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INTERNATIONAL WHALING COMMISSION

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ABSTRACT

The results of the first survey of the Japanese Abundance and Stock structure Surveys in the Antarctic (JASS-A) are reported. A dedicated sighting vessel (SV) was engaged in the survey based on the line transect method for 25 days, from 13 January to 6 February 2020 in the western part of Area III (000° - 015°E). The survey design was based on IWC/IDCR-SOWER survey procedures and two survey modes were used, Normal Passing mode (NSP) and Independent Observer mode (IO). The total searching distance in the research area was 1,447.9n.miles (2,681.5km), including 650.3n.miles covered in NSP mode and 797.6n.miles in IO mode. The survey coverage was 71% in the northern stratum and 83% in the southern stratum. Four baleen whale species, blue (19 schools/20 individuals), fin (72/136), Antarctic minke (119/203), humpback (90/168) and at least three toothed whale species, sperm (5/5), southern bottlenose (7/22) and killer (1/1) whales, were sighted in the research area. Blue whales were found mainly in the southern stratum of the research area. Fin whales were found mainly north of 64°S. Antarctic minke whales were the most frequently sighted whale species, and were mainly distributed near the ice edge and in the western side of the northern stratum. Humpback whales were widely distributed in the research area, and their distribution pattern was similar to that of fin whales. Estimated Angle and Distance Experiments were completed in the research area. Routine photo-ID and biopsy sampling on large whales were also conducted, and a total of 39 photo-IDs (20 blue, 14 humpback and 5 killer whales), were obtained. A total of 29 biopsy (skin and blubber) samples were also collected from 10 blue, 11 fin and 8 Antarctic minke whales using the Larsen system. Ten and eight satellite tags were deployed on fin and Antarctic minke whales, respectively. Oceanographic observation was conducted at 75 stations using the eXpendable Conductivity, Temperature and Depth (XCTD). An Argo float under the Argo oceanographic programme was successfully deployed at 40°13'S; 038°33'E. A total of three marine debris were observed in the research area. Data and samples collected in this survey will be analyzed in conjunction with data and samples obtained during past research programs in the Antarctic (JARPA, JARPAII, NEWREP-A), in the context of the primary and secondary objectives of the JASS-A.

KEYWORDS: ANTARCTIC; FEEDING GROUNDS; BLUE WHALES; FIN WHALES; ANTARCTIC MINKE WHALES; HUMPBACK WHALES; LINE-TRANSECT; SURVEY VESSEL

INTRODUCTION

The Japanese Abundance and Stock-structure Surveys in the Antarctic (JASS-A) has two main research objectives (MO) and five secondary research objectives (SO). The MO1 is 'Study of the abundance and abundance trends of large whale species in the Indo-Pacific region of the Antarctic'. Abundance and abundance trends of whales in the Antarctic is essential for conservation and management purposes. Many whale species were depleted in the past. Some of them have shown signs of recovery in recent years, and it is important to monitor their recovery process and how such recovery could affect other whale species in the ecosystem. MO2 is 'Study of the distribution, movement and stock structure of large whale species in the Indo-Pacific region of the Antarctic'. Stock structure information is important to interpret distribution and abundance data. Genetic stocks are demographically independent units and therefore each stock will respond in a different way to changes that have occurred in the ecosystem. Ideally abundance estimates should be based on the geographical and temporal boundaries of genetic stocks (Government of Japan, 2019a, 2019b, 2019c).

The SO1 is: 'Investigation of the oceanographic conditions in the Indo-Pacific region of the Antarctic'; SO2: 'To investigate the spatial and temporal trend of marine debris on sea surface'; SO3: 'To conduct feasibility studies to evaluate the utility of genetics data to estimate abundance'; SO4: 'To continue with feasibility studies to evaluate the utility of non-lethal techniques for whale biological research'; and SO5: 'Feasibility study on the utility of Unmanned Aerial Vehicle (UAV) for obtaining information relevant for abundance estimate of large whales' (Government of Japan, 2019a; 2019b; 2019c).

It is important to continue with the whale and ecosystem surveys in the Indo Pacific region of the Antarctic through dedicated sighting surveys and other non-lethal techniques to investigate primarily abundance, abundance trends and stock structure of large whales.

