17.5	S	96	35.7	E	123	C	110	36.00	32.11	89%	41	YSI
124A	63	30.0	S	97	51.0	E	123	C	180	20.00	18.31	92%	41	YSI
124B	63	50.0	S	97	51.0	E	124	IO	360	20.00	18.46	92%	41	YSI
124B	63	30.0	S	97	51.0	E	124	IO	46	47.20	34.13	72%	41	YSI
125	62	57.5	S	99	07.0	E	125	C	46	33.80	28.25	84%	41	YSI
126	62	34.2	S	100	00.0	E	126	C	46	13.40	12.37	92%	41	YSI
127	62	25.0	S	100	21.0	E	127	IO	145	58.40	55.17	94%	42	YS2
128	63	12.5	S	101	35.0	E	128	C	145	58.40	52.84	90%	42	YS2
129A	64	00.0	S	102	51.0	E	128	IO	180	12.00	12.30	103%	42	YS2
129	64	13.0	S	102	51.0	E	129	IO	84	33.00	27.13	82%	42	YS2
130	64	08.5	S	104	06.1	E	130	C	84	33.00	30.20	92%	42	YS2
131	64	05.0	S	105	21.0	E	131	IO	130	42.40	36.08	85%	42	YS2
132	64	32.5	S	106	35.3	E	132	C	130	42.50	38.63	91%	42	YS2
133A	65	00.0	S	107	51.0	E	132	C	180	27.00	26.11	97%	42	YS2
133	65	27.0	S	107	51.0	E	133	IO	53	39.50	31.62	80%	42	YS2
134	65	03.5	S	109	06.6	E	134	C	53	28.30	22.17	78%	42	YS2
135	64	46.7	S	110	00.0	E	135	C	53	11.20	9.68	86%	42	YS2
136	64	40.0	S	110	21.0	E	136	IO	134	43.60	29.06	67%	42	YSI
137	65	10.0	S	111	35.3	E	137	C	134	43.60	32.63	75%	42	YSI
138A	65	40.0	S	112	51.0	E	137	C	180	7.50	4.72	63%	42	YSI
138B	65	47.5	S	112	51.0	E	138	C	360	7.50	4.15	55%	42	YSI
138C	65	40.0	S	112	51.0	E	138	IO	360	25.00	15.46	62%	42	YSI
138D	65	15.0	S	112	51.0	E	138	IO	49	42.30	38.77	92%	42	YSI
139	64	47.5	S	114	06.7	E	139	C	49	42.30	26.67	63%	42	YSI
140	64	27.8	S	115	00.0	E	140	C	-	-	-	-	42	YSI
138E	65	15.0	S	112	51.0	E	137	C	180	32.50	25.39	78%	42	YSI
138F	65	47.5	S	112	51.0	E	137	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	-		-	1,726.80	1,409.79	82%	-	-

Table 1d. Way Points (WP) in the Prydz Bay.

WP	Latitude			Longitude			Leg no.	mode	course	plan	effort	covered (%)	area code	vessel
501	66	30.0	S	70	00.0	E	501	C	39	19.30	14.55	75%	45	YSl
502	66	15.0	S	70	30.1	E	502	IO	39	19.30	18.21	94%	45	YSl
503	66	00.0	S	71	00.0	E	503	C	165	70.10	58.42	83%	45	YSl
504	67	07.7	S	71	44.1	E	504	IO	165	69.70	62.84	90%	45	YSl
505A	68	15.0	S	72	30.0	E	504	IO	180	6.00	2.94	49%	45	YSl
505	68	21.0	S	72	30.0	E	505	C	360, 30	40.20	39.31	98%	45	YSl
506	67	45.4	S	73	15.4	E	506	IO	30	34.90	35.78	103%	45	YSl
507	67	15.0	S	74	00.0	E	507	C	162	55.30	52.85	96%	45	YSl
508	68	07.6	S	74	44.2	E	508	IO	162	55.30	48.00	87%	45	YSl
509A	69	00.0	S	75	30.0	E	508	IO	180	10.00	7.23	72%	45	YSl
509	69	10.0	S	75	30.0	E	509	C	360, 27	46.40	36.49	79%	45	YSl
510	68	27.6	S	76	15.5	E	510	IO	27	36.60	29.33	80%	45	YSl
511A	67	55.0	S	77	00.0	E	510	IO	360	29.10	25.05	86%	45	YSl
511	67	26.0	S	77	00.0	E	511	C	130	22.50	14.78	66%	45	YSl
512	67	40.5	S	77	44.9	E	512	IO	130	22.40	23.28	104%	45	YSl
513A	67	55.0	S	78	30.0	E	512	IO	180	15.00	14.08	94%	45	YSl
513	68	10.0	S	78	30.0	E	513	C	360, 46	55.00	54.04	98%	45	YSl
514	67	27.4	S	79	45.9	E	514	IO	46	39.80	36.71	92%	45	YSl
515	67	00.0	S	81	00.0	E	-		-	-	-	-	-	-
Total	-	-	-	-	-	-	-		-	646.90	573.89	89%	-	-

Table 1e. Way Points (WP) in the northern strata.

WP	Latitude			Longitude			Leg no.	mode	course	plan	effort	covered (%)	area code	vessel
201	64	54.8	S	70	00.0	E	201	IO	156	22.10	0.00	0%	43	YS2
202	65	15.0	S	70	21.0	E	202	C	24	86.00	81.93	95%	43	YS2
203	63	56.3	S	71	41.1	E	203	IO	24	86.00	85.18	99%	43	YS2
204	62	37.6	S	72	57.5	E	204	C	24	86.00	81.50	95%	43	YS2
205	61	18.9	S	74	10.7	E	205	IO	24	86.20	64.92	75%	43	YS2
206	60	00.0	S	75	21.0	E	206	C	147	64.48	51.56	80%	43	YS2
207	60	53.8	S	76	32.8	E	207	IO	147	64.48	56.88	88%	43	YS2
208	61	47.5	S	77	46.7	E	208	C	147	64.48	49.56	77%	43	YS2
209	62	41.3	S	79	02.7	E	209	IO	147	64.48	32.14	50%	43	YS2
210	63	35.0	S	80	21.0	E	210	C	33	64.50	41.40	64%	43	YSl
211	62	41.3	S	81	39.4	E	211	IO	33	64.50	42.01	65%	43	YSl
212	61	47.5	S	82	55.4	E	212	C	33	64.50	0.00	0%	43	YSl
213	60	53.7	S	84	9.2	E	213	IO	33	64.50	59.99	93%	43	YSl
214	60	00.0	S	85	21.0	E	214	C	155	81.60	62.81	77%	43	YSl
215	61	13.8	S	86	31.5	E	215	IO	155	81.60	45.14	55%	43	YSl
216	62	27.6	S	87	44.8	E	216	C	155	81.60	70.50	86%	43	YSl
217	63	41.3	S	89	1.2	E	217	IO	155	81.60	68.59	84%	43	YSl
218	64	55	S	90	21.0	E	218	C	25	81.50	50.64	62%	43	YS2
219	63	41.3	S	91	40.7	E	219	IO	25	81.60	78.85	97%	43	YS2
220	62	27.5	S	92	57.1	E	220	C	25	81.50	73.48	90%	43	YS2
221	61	13.8	S	94	10.3	E	221	IO	25	81.60	69.11	85%	43	YS2
222	60	0	S	95	21.0	E	222	C	135	51.30	42.81	83%	43	YS2
223	60	36.3	S	96	33.9	E	223	IO	135	51.20	49.32	96%	43	YS2
224	61	12.5	S	97	48.1	E	224	C	135	51.30	47.01	92%	43	YS2
225	61	48.8	S	99	3.9	E	225	IO	135	37.30	26.81	72%	43	YS2
226	62	12.5	S	100	0.0	E	226	IO	135	13.90	0.00	0%	44	YS2
227	62	25	S	100	21.0	E	227	C	45	51.30	17.75	35%	44	YSl
228	61	48.7	S	101	38.2	E	228	IO	45	51.30	47.62	93%	44	YSl
229	61	12.5	S	102	54.0	E	229	C	45	51.30	49.55	97%	44	YSl
230	60	36.2	S	104	8.3	E	230	IO	45	51.10	17.02	33%	44	YSl
231	60	0	S	105	21.0	E	231	C	154	78.30	55.46	71%	44	YSl
232	61	10.1	S	106	31.8	E	232	IO	154	78.30	67.09	86%	44	YSl
233	62	20.1	S	107	45.3	E	233	C	154	78.30	40.85	52%	44	YSl
234	63	30.1	S	109	1.6	E	234	IO	154	78.30	35.80	46%	44	YSl
235	64	21.8	S	110	0.0	E	235	IO	154	20.40	16.88	83%	44	YSl
236	64	40.0	S	110	21.0	E	236	C	26	78.28	64.19	82%	44	YS2
237	63	30.0	S	111	40.5	E	237	IO	26	78.28	69.33	89%	44	YS2
238	62	20.0	S	112	56.8	E	238	C	26	78.28	51.16	65%	44	YS2
239	61	10.0	S	114	10.2	E	239	IO	26	54.68	26.46	48%	44	YS2
240	60	21.1	S	115	0.0	E	240	IO	26	23.60	-	-	44	YS2
Total	-	-	-	-	-	-	-	-	-	2,591.52	1,891.30	73%	-	-

Table 1f. Summary of search effort (time and distance) and experimental time (hours) conducted.