The approach is systematic vessel-based sighting surveys utilizing the Line Transect Method. Surveys is designed and conducted following the protocols included in the 'Requirements and Guidelines for Conducting Surveys and Analyzing Data within the Revised Management Scheme' (IWC, 2012). Sighting protocols are the same as those used in the former IDCR/SOWER surveys (Matsuoka *et al*., 2003).

The data collected through the JASS-A can be analyzed in conjunction with the data collected by the previous JARPA/JARPAII, NEWREP-A and IDCR/SOWER in the same region so that the analyses can be based on a long and consistent data set.

This paper presents the results of the first JASS-A survey in the 2019/20 season in the western part of Antarctic Areas III (Area IIIW).

SURVEY DESIGN

All research activities conducted on Antarctic waters and the high seas in international waters by Japanese researchers aboard the dedicated sighting vessel were authorized under permit SUIKAN 1-1495 issued by Fisheries Agency, Government of Japan.

Research area

The research area covered by the survey was Area IIIW (000°-015°E), south of 60°S (Figure 1a). The area was divided into northern and southern strata based on the ice edge information (Figure 1b).

Research vessel

The dedicated sighting vessel (SV) *Yushin-Maru No.2* (*YS2*) (747GT) was engaged in the survey. This vessel was equipped with a top barrel platform (TOP), Independent Observer Platform (IOP) and an upper bridge platform. Vessel specification and photo are provided in Appendix 1.

Track line

In the northern and southern strata, the survey track lines consisted of a zigzag course changing direction at 5°00' and 2°30' longitudinal degree intervals in a 10 degrees longitudinal band, respectively (Figure 1c). Track line design and location of the searching effort were shown Figures 1d and 1e. The boundary between southern and northern strata was defined by a line 45n.miles from the ice-edge. A randomised start point for survey tracks was used, as for all previous IWC-SOWER surveys, based on the IWC/SC survey guidelines (IWC, 2012).

Research hours, acceptable weather conditions

Research hours was consistent with previous IWC/SOWER survey procedure. Research effort began 60 minutes after sunrise and ended 60 minutes before sunset, with a maximum of 12-hour research per day (approximately 06:00-19:00). Time-zone changes was recorded at 30-minute intervals, effective from 01:00h. Schedules were adhered to local 'ship' time ranging between +1.5 and +9.0 UTC (Table 1b). Data collected throughout the survey and all associated reporting was in accord with the local 'ship' time. The searching activity was conducted when the weather conditions were suitable for observations: visibility (minke whale visibility) better than 1.5n.miles and the wind speed less than 21 knots in northern stratum or 26 knots in southern stratum.

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

Survey modes

Sighting activities were classified into two principal types: 'On-effort' and 'Off-effort'. 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 classified as '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) Passing with abeam Closing mode (NSP) 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; 2012).

For NSP mode, there were two primary observers on the TOP. These observers conducted searching for cetaceans by using angle board and binoculars with reticles (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 (IWC, 2008; 2012).

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 with reticles (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 required only to clarify information without distracting them from their normal search procedure. These observers reported sighting-information to the researchers and other observers on the upper bridge for data recording. In the case of sighting of some 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; 2012). Captain and helmsman (primary observers) were at the upper bridge using binoculars with reticles (7x), regardless of the research mode. Also present on the upper bridge normally was the chief engineer (or an alternate) and three researchers.

Identification of species

Guidelines for species identification were the same as those used during the IWC-SOWER surveys:

'Positive identification of species is based on multiple clues and usually requires the clear observation of the whale's body. Occasionally, repeated observations of the shape of the blow, surfacing and other behavioural patterns may also be sufficient; this judgement should be made only by the Senior Scientist or other designated researcher.' (IWC, 2008).

'Probable identification of species is based on multiple clues, which are nevertheless insufficient to be absolutely confident in identification. This usually occurs when blows are seen, the surfacing pattern is correct, but the whale's body cannot be seen or clearly seen' (IWC, 2008).

Determination of group size

The following guidelines were used in determining group size:

'Schools where the number of animals, or an accurate estimated range of the number of animals, is determined are classified as confirmed schools. The data from the confirmed schools are used in the analysis to determine a mean school size. Therefore, it is critical that the schools that are confirmed are representative in size of the schools that are in the survey area. Normally, schools believed to be confirmed for school size are approached to within 1n.mile for large whales and to within 0.3n.miles for minke whales. Obviously, there are differences in the environmental conditions and behaviour of the animals for every sighting, however, (with particular reference to minke whale sightings) every effort should be made to be as consistent as possible in regard to the maximum time spent on identification of species and confirmation of numbers. Normally, if the sighting is thought to be minke whales, no more than 20 minutes (after closure has been completed) should be spent trying to complete these tasks (Otherwise there is the potential for confusion with other sightings in the vicinity).' (IWC, 2008).

Attending scientists and responsibilities

Three experienced Japanese researchers participated in the survey. They had enough experience conducting line transect surveys, biopsy sampling, photo-identification (photo-ID), satellite tagging experiments and oceanographic survey in the Antarctic through the JARPA/JARPAII and NEWREP-A programs or other research programs. Koji Matsuoka (Institute of Cetacean Research, ICR) was the responsible person for this survey, and same as in recent seasons, acted as the oversight person on behalf of the IWC SC.

Tatsuya ISODA- Cruise Leader, sighting and satellite tagging
Taiki KATSUMATA - sighting, photo-ID, biopsy and oceanographic survey
Futoshi YAMAGUCHI - sighting, photo-ID and biopsy

Other research activities

Distance and angle experiment
Sighting distance and angle experiment was conducted in order to evaluate the accuracy of sighting distance and angle provided by primary observers. Observers were required to assess eight sets of angles and distance from two platforms (TOP and IO) and upper bridge. All trials were conducted under the weather and sighting conditions defined above.

Photo-ID
Photo-ID experiments were carried out on an opportunistic basis, mainly using Canon EOS 7D Mark II with a 100-400 mm image-stabilized lens. GPS locations were recorded in the metadata of each picture by the camera's built-in GPS. Generally, whales were approached within 15-20 metres. Adults, juveniles, and females accompanied by calves were approached for photo identification. Photo-ID experiments involved a minimum of one photographer (maximum three) on the bow, with additional photographers in the TOP barrel and IO barrel or upper bridge. Priority species for photo-ID were blue, southern right and humpback whales. Photo-ID data is used for matching exercise to investigate distribution and movement of those large whales.

Biopsy sampling
Biopsy sampling experiments were carried out on an opportunistic basis. Priority species for biopsy sampling was blue, fin, southern right and humpback whales. The Larsen system (Larsen, 1998) was used for all biopsy attempts on all species. The biopsy darts consisted of a carbon fibre shaft, which is high-pressure moulded to a polyethylene float that also functions as a stop to limit penetration into the tissue. In the float end of the dart, a threaded insert is used for attaching the screw-on biopsy-sampling tip. The biopsy tip is a stainless-steel cylinder with a 9mm outer diameter, an internal diameter of 7mm and three internal barbs for sample retention. All collected samples were stored at -20°C. Biopsy samples are used for studies on stock structure of large whale based on genetic analyses, feasibility studies to evaluate the utility of genetics data to estimate abundance and non-lethal techniques to get biological and feeding ecology information from large whale. The biopsy samples are then imported to Japan under the CITES Japan Management Authority i.e., Fisheries Agency, Government of Japan: Permit/Cert. No. SUIKAN. 1-2264.

Satellite tagging
Satellite tagging experiment was based on a pneumatic tool (LK-ARTS, Skutvik, Norway) and a blubber penetration type satellite tag (SPOT6, Wildlife computers, WA, USA) with a mount anchor system for whales. The experiments were conducted following the same protocols during the NEWREP-A surveys (Konishi *et al*., 2020). The tagged whale was also target of a biopsy sampling using the Larsen system. The target species for this experiment were fin and Antarctic minke whales. To investigate the breeding areas of Antarctic minke whale in the low latitudes, tagging was attached to the whales in the Antarctic during late period of this cruise as much as possible (e.g. between end of January and early February). The data of satellite tagging is used to the study of movement, distribution and the stock structure of this species.

Oceanographic survey
Oceanographic observations were conducted per 45° and 15° latitudinal degrees along the track lines in the northern and southern strata of research area, respectively. The vertical distribution of water temperature and salinity were recorded from sea surface to 1,850 m water depth using XCTD system (eXpendable Conductivity, Temperature and Depth, Tsurumi-Seiki Co., Ltd., Yokohama, Japan) (TSK, 2019). Oceanographic surveys using XCTD system were conducted in the same protocols as in the previous JARPA/JARPAII surveys (Watanabe *et al*., 2014). The oceanographic observations are to obtain fundamental information of the ecosystem in the Antarctic and to contribute to clarify the relationship between the oceanographic conditions and whales.