Yushi-Maru & Yushi-Maru No.2	Start	End	NSC		IO		Photo-ID, Biopsy	Estimated angle and distance training / experiment
	Date	Date	Time	Dist.	Time	Dist.	Time	Time
	Time	Time	(hh:mm:ss)	(n.m.)	(hh:mm:ss)	(n.m.)	(hh:mm:ss)	(hh:mm:ss)
Transit survey to research area	19-Jan. 6:45	31-Jan 18:00	5:07:10	1525.55	0:00:00	0.00	0:17:57	3:10:26
Research area	31-Jan. 12:00	4-Mar. 16:45	5:15:26	1,835.80	7:15:24	2,034.06	23:49:20	6:38:52
Transit survey from research area	4-Mar. 14:37	15-Mar. 17:10	18:15:28	1577.92	0:00:00	0.00	0:00:00	0:00:00
Total	19-Jan. 6:45	15-Mar. 17:10	4:38:04	4,939.27	7:15:24	2,034.06	0:07:17	9:49:18

Table 2a. Number of sightings for all species observed in the research area by each stratum.

	West-South				Prydz Bay				West-North				East-South				East-North				Total			
Species	Primary		Secondary		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.	sch.	Ind.	sch.	Ind.
Blue whale	1	1	0	0	0	0	0	0	3	4	0	0	0	0	0	0	2	2	0	0	6	7	0	0
Fin whale	39	92	0	0	0	0	0	0	51	111	2	4	1	1	0	0	11	28	0	0	102	232	2	4
Sei whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	8	0	0	5	8	0	0
Antarctic minke whale	38	42	2	2	35	49	3	3	21	25	0	0	26	40	0	0	3	4	0	0	123	160	5	5
Like minke	2	2	1	1	5	5	2	2	1	1	0	0	0	0	0	0	0	0	0	0	8	8	3	3
Humpback whale	297	610	6	7	11	25	0	0	207	426	3	10	244	547	1	2	68	116	0	0	827	1,724	10	19
Southern right whale	3	3	0	0	0	0	0	0	3	4	0	0	15	23	0	0	6	13	0	0	27	43	0	0
Baleen whale	38	69	0	0	1	2	0	0	14	19	1	1	4	5	0	0	9	14	0	0	66	109	1	1
Sperm whale	17	17	1	1	0	0	0	0	13	13	1	1	0	0	0	0	1	1	0	0	31	31	2	2
Southern bottlenose whale	13	31	1	3	0	0	0	0	9	16	0	0	5	7	0	0	4	8	0	0	31	62	1	3
Unid. Whale	9	13	0	0	0	0	0	0	11	13	0	0	4	5	0	0	1	1	0	0	25	32	0	0

Table 2b. Number of sightings for all species observed during this cruise including transit sighting survey to and from research area (R.A.).

	Transit to R.A.				Research Area (R.A.)				Transit from R.A.				Total					
Species	Primary		Secondary		Primary		Secondary		Primary		Secondary		Primary		Secondary		Total	
	sch.	Ind.	sch.	Ind.	sch.	Ind.	sch.	Ind.	sch.	Ind.	sch.	Ind.	sch.	Ind.	sch.	Ind.	sch.	Ind.
Blue whale	1	1	0	0	6	7	0	0	0	0	0	0	7	8	0	0	7	8
Fin whale	0	0	7	17	102	232	2	4	0	0	0	0	102	232	9	21	111	253
Sei whale	2	4	1	1	5	8	0	0	0	0	0	0	7	12	1	1	8	13
Antarctic minke whale	0	0	0	0	123	160	5	5	0	0	0	0	123	160	5	5	128	165
Like minke	0	0	0	0	8	8	3	3	0	0	0	0	8	8	3	3	11	11
Humpback whale	8	15	12	19	827	1,724	10	19	0	0	0	0	835	1,739	22	38	857	1,777
Southern right whale	0	0	0	0	27	43	0	0	0	0	0	0	27	43	0	0	27	43
Baleen whale	5	9	9	11	66	109	1	1	0	0	0	0	71	118	10	12	81	130
Sperm whale	0	0	1	1	31	31	2	2	4	19	1	1	35	50	4	4	39	54
Southern bottlenose whale	2	6	1	1	31	62	1	3	0	0	0	0	33	68	2	4	35	72
Unid. whale	1	1	0	0	25	32	0	0	0	0	0	0	26	33	0	0	26	33

Table 2c. Identification of duplicate sightings observed during survey in Independent Observer (IO) mode. Duplicate status was based on the number of sightings made by the Independent Observer Platform (IOP) that were observed also by the Topmen in the Standard TOP Barrel. Status codes: D - Definite duplicate, P - Possible duplicate, R - Remote duplicate, N - Not duplicate.

Species	Number of sightings	Duplicate Status			
	made by IOP	D	P	R	N
Blue whale	4	3	0	0	1
Fin whale	41	31	0	0	10
Sei whale	2	2	0	0	0
Antarctic minke whale	13	8	0	0	5
Like minke	2	0	0	0	2
Southern right whale	11	9	0	0	2
Humpback whale	267	215	0	0	52
Sperm whale	12	9	0	0	3
Southern bottlenosed whale	5	4	0	0	1
Baleen whales	27	9	0	0	18

Table 3a. Summary of the photo-ID data.

Species	Number of individuals photographed
Blue whale	8
S. right whale	39
Humpback whale	45
Total	92

Table 3b. Summary of the photo-identification and biopsy data with accompanying photo-ID data and encounter duration (minutes). LD: Left dorsal; RD: Right dorsal, HD: Head.