An Argo float was deployed, under the Argo oceanographic programme (JAMSTEC, 2020). Deployment at the target latitude was made during the transit to the Antarctic. This operation was implemented as cooperation towards Japan Agency for Marine-Earth Science and Technology (JAMSTEC) and Japan argo.

Marine debris observation
During the research hours, floating macro debris was recorded south of 60°S. For each recorded marine debris, the items recorded were date of the observation, angle, distance, time of initial sighting, geographical location (longitude and latitude), type of debris, size by visual observation and photographs. Data of JASS-A of floating macro debris was registered to the ICR database and will be analyzed in conjunction with the data sets of marine debris produced by JARPA/JARPAII and NEWREP-A in the Indo-Pacific region of the Antarctic.

Feasibility study on the utility of Unmanned Aerial Vehicle (UAV)
In this season, a preliminary experiment was conducted for collecting aerial images of whale, using small UAV. We used the DJI phantom 4 Pro (DJI, 2018), it works with GLONASS/GPS satellite positioning systems and onboard camera features a 1-inch 20MP CMOS sensor, with a field of view of 84° and a focal length of 8.8 mm/24 mm (35 mm format equivalent). It was launched and landed at bow deck of *YS2* and was operated within line-of-sight by a pilot and/or a person for supporting navigation. Images were tried to take a whale lying flat at the surface with a straight body axis.

Data entry system on board

Researchers input the data collected on weather, effort, sighting and experiments into the computer at the field 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. The data was validated and stored at the ICR.

RESULTS AND DISCUSSION

Brief narrative of the survey

The *YS2* departed Shiogama, Miyagi, Japan on 2 December 2019. The transit survey was started on 19 December and interrupted from 24 December. The *YS2* arrived in Port Louis, Republic of Mauritius, the home port, on 27 December. It departed Port Louis on 29 December 2019. The *YS2* resumed the transit survey on 31 December, passing the 60°S on 10 January 2020. The transit survey was finished on 12 January. The *YS2* started the sighting survey in Area IIIW at 68°40.3'S; 0°00.0'E on 13 January, which was completed at 63°05.5'S; 15°00.0'E on 6 February. The *YS2* started the transit back survey on 6 February. It passed the 60°S on 7 February and interrupted the transit survey from 18 February. The *YS2* arrived in Port Louis on 20 February and departed the home port on 23 February. It resumed the transit survey on 25 February, which was completed on 1 March. The vessel arrived in Shiogama on 19 March (Tables 1a and 1b).

Research effort in the research area

The *YS2* was engaged in the research for 25 days, from 13 January to 6 February 2020, between 000° and 015°E in Area IIIW (Figure 1b). Tabulations of all track line Waypoint (WP) are shown in Tables 1c and 1d, the searching effort and time spent on experiments in Table 1e. The total searching effort was 1,447.9n.miles (2,681.5km); 650.3n.miles in NSP mode during 61 hour 19 minutes of research and 797.6n.miles in IO mode during 73 hour 31 minutes of research. In the northern stratum, the total searching effort was 1,072.0n.miles (NSP: 453.5n.miles; IO: 618.5n.miles), and the searching effort coverage was 71%. In the southern stratum, the total searching effort was 375.7n.miles (NSP: 196.8n.miles; IO: 178.9n.miles), and the searching effort coverage was 83%. The total experimental time for photo-ID, biopsy sampling, satellite tagging and distance and angle experiment, was 26 hour 49 minutes. Figures 6a–c shows the breakdown of research time in hours by effort, wind speed and visibility (minke whale visibility) in the research area.

Whale sighting in the research area

Four baleen whale species and at least three toothed whale species were sighted in the research area. The dominant whale species in the research area was the Antarctic minke whale (119 schools/203 individuals) followed by the humpback whale (90/168). Sightings of other species were as follows; blue (19/20), fin (72/136), sperm (5/5), southern bottlenose (7/22), killer whales (1/1) and *ziphiidae* (14/24) (Table 2a). Figures 3a to 3d show the geographical distribution of the primary sightings in the research area for the main whales sighted.