Vesl.	Date	Sight	Species	Scl.	Sighted Position				Area	Est. body length	number of	number of	Opportunity	Position	Biopsy	
		No.		size	Lat.	[min.]	Long.	[min.]		of target ind. [m]	marked individual	shoot	of shoot	of shoot	sample no.	Notes.
YS1	20150208	58	H	1	-64	56.23	77	17.56	41	12.8	1	2	G	RD,	-	Opportunistic
YS1	20150208	78	B	1	-64	39.71	78	2.22	41	18.3	1	29	P	HD, RL, RD,	-	Opportunistic
YS1	20150210	18	H	3	-63	26.93	80	36.65	43	12.7 12.5	2	10	E	RD, FL, OT,	-	Opportunistic
YS1	20150210	29	B	2	-63	5.52	81	4.30	43	25.6 22.2	2	13	G	LD, RD, OT,	J14YS1B005	-
YS1	20150215	9	H	2	-62	18.76	87	35.86	43	12.8 7.7	2	14	E	LD, HD, LL, RL, FL,	-	Opportunistic
YS1	20150216	20	H	10	-62	42.16	87	59.82	43	-	4	10	G	LD,LL, FL,	-	Opportunistic
YS1	20150217	14	R	1	-64	10.13	89	32.46	43	12.8	1	8	E	HD, OT,	J14YS1R007	-
YS1	20150217	58	H	3	-64	45.74	91	1.48	41	-	1	4	G	FL,	-	Opportunistic
YS1	20150219	52	H	8	-63	20.14	96	51.09	41	-	1	5	G	LL,	-	Opportunistic
YS1	20150219	59	H	1	-63	24.52	97	18.85	41	11.5	1	2	G	LD,	-	Opportunistic
YS1	20150220	45	R	1	-63	14.97	98	25.70	41	14.8	1	7	G	FL, HD, FL,	J14YS1R008	-
YS1	20150220	47	R	1	-63	14.28	98	27.54	41	14.2	1	6	G	HD, RL, FL,	J14YS1R009	-
YS1	20150222	6	R	1	-62	40.04	99	46.83	41	12.7	1	4	G	HD,	J14YS1R010	-
YS1	20150222	20	R	1	-62	28.57	100	12.59	42	13.4	1	6	G	HD, FL, OT,	J14YS1R011	-
YS1	20150223	25	R	2	-60	55.06	103	29.72	44	13.1 10.5	2	6	E	HD,	J14YS1R012, J14YS1R013,	-
YS1	20150224	9	B	1	-61	37.66	107	0.62	44	24.8	1	9	G	LL, HD, RD, DM, LD,	-	Opportunistic
YS1	20150225	10	H	3	-62	1.69	107	26.05	44	12.2 12.6 13.0	3	6	G	RD, OT, FL,	J14YS1H014	-
YS1	20150226	12	H	2	-64	10.34	109	47.30	44	12.4 11.8	2	6	G	LD, FL, RD,	J14YS1H015	-
YS1	20150226	17	H	2	-64	26.02	110	4.58	44	12.1 11.0	2	4	G	RD, LD,	J14YS1H016	-
YS1	20150226	38	H	1	-64	37.00	110	17.60	42	10.4	1	3	G	RD, LD,	J14YS1H017	-
YS1	20150303	12	H	2	-64	53.03	113	51.56	42	13.0	1	2	G	FL,	-	Opportunistic
YS1	20150303	15	H	4	-64	51.86	113	54.50	42	-	2	5	G	RD, LD, DM,	J14YS1H018, J14YS1H019,	-
YS1	20150303	23	H	6	-64	47.50	114	6.33	42	-	4	9	G	LD, FL, HD, RD, DM,	J14YS1H020	-
YS1	20150303	30	H	11	-64	41.20	114	23.40	42	-	6	6	G	OT, RD, FL,	-	Opportunistic
YS2	20150130	9	B	1	-59	46.73	78	3.11	1	23.6	1	30	G	HD, RL,	J14YS2B001	-
YS2	20150204	14	H	1	-62	0.26	73	28.72	43	11.2	1	7	P	LD,	-	Opportunistic
YS2	20150206	7	B	1	-60	43.00	76	18.26	43	23.8	1	71	G	HD, RD,	-	
YS2	20150212	36	H	2	-65	23.52	87	31.18	41	12.4,12.8	2	20	G	FL,	-	Opportunistic
YS2	20150213	12	H	1	-65	5.59	89	46.42	41	11.8	1	6	G	FL,	-	Opportunistic
YS2	20150216	2	R	1	-62	54.14	92	29.86	43	13.8	1	71	G	HD, OT,	J14YS2R001	-
YS2	20150216	28	H	1	-61	35.77	93	48.81	43	11.3	1	10	G	LD,	-	Opportunistic
YS2	20150217	5	R	2	-60	42.50	94	40.59	43	13.1,13.8	2	113	G	HD, OT,	J14YS2R002, J14YS2R003,	-
YS2	20150219	9	B	1	-61	54.33	99	15.53	43	24.8	1	106	G	HD, RL, RD,	-	Mixed school of fin whale
YS2	20150223	2	R	1	-63	15.23	101	39.04	42	13.1	1	48	G	HD, OT,	J14YS2R004	-
YS2	20150223	3	R	1	-63	18.60	101	44.68	42	12.7	1	70	G	HD, OT,	J14YS2R005	-
YS2	20150224	13	R	1	-64	11.00	103	12.13	42	12.2	1	36	G	HD, OT,	J14YS2R006	-
YS2	20150224	15	R	1	-64	10.48	103	24.15	42	13.1	1	56	G	HD, OT,	J14YS2R007	-
YS2	20150224	20	R	1	-64	9.15	103	49.45	42	13.4	1	23	G	HD, OT,	J14YS2R008	-
YS2	20150224	26	R	1	-64	8.61	104	1.98	42	13.0	1	23	G	HD, OT,	J14YS2R009	-
YS2	20150224	34	R	1	-64	6.88	104	42.19	42	14.1	1	140	G	HD, OT,	J14YS2R010	-
YS2	20150225	6	R	5	-64	29.65	106	27.52	42	3.1,13.3,13.7,14.0,14.	5	726	G	HD, OT,	J14YS2R011, J14YS2R012, J14YS2R013, J14YS2R014, J14YS2R015	-
YS2	20150225	12	R	2	-64	36.87	106	47.35	42	10.3,14.2	2	29	G	HD, OT,	J14YS2R016, J14YS2R017	Mother & calf pair (sample from each animal)
YS2	20150225	16	R	1	-64	47.70	106	16.97	42	12.9	1	54	G	HD, OT,	J14YS2R018	-
YS2	20150227	15	R	3	-65	16.06	108	26.45	42	13.0,13.4,14.2	3	149	P	HD, OT,	J14YS2R019, J14YS2R020, J14YS2R021	-
YS2	20150227	18	R	1	-65	15.01	108	29.48	42	12.1	1	34	P	HD, OT,	J14YS2R022	
YS2	20150227	38	R	2	-65	8.07	108	51.75	42	10.3,14.1	1	101	P	HD, OT,	J14YS2R023, J14YS2R024	Mother & calf pair (sample from each animal)
YS2	20150227	53	H	2	-64	37.41	110	24.11	44	10.2,13.6	2	30	G	RL, RD,	J14YS2H001	Mother & calf pair (sample from calf)
YS2	20150227	54	R	2	-64	36.16	110	24.85	44	10.8,14.2	2	54	G	HD, OT,	J14YS2R025, J14YS2R026	Mother & calf pair (sample from each animal)
YS2	20150227	61	R	1	-64	10.76	110	54.93	44	12.7	1	56	G	HD, OT,	J14YS2R027	-
YS2	20150228	2	R	5	-64	4.56	111	1.51	44	12.9,13.1,13.2,13.7	4	428	G	HD, OT,	J14YS2R028, J14YS2R029, J14YS2R030	-
YS2	20150228	4	H	4	-64	0.12	111	6.23	44	10.8,12.3,13.6	3	84	G	RD,	J14YS2H002	-
YS2	20150228	7	R	2	-63	55.01	111	16.63	44	10.2,14.3	2	216	G	HD, OT,	J14YS2R031, J14YS2R032	Mother & calf pair (sample from each animal)
YS2	20150301	1	B	1	-63	7.98	112	4.43	44	24.5	1	200	G	HD, LL, LD,	J14YS2B002	-
YS2	20150301	17	H	2	-62	20.37	112	56.38	44	12.7,13.5	2	188	G	LD,	J14YS2H003	-

Table 4a. Summary of biopsy samples collected.

Species	Number of individuals collected
Blue whale	3
Fin whale	9
S. right whale	39
Humpback whale	10
Total	61

Table 4b. Summary of the biopsy data and encounter duration.

Vesl.	Sheet	Date	Sight	Sp.	Scl.	Sighted Position				Area	Start time	End time	Experiment	Est. body length	number	number	Position	number	Sample	
	number		No.		size	Lat.	[min.]	Long.	[min.]		of BX	of BX	duration	of target ind. [m]	of shoot	of hit	struck	of sample	No.	Notes.
YSl	BY104	20150209	16	F	5	-64	31.23	78	21.31	41	8:03:18	8:26:43	00:23:25	22.1	2	1	RD	1	J14YSlF001	-
YSl	BY105	20150209	31	F	5	-64	20.31	78	44.47	41	10:53:58	11:32:22	00:38:24	21.0	2	1	-	1	J14YSlF002	-
YSl	BY106	20150210	14	F	2	-63	28.11	80	33.52	43	12:30:29	12:52:25	00:21:56	-	0	0	-	0	-	No chance to shoot
YSl	BY107	20150210	17	F	2	-63	34.21	80	21.88	43	13:48:52	14:29:01	00:40:09	22.4, 15.3	5	4	RC1, LC1, C1, C2	2	J14YSlF003, J14YSlF004,	-
YSl	BY108	20150210	22	F	5	-63	21.15	80	41.39	43	15:37:22	16:11:03	00:33:41	23.0 19.2	3	0	-	0	-	-
YSl	BY109	20150210	29	B	2	-63	5.52	81	4.30	43	17:41:03	18:30:00	00:48:57	22.2	4	1	RC3	1	J14YSlB005	-
YSl	BY110	20150216	44	F	1	-63	30.59	88	49.62	43	17:17:27	17:42:03	00:24:36	20.1	2	2	LC1	1	J14YSlF006	-
YSl	BY111	20150217	14	R	1	-64	10.13	89	32.46	43	8:24:06	8:34:10	00:10:04	12.8	2	2	LC2	1	J14YSlR007	-
YSl	BY112	20150220	45	R	1	-63	14.97	98	25.70	41	12:44:01	13:47:33	01:03:32	14.8	3	1	RA	1	J14YSlR008	-
YSl	BY113	20150220	47	R	1	-63	14.28	98	27.54	41	12:44:01	13:47:33	01:03:32	14.2	2	1	FL	1	J14YSlR009	-
YSl	BY114	20150222	6	R	1	-62	40.04	99	46.83	41	13:23:39	13:39:50	00:16:11	12.7	2	1	RD2	1	J14YSlR010	-
YSl	BY115	20150222	20	R	1	-62	28.57	100	12.59	42	15:02:37	15:43:38	00:41:01	13.4	2	1	RD2	1	J14YSlR011	-
YSl	BY116	20150223	25	R	2	-60	55.06	103	29.72	44	13:52:26	14:50:04	00:57:38	13.1, 10.5	8	3	LB1a, LC1	2	J14YSlR012, J14YSlR013	-
YSl	BY117	20150224	9	B	1	-61	37.66	107	0.62	44	18:26:26	18:53:58	00:27:32	24.8	1	0	-	0	-	-
YSl	BY118	20150225	10	H	3	-62	1.69	107	26.05	44	9:27:09	9:37:27	00:10:18	12.2	2	1	RC1	1	J14YSlH014	-
YSl	BY119	20150226	12	H	2	-64	10.34	109	47.30	44	09:05:16	09:16:38	00:11:22	12.4	4	1	LC1	1	J14YSlH015	-
YSl	BY120	20150226	17	H	2	-64	26.02	110	4.58	44	15:38:59	15:55:38	00:16:39	12.1	2	1	C1	1	J14YSlH016	-
YSl	BY121	20150226	38	H	1	-64	37.00	110	17.60	42	17:36:55	17:54:41	00:17:46	10.4	2	1	RC1	1	J14YSlH017	-
YSl	BY122	20150303	15	H	4	-64	51.86	113	54.50	42	9:22:37	10:01:03	00:38:26	13.1, 12.5	6	6	RC1, LC1, RC3, LC3	2	J14YSlH018, J14YSlH019,	-
YSl	BY123	20150303	23	H	6	-64	47.50	114	6.33	42	10:38:51	11:00:22	00:21:31	12.3	2	2	LC2.RC2	1	J14YSlH020	-
YS2	BY201	20150130	9	B	1	-59	46.73	78	3.11	1	10:15:40	10:33:37	00:17:57	23.6	2	1	RC1	1	J14YS2B001	-
YS2	BY202	20150131	10	F	2	-65	4.37	74	16.67	41	15:22:01	15:34:17	00:12:16	-	0	0	-	0	-	No chance to shoot
YS2	BY203	20150203	16	F	6	-64	37.55	70	59.42	43	09:57:01	10:32:25	00:35:24	20.5, 21.8, 21.3	4	1	C1	1	J14YS2F001	-
YS2	BY204	20150206	7	B	1	-60	43.00	76	18.26	43	17:08:58	18:17:14	01:08:16	23.8	3	0	-	0	-	-
YS2	BY205	20150216	2	R	1	-62	54.14	92	29.86	43	07:10:13	07:14:48	00:04:35	13.8	2	1	-	1	J14YS2R001	-
YS2	BY206	20150216	30	F	4	-61	17.65	94	6.69	43	17:20:11	18:00:00	00:39:49	-	0	0	-	0	-	No chance to shoot
YS2	BY207	20150217	5	R	2	-60	42.50	94	40.59	43	09:05:07	09:19:26	00:14:19	13.1, 13.8	2	2	RC1,RC3	2	J14YS2R002, J14YS2R003,	-
YS2	BY208	20150218	2	F	1	-60	42.43	96	46.34	43	08:33:49	08:43:18	00:09:29	19.7	2	2	RD1	1	J14YS2F002	-
YS2	BY209	20150219	3	F	4	-61	47.44	99	0.88	43	08:34:22	09:09:11	00:34:49	19.7, 20.3, 21.8	3	1	C2	1	J14YS2F003	Sample from 21.8m anima
YS2	BY210	20150219	9	B	1	-61	54.33	99	15.53	43	13:45:03	15:05:56	01:20:53	24.8	2	1	-	0	-	-
	BY210			F	1								00:00:00	22.1	2	1	RD2	1	J14YS2F004	-
YS2	BY211	20150223	2	R	1	-63	15.23	101	39.04	42	07:18:28	07:50:52	00:32:24	13.1	5	3	C1,C2,RC1	1	J14YS2R004	-
YS2	BY212	20150223	3	R	1	-63	18.60	101	44.68	42	08:15:58	08:33:13	00:17:15	12.7	4	2	LC2,RC2,RC3	1	J14YS2R005	-
YS2	BY213	20150224	13	R	1	-64	11.00	103	12.13	42	08:03:30	08:07:12	00:03:42	12.2	2	2	B1p,C1	1	J14YS2R006	-
YS2	BY214	20150224	15	R	1	-64	10.48	103	24.15	42	08:38:50	08:51:17	00:12:27	13.1	2	1	RC1	1	J14YS2R007	-
YS2	BY215	20150224	20	R	1	-64	9.15	103	49.45	42	10:25:58	10:31:59	00:06:01	13.4	2	1	C2	1	J14YS2R008	-
YS2	BY216	20150224	26	R	1	-64	8.61	104	1.98	42	10:55:29	11:06:41	00:11:12	13.0	1	1	RC2	1	J14YS2R009	-
YS2	BY218	20150224	34	R	1	-64	6.88	104	42.19	42	13:00:48	13:36:18	00:35:30	14.1	4	1	FL	1	J14YS2R010	-
YS2	BY219	20150225	6	R	5	-64	29.65	106	27.52	42	07:10:34	08:04:11	00:53:37	13.1,13.3,14.0,14.2, 13.1,13.7,14.0	14	5	C1,RC3, C1,RC1,RD2	5	J14YS2R011, J14YS2R012, J14YS2R013, J14YS2R014, J14YS2R015	-
YS2	BY220	20150225	12	R	2	-64	36.87	106	47.35	42	09:19:56	09:28:54	00:08:58	10.3,14.2	3	3	C1,RC1,C2	2	J14YS2R016, J14YS2R017	Mother & calf pair
YS2	BY221	20150225	16	R	1	-64	47.70	106	16.97	42	11:16:03	11:33:51	00:17:48	12.9	5	4	LC1,LC2	1	J14YS2R018	-
YS2	BY222	20150227	15	R	3	-65	16.06	108	26.45	42	06:47:04	07:16:51	00:29:47	13.0,13.4,14.2	8	5	C2,RC1,RC2,LC2	3	J14YS2R019, J14YS2R020, J14YS2R021	-
YS2	BY223	20150227	18	R	1	-65	15.01	108	29.48	42	07:36:59	07:57:03	00:20:04	12.1	3	2	RC1	1	J14YS2R022	-
YS2	BY224	20150227	38	R	2	-65	8.07	108	51.75	42	09:08:05	09:19:39	00:11:34	10.3,14.1	3	2	C2,LC1	2	J14YS2R023, J14YS2R024	Mother & calf pair
YS2	BY225	20150227	53	H	2	-64	37.41	110	24.11	44	14:14:31	14:22:03	00:07:32	10.2,13.6	3	1	RD2	1	J14YS2H001	Mother & calf pair (sample from calf)
YS2	BY226	20150227	54	R	2	-64	36.16	110	24.85	44	14:28:43	14:56:24	00:27:41	10.8,14.2	6	3	RD2,RC2,LC2	2	J14YS2R025, J14YS2R026	Mother & calf pair
YS2	BY227	20150227	61	R	1	-64	10.76	110	54.93	44	17:42:57	17:52:20	00:09:23	12.7	2	2	C2,LC2	1	J14YS2R027	-
YS2	BY228	20150228	2	R	5	-64	4.56	111	1.51	44	06:32:26	07:11:51	00:39:25	12.9,13.1,13.2,13.7	4	3	LC2,RC2,RE2	3	J14YS2R028, J14YS2R029, J14YS2R030	-
YS2	BY229	20150228	4	H	4	-64	0.12	111	6.23	44	09:55:52	10:11:08	00:15:16	10.8,12.3,13.6	4	2	RC1,D2	1	J14YS2H002	-
YS2	BY230	20150228	7	R	2	-63	55.01	111	16.63	44	13:30:08	13:45:25	00:15:17	10.2,14.3	6	3	RC1,LC1,RD2	2	J14YS2R031, J14YS2R032	Mother & calf pair
YS2	BY231	20150301	1	B	1	-63	7.98	112	4.43	44	07:42:01	08:11:38	00:29:37	24.5	1	1	C2	1	J14YS2B002	-
YS2	BY232	20150301	17	H	2	-62	20.37	112	56.38	44	14:26:17	14:33:51	00:07:34	12.7,13.5	3	1	C1	1	J14YS2H003	-

Table 5. Summary of marine debris observations.

No.	Date (YYYY/MM/DD)	Latitude (xx-xx.x)	Longitude (xxx-xx.x E)	Area code	Marine Debris Code	Description
1	2015/2/13	61-00S	084-01E	43	20	styrofoam float with rope
2	2015/2/25	61-51S	107-14E	44	20	single fishing float
3	2015/3/2	65-15S	112-45E	42	20	single fishing float
4	2015/3/3	63-33S	114-59E	42	20	single fishing float
5	2015/2/16	62-19S	093-06E	43	20	single fishing float
6	2015/2/18	60-59S	097-20E	43	20	single fishing float
7	2015/2/19	61-53S	099-08E	43	60	drum can
8	2015/2/28	63-27S	111-43E	44	20	single fishing float
9	2015/2/28	63-19S	111-52E	44	60	drum can
10	2015/3/1	63-09S	112-03E	44	60	drum can
11	2015/3/1	62-57S	112-17E	44	20	styrofoam float

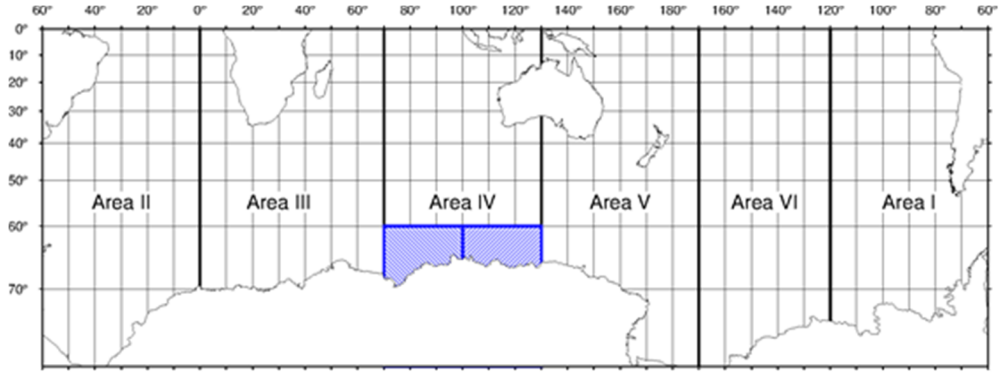

Figure 1a. Research area of the 2014/15 Antarctic dedicated cetacean sighting survey.