Primary and secondary sightings of Antarctic minke whale were 99/179 and 20/24, respectively (Table 2a). As in previous surveys, no mother and calf pair of the Antarctic minke whale was observed. Density index (DI: schools sighted/ 100n. miles searching distance) based on primary sightings was 0.04 in the northern stratum and 0.14 in the southern stratum. The DI in the northern and southern stratum based on past SOWER cruises in Area IIIW were 0.01-0.03 and 0.10-0.14, respectively (Matsuoka *et al*., 2003). The DI in the survey was not widely different from the DIs in the past SOWER cruises. In 2004/2005 SOWER cruise, Antarctic minke whale was mainly sighted near the ice edge in Area IIIW (Ensor *et al*, 2005). In this survey, the sighting of Antarctic minke whales was abundant near the ice edge similar to the situation observed in the 2004/2005 SOWER cruise. In addition, many sightings occurred in the western side of the northern stratum (Figure 3b).

Primary and secondary sighting of humpback whale were 75/145 and 15/23, respectively (Table 2a). One mother and calf pair was observed at 61°10'S; 007°18'E, and the estimated body lengths of the mother and calf were 13.0m and 8.1m, respectively. The DI based on primary sightings was 0.06 in the northern stratum and 0.03 in the southern stratum. This species was widely distributed in the research area, with the distribution concentrated between 61°S and 62°S (Figure 3b). In Area III East in the NEWREP-A 2018/19 dedicated sighting survey, humpback whales were distributed at high density almost throughout the entire research area, with DIs being extremely higher (northern stratum: 0.19 and southern stratum: 0.22) (Mogoe *et al*., 2019), than the DIs in this survey. In the 2004/2005 SOWER cruise in Area III, humpback whales were sighted most frequently in the southern stratum east of longitude 030°E with limited sighting in the sector 000°-020°E (Ensor *et al*, 2005). The pattern of distribution and density of this species in this survey seems to be different from those in past surveys in the western and eastern parts of Area III.

Primary and secondary sightings of fin whale were 70/129 and 2/7, respectively (Table 2a). Three mother and calf pairs were observed at 60°19'S; 006°31'E, 60°36'S; 007°14'E and 61°33'S; 005°51'E, respectively. The estimated body lengths of the pairs were 20.3m-15.4m, 21.8m-14.5m, and 20.6m-16.3m, respectively. This species was mainly distributed north of 64°S in the northern stratum (Figure 3a). High density was observed particularly between 61°S and 62°S, same as in the humpback whale. In the 2004/2005 SOWER cruise, the species was rarely observed in the sector 000°-020°E, and only in the southern stratum (Ensor *et al*, 2005). On the other hand in the 2005/2006 and 2006/2007 SOWER cruises (Ensor *et al*, 2006; 2007) there were many sightings between 55°S and 58°S. An increasing trend in abundance of this species was suggested (Matsuoka and Hakamada, 2014). Fin whales in this survey had shown a rapid increase in the number of sightings, in comparison with those in the 2004/2005 SOWER cruise.

Primary and secondary sightings of blue whale were 17/18 and 2/2, respectively (Table 2a). One mother and calf pair was observed at 61°59'S; 007°45'E and the estimated body length of the mother and calf were 25.0m and 13.1m, respectively. During the 2004/2005 SOWER cruise in the sector 000°-020°E, blue whales were only recorded in the southern stratum with a wide distribution from the pack ice to about 40n.miles from the ice. A large aggregation of 26 whales was observed at position 68°32'S; 019°16'E (Ensor *et al*, 2005). In this survey, 13 schools (13 individuals) were distributed in the southern stratum, similar to the situation in the 2004/2005 SOWER cruise. A total of 6 schools (7 individuals) was distributed in northern stratum (Figure 3a). However no large aggregation was observed in both strata in the present survey.

Solitary large sperm whales were sighted as primary sightings (5 individuals) and they were found in the eastern part of the research area. A solitary killer whale was sighted in the southern stratum of the research area, near the ice edge (Table 2a, Figure 3c). Southern bottlenose whales were sighted as primary sightings (7/22). *Ziphiidae* whales were sighted as primary sightings (14/24), and they were observed mainly in the northern stratum of the research area (Table 2a, Figure 3d).

IO results

Resight data were recorded for a total of 224 sightings during the IO Mode survey (Table 2c). Duplicates were those sightings made by the IOP that were also observed by the TOP barrel. For Antarctic minke whales, there were 55 school sightings made by TOP or IOP and 16 schools made by IOP. A breakdown of the numbers of the 16 include 12 for "Definite duplicate" and 4 for "Not duplicate". For humpback whales, there were 61 school sightings made by TOP or IOP and 25 schools made by IOP. A breakdown of the numbers of the 25 include 23 for "Definite duplicate" and 2 for "Not duplicate". For fin whales, there were 66 school sightings made by TOP or IOP and 32 schools made by IOP. A breakdown of the numbers of the 32 schools include 27 for "Definite duplicate" and 5 for "Not duplicate". These data will be used for to estimate whale abundance considering estimated g(0).

Sighting survey in the transit area

Sighting survey was conducted between south of 10°S and the research area, excluding areas of the foreign countries EEZs. Sighting was made on using passing mode (Tables 1a and 1e). In transit from 10°S to the Republic of Mauritius EEZ, sighting survey was conducted from 19 to 24 December. The searching effort was 347.6n.miles and no large whales were sighted. In transit from the Republic of Mauritius EEZ to the research area in the Antarctic, sighting survey was conducted from 31 December to 12 January. The searching effort was 821.5n.miles and total sightings included blue (3/4), fin (8/11), Antarctic minke (5/8), humpback (9/17), sperm (6/6) and southern bottlenose (1/4) whales (Table 2b). Biopsy sample was collected from one blue whale at 29°55'S; 48°41'E. A mother and calf pair of fin whale was observed at 47°33'S; 37°42'E, and estimated body length of the mother and calf were 22.2m and 15.6m, respectively.

In transit from the Antarctic research area to the Republic of Mauritius EEZ, sighting survey was conducted from 6 to 18 February. The searching effort was 813.8n.miles and the total sightings included fin (1/3), sei (1/1), humpback (3/6), sperm (3/4), southern bottlenose (1/4) and killer (1/17, classified as Type A) whales (Table 2b). A biopsy samples was collected from fin whale, and a satellite tag was attached to the same whale at 63°01'S; 15°05'E. In transit from the Republic of Mauritius EEZ to 10°S, sighting survey was conducted from 25 February to 1 March. The searching effort was 557.0n.miles and no large whales were sighted. A total of experimental time in transit survey for photo-ID, biopsy sampling and satellite tagging was 2 hour 28 minutes.

Other research activities

Sighting distance and angle experiment

A training for this experiment was conducted on 15 January for 1 hour 58 minutes. The actual experiments were successfully completed on 30 January for 4 hour 16 minute (144 trials). The results of this experiment will be used for the calculation of abundance estimates.

Photo-ID
A total of 20 blue, 14 humpback and five killer whales were successfully photo-identified during whole survey (Table 3). These data will be registered to the ICR catalogue and submission of photographs to relevant international catalogues (e.g. Matsuoka and Pastene, 2014). Data will be available to the national and international scientific community through established data access protocols of ICR.

Biopsy sampling for large whales
A total of 29 biopsy samples were collected (Table 4), including 10 blue, 11 fin, 8 Antarctic minke whales. Satellite tags were attached to the eight biopsied Antarctic minke and seven of the 11 biopsied fin whales. Biopsy samples were stored at -20°C. These samples will be used in genetic analyses and studies to evaluate the utility of non-lethal techniques for whale biological research (e.g. Pastene *et al*., 2014; Kanda *et al.*, 2014; Inoue *et al.*, 2019).

Satellite tagging (for details, see Appendix 2)
A total of 24 trials for fin whales and a total of 13 trials for Antarctic minke whales were made. 10 and 8 satellite tags were deployed on fin and Antarctic minke whales, respectively. Figure 4 show satellite deployed positions of 10 fin and 8 Antarctic minke whales. Tracking data of both species will contribute to the elucidation of the timing of departure from Antarctic feeding area to low latitude breeding area.