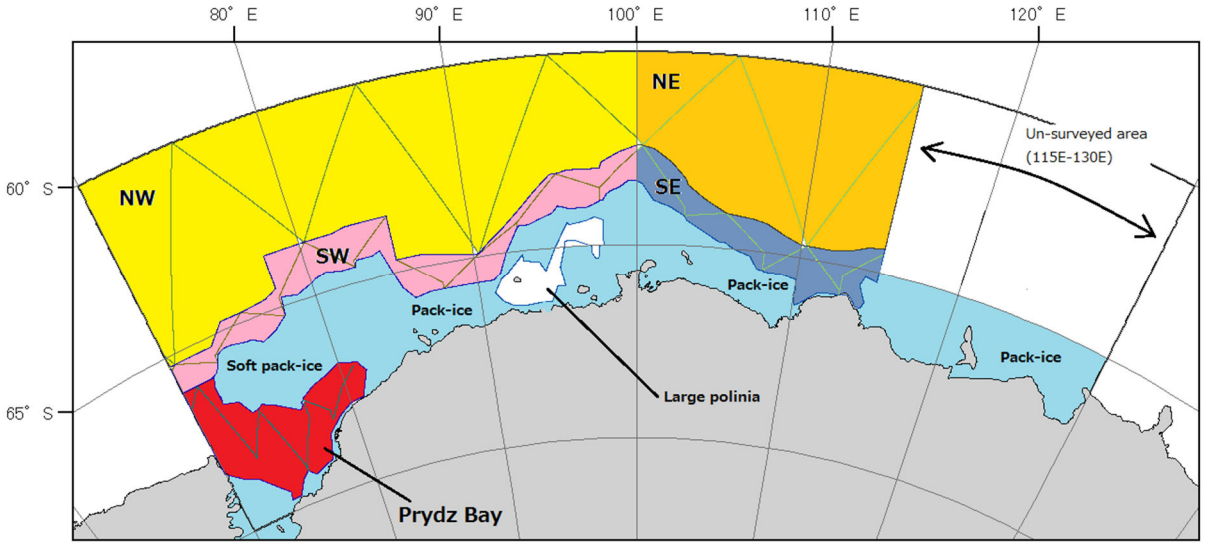

Figure 1b. Research area and trackline of the 2014/15 Antarctic dedicated cetacean sighting survey. NW: North-Western stratum, SW: South-Western, NE: North-Eastern, SE: South-Eastern.

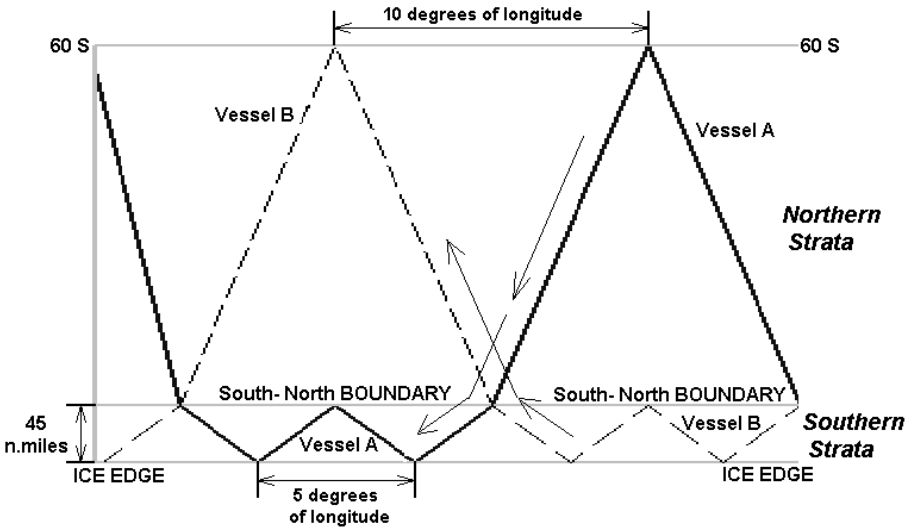

Figure. 1c. Basic design of the pre-determined track line. Two vessels alternately survey the northern and southern strata each crossing the track line at the way-point between two strata.

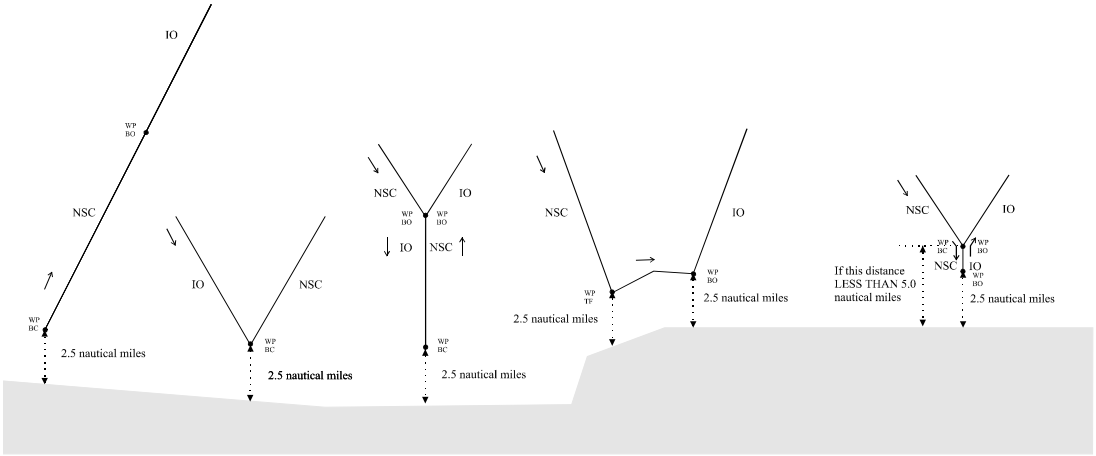

Figure. 1d. Standard procedures for modifications to the cruise trackline in the southern strata (IWC, 2008). If the ice edge is encountered prior to reaching a planned waypoint, 2.5 n.miles from the estimated ice edge, the vessel shall follow the ice edge, off-effort, until survey can be resumed on the planned trackline. If the ice edge is not encountered on reaching a planned ice edge waypoint, research shall be conducted on a bisector. Survey mode is to be changed at the planned waypoint (unless the ice edge is within 5 n.miles of the waypoint), and again on reversing direction when the true ice edge is encountered.

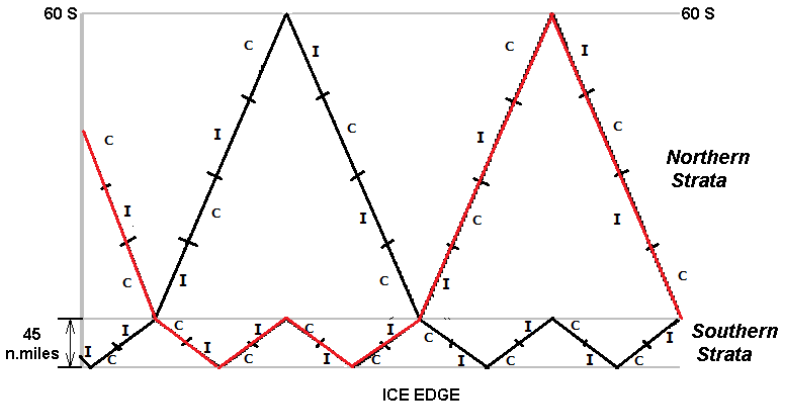

Figure. 1e. The survey modes (NSC (C) and IO (I) modes) were set alternately in each trackline (red or black lines).

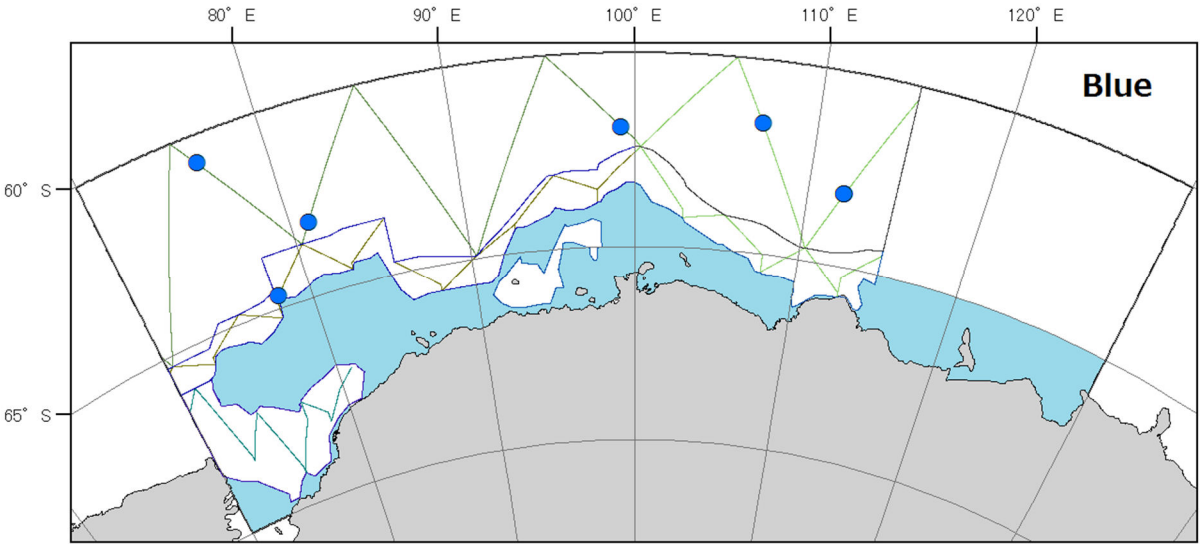

Figure 2a. Track line and sighting positions of blue (blue circle) whales in the research area.

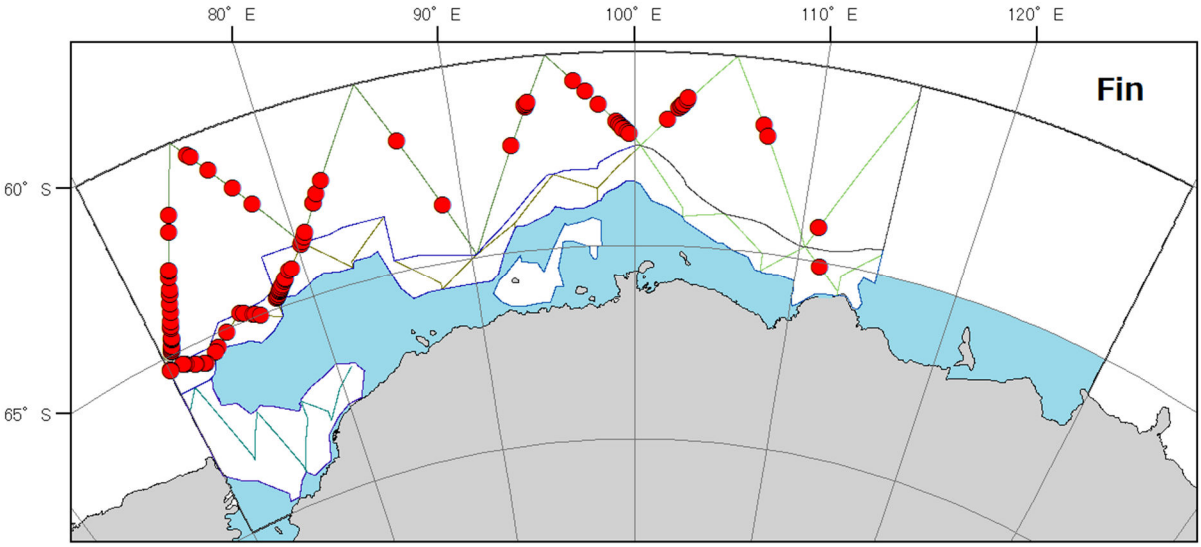

Figure 2b. Track line and sighting positions of fin whales (red circle) in the research area.

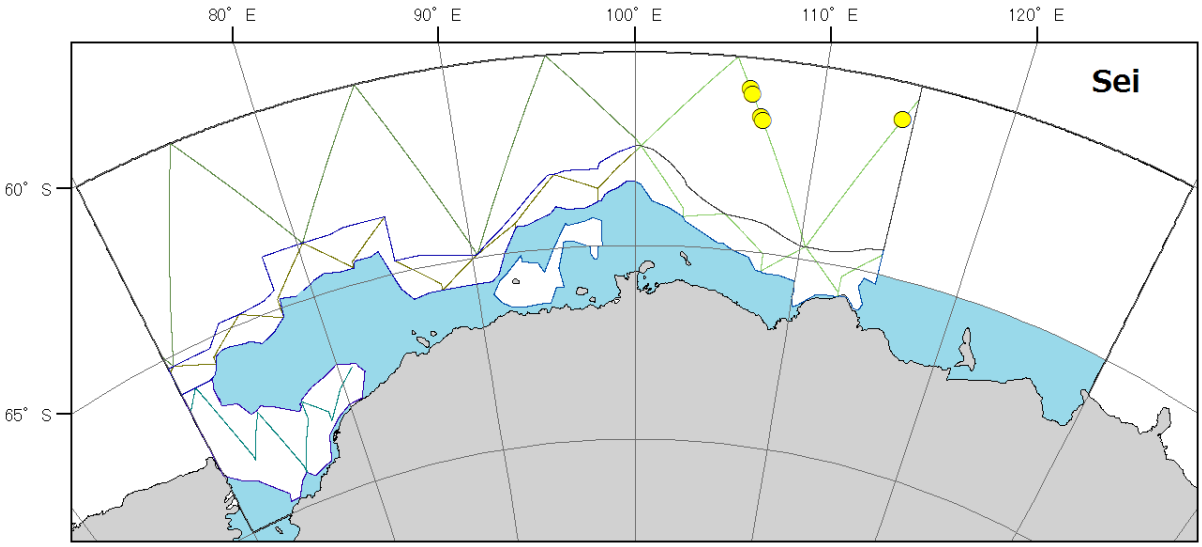

Figure 2c. Track line and sighting positions of sei whales (yellow circle).

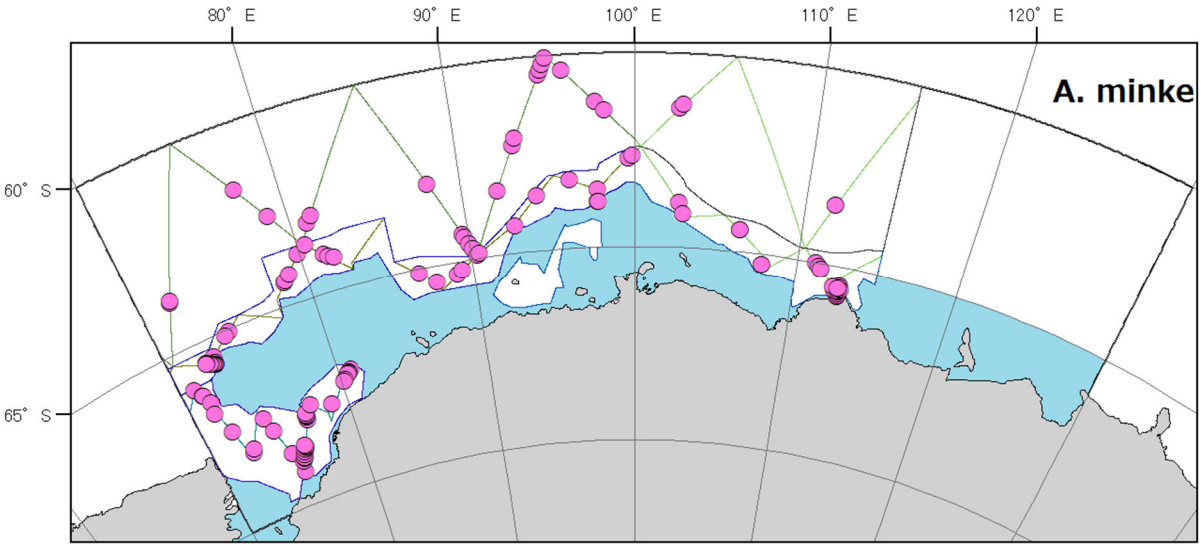

Figure 2d. Track line and sighting positions of Antarctic minke whales (pink circle).

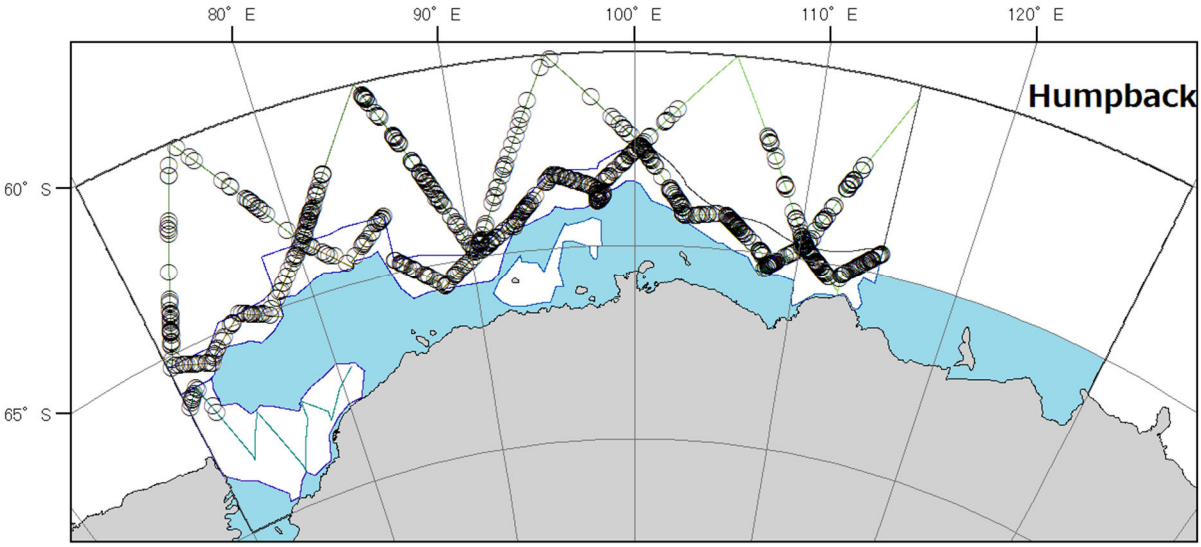

Figure 2e. Track line and sighting positions of humpback whales (white circle).

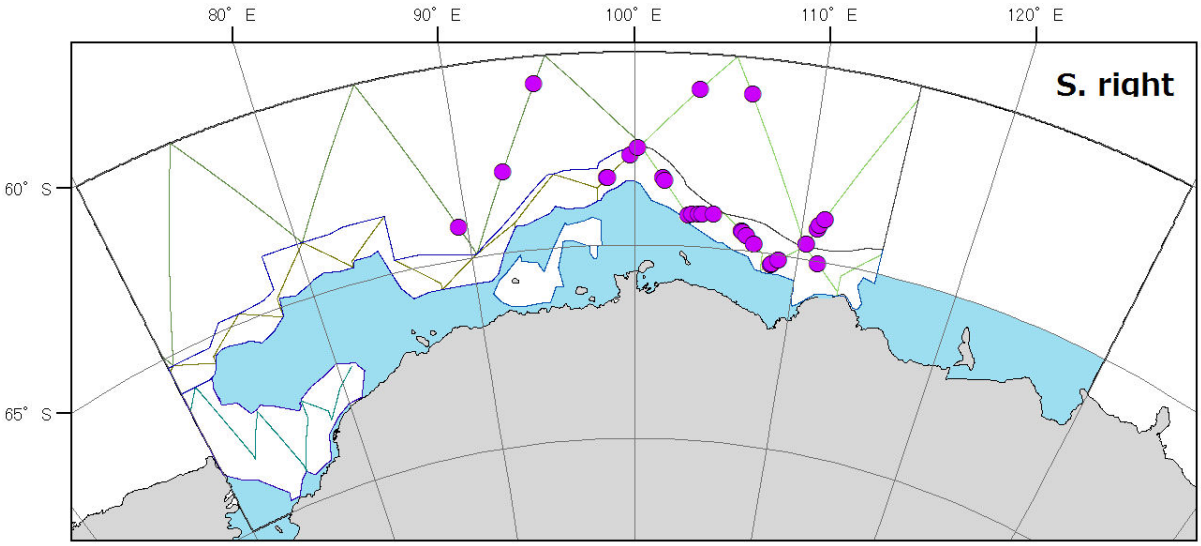

Figure 2f. Track line and sighting positions of southern right whales (purple circle).

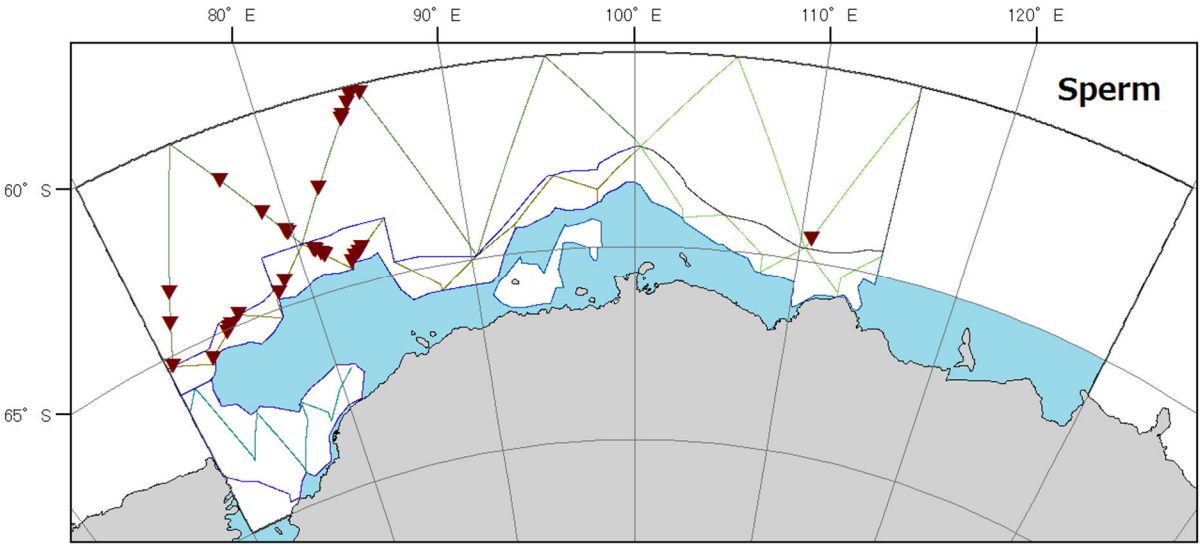

Figure 2g. Track line and sighting positions of sperm whales (triangle).

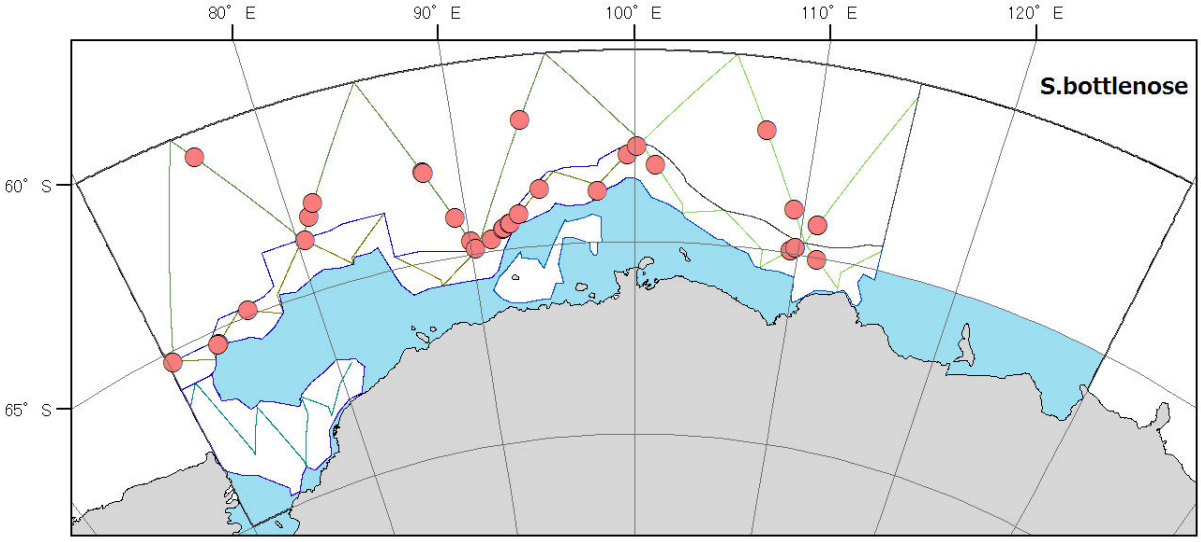

Figure 2h. Track line and sighting positions of southern bottlenose whales (circle).

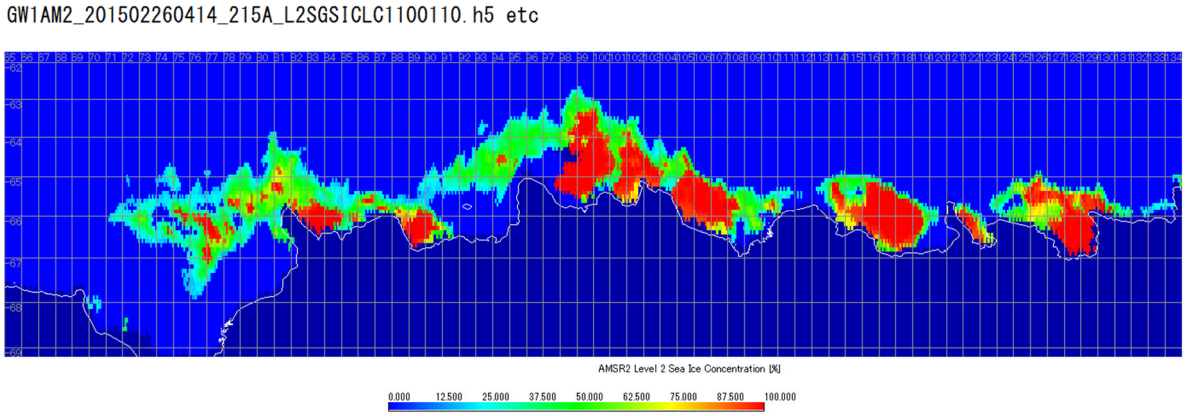

Figure 3. The pack-ice distributions and location of the large polynias in the research area, dated 26 February 2015 using observational data acquired by the Advanced Microwave Scanning Radiometer 2 (AMSR2). Data from the Japan Aerospace Exploration Agency (JAXA), http://global.jaxa.jp/projects/sat/gcom_w/.

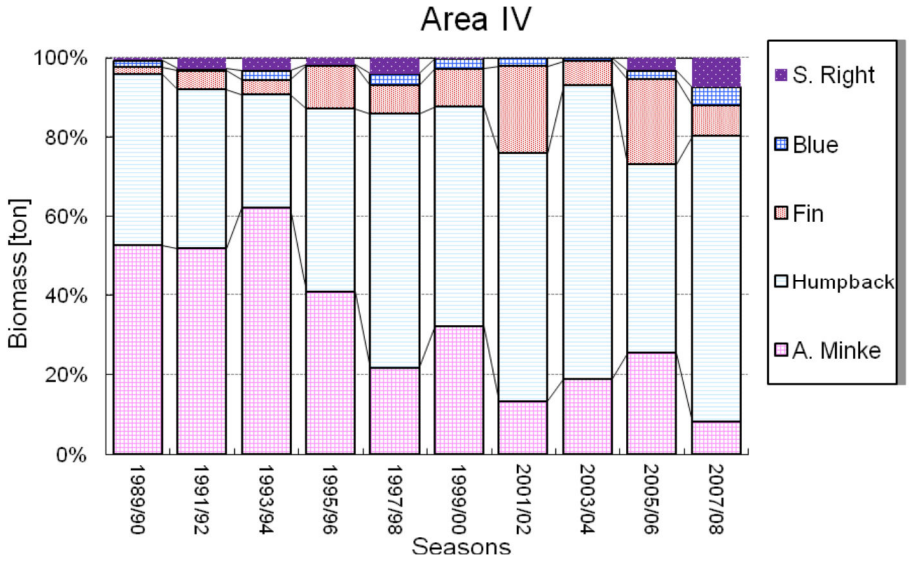

Figure 4. Estimated biomass of blue, fin, humpback, Antarctic minke and southern right whales in Area IV (south of 60°S) between 1989/90 and 2007/08 seasons based on JARPA and JARPAII sighting data (Matsuoka and Hakamada, 2014).

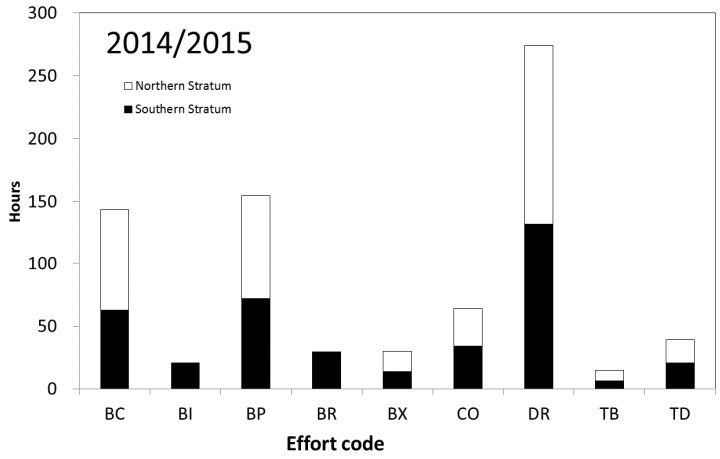

Figure 5a. Breakdown of research time in hours, by effort code in the research area. BC: Closing mode searching, BI: Closing mode searching with in the ice area, BP: Independent Observer with Passing mode (IO) searching, BR: IO mode within ice area, BX: Distance and angle estimate experiment, Photo-ID and Biopsy experiments, CO: Confirmation of school, DR: Drifting, TB: Time back to trackline, TD: Top down steaming.

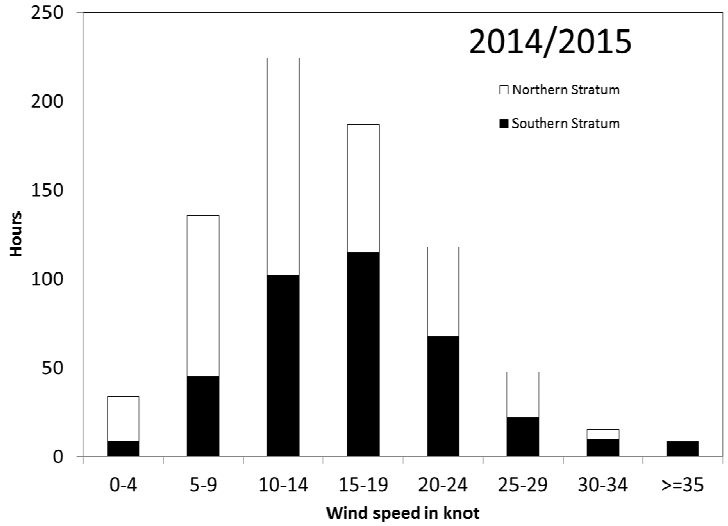

Figure 5b. Breakdown of research time in hours in the research area, by wind speed in knots.

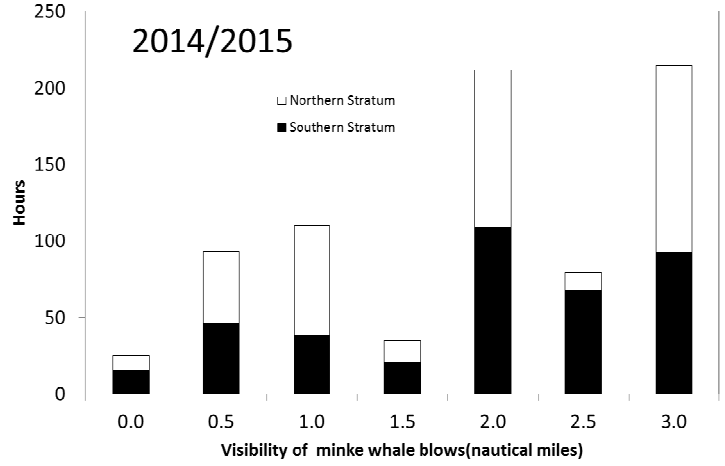

Figure 5c. Breakdown of research time in hours in the research area, by visibility in nautical mile.

Appendix A. Ship specifications and crew list of *Yushin-Maru and Yushin-Maru No.2*.

Vessel photos:

Vessel specifications:

	Yushin-Maru	*Yushin-Maru No.2*
Call sign	JLZS	JPPV
Length overall [m]	69.61	69.61
Molded breadth [m]	724	747
Gross tonnage (GT)	19.5	19.5
Barrel height [m]	13.5	13.5
Upper bridge height [m]	11.5	11.5
Bow height [m]	6.5	6.5
Engine power [PS / kW]	5280 / 3900	5280 / 3900

Crew list:

	Yushin-Maru	*Yushin-Maru No.2*
Cruise leader / Senior Scientist	Koji Matsuoka	Masaomi Tsunekawa
Researcher	Futoshi Yamaguchi	Hideto Honma
Captain	Chikamasa Okoshi	Nobuo abe
Chief Officer	Shintarou Takeda	Motonori Aki
Second Officer	Tomoya Hirai	Chikara Omukai
Junior Second Officer	Hiroya Mure	-
Chief Engineer	Yasunari Murai	Yoshihiro Oura
First Engineer	Takayuki Hagiwara	Shigeki Miyamoto
Second Engineer	Koji Takamatsu	Kenji Kawamoto
Third Engineer	Takashi Matsubara	Yoshiaki Kimura
Junior Third Engineer	-	Takahisa Yatabe
Fireman	Ryutaro Masui	Ryuji Takahara
Chief Operator	Takeshi Semii	Jyun Kuwaoka
Second Operator	Kenji Tsuda	Hisaji Suzuki
Boatswain	Masahiko Abe	Kenji Wakatsuki
Quartermaster	Hisashi Katase	Takashi Kurogi
Quartermaster	Kazumitsu Kurisu	Kosuke Maehashi
Quartermaster	Takato Sawabe	Takahiro Nagai
Quartermaster	Takashi Kominami	Naoto Suzuki
Quartermaster	Hayata Nawa	-
Sailor	-	Naoto Nomakawauchi
Sailor	-	Shinya Torihara
Chief Steward	Seichi Hamashita	Yoshiki Namiguchi
Steward	-	Yuji Furukawa

Appendix B.

Oversight for the 2014/15 Japanese Antarctic dedicated sighting survey

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The plan of this survey was presented to the 2014 IWC/SC meeting (Matsuoka *et al*., 2014) and endorsed by the Scientific Committee (IWC, 2014). On behalf of the IWC Scientific Committee I carried out the oversight work during the 2014/15 Japanese Antarctic dedicated sighting survey. This is a brief report of the oversight activities conducted on that survey.

Preparatory work
I participated in a pre-cruise meeting carried out in Shimonoseki on 7 January 2015. The survey organizers, researchers and crewmembers also participated in that meeting. During the meeting the organizers explained the objective of the survey and the procedure to be used for both sighting surveys and experiments. The planned sighting procedure was in order with that agreed by the Scientific Committee. Two research vessels were available for the survey, the R/V *Yushin-Maru* (YS1) (724GT) *and Yushin-Maru No.2* (YS2) (747GT). These vessels were assigned to cover the research area, south of 60°S in IWC Area IV, and in the longitudinal range of 70°E-130°E . The vessels were assigned to cover pre-determined transects, alternating closing and passing mode. Two experienced researchers were assigned to each vessel.

Oversight period and method
Oversight activity were carried from the YS1. I was on board this vessel during the whole cruise period (between 8 January and 28 March). Thus the total survey was oversighted. The research activities in the other vessel were oversight by daily radio communication and by examining the daily report prepared by the researchers on board YS2. In some instances telephone calls were made for further clarification of the activities, procedure and sightings made. Geographical positions and weather information of YS2 was tracked three times per day from YS1.

Brief narrative of the oversight vessel
The duration of this cruise was 80 days for each vessel. The YS1 and YS2 departed from Shimonoseki, Japan on 8 January and started the transit survey on 19 January and completed on 31 January. They started survey in the research area on 1 February and complete the research area 4 March. The vessels left the research area and started the transit survey on 4 March, and arrived at Shimonoseki on 28 March.

Post-cruise meeting
I participated in a post-cruise meeting held on 28 March 2015. Survey organizers, researchers and the Captain participated in that meeting. Apart to discuss and assess the results of the surveys, the researchers engaged in the verification and checking of data.

Conclusion
All equipment and the survey method of each vessel were the same as in the past sighting surveys. The design of the survey strata and track lines were improved to cover each strata completely. 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. I then endorse the information and data obtained during the 2014/15 Japanese Antarctic dedicated sighting survey.

Reference
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. (Suppl.) 7:92-101.

IWC. 2014. Report of the Scientific Committee. Annex G. 27pp. Bled, Slovenia, 2014. [Paper available at the IWC Office].

Matsuoka, K., Hakamada, T. and Miyashita, T., 2014. Proposal for a cetacean sighting survey in the Antarctic in the 2014/15 austral summer season. Paper SC/65b/IA12. 4pp. [available at the IWC Office]. 27pp. [Paper available at the IWC Office].