Oceanographic survey
Oceanographic observation was conducted by XCTD at 75 stations on the survey track lines, including transit survey south of 60°S (Table 5, Figure 5). Oceanographic data will be analysed in conjunction with the data collected by the previous JARPA/JARPAII, NEWREP-A, and in the same protocols as in the previous surveys (Watanabe *et al*., 2014). An Argo float was successful deployed at 40°13'S; 038°33'E on 4 January 2020. Float status is confirmed with this site: http://www.jamstec.go.jp/ARGO/argo_web/argo/?page_id=31&lang=ja.

Marine debris observation
A total of three marine debris objects, two plastic bottle and a fishing buoy, were observed during the survey in the research area (Table 6). Two items were recorded 'on effort' (i.e., during systematic sighting survey) and one item was recorded during 'off effort'. These data will be registered to the ICR database and reported in the future (e.g. Isoda *et al*., 2014; Murase *et al*., *in press*).

Feasibility study on the utility of Unmanned Aerial Vehicle (UAV)
A total of two blue and three humpback whales were successful in collecting whale images (movies can access at https://www.youtube.com/channel/UCz3c9IIMiQPVeryAogmJIig). One blue whale was sighted and took images at 68°25'S; 014°40'E on 2 February. Other blue whale was sighted and took images at 68°22'S; 012°19'E on 3 February. Three humpback whales of same school, including one mother and calf pair were sighted and took images at 61°59'S; 007°45'E on 24 January. These data will be registered to the photo-ID catalogue of ICR and will be available to the national and international scientific community through established data access protocols of ICR.

Report of the IWC oversight

The oversight report was shown in Appendix 3.

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TABLES AND FIGURES

Table 1a. Narrative of the 2019/20 JASS-A dedicated sighting survey.

Date (y/m/d)	Event
2019/11/30	The 1st pre-cruise meeting at Shiogama, Japan
2019/12/02	YS2 departed at Shiogama, Japan
2019/12/19	Started transit survey at 10°10'S, 88°13'E (High sea)
2019/12/24	Interrupted transit survey at 17°08'S, 66°01'E (Entering MU EEZ)
2019/12/27	YS2 arrived at Port Louis, Mauritius
2019/12/28	The 2nd pre-cruise meeting at Port Louis, Mauritius
2019/12/29	YS2 departed at Port Louis, Mauritius
2019/12/31	Resumed transit survey at 25°43'S, 52°29'E (High sea)
2020/01/12	Finished transit survey at 68°39'S, 000°00'
2020/01/13	Started survey in the research area at 68°40'S, 000°00'
2020/02/06	Completed survey in the research area (25 days) and start transit survey at 63°06'S, 15°00'E
2020/02/18	Interrupted transit survey at 24°16'S, 57°44'E (Entering MU EEZ)
2020/02/20	YS2 arrived at Port Louis, Mauritius
2020/02/23	YS2 departed at Port Louis, Mauritius
2020/02/25	Resumed transit survey at 17°08'S, 66°00'E (High sea)
2020/03/01	Finished transit survey at 10°00'S, 88°-44'E
2020/03/19	YS2 arrived and post cruise meeting at Shiogama, Japan.

Table 1b. Summary of the 'Ship's Time Adjustment' Schedule. JST: Japan Standard Time.

Date (y/m/d)	Ah'd/Ab'k	Balance	Ship's time	Remarks
2019/12/02	-	UTC+9.0h	JST	Departed Japan (Shiogama)
2019/12/09	Ab'k 60min	UTC+8.0h	JST-1.0h	-
2019/12/10	Ab'k 60min	UTC+7.0h	JST-2.0h	-
2019/12/19	Ab'k 30min	UTC+6.5h	JST-2.5h	Started transit survey
2019/12/20	Ab'k 30min	UTC+6.0h	JST-3.0h	-
2019/12/21	Ab'k 30min	UTC+5.5h	JST-3.5h	-
2019/12/22	Ab'k 30min	UTC+5.0h	JST-4.0h	-
2019/12/23	Ab'k 30min	UTC+4.5h	JST-4.5h	-
2019/12/24	Ab'k 30min	UTC+4.0h	JST-5.0h	Interrupted transit survey entering MU EEZ
2019/12/31	Ab'k 31min	UTC+3.5h	JST-5.5h	Resumed transit survey leaving MU EEZ
2020/01/01	Ab'k 30min	UTC+3.0h	JST-6.0h	-
2020/01/04	Ab'k 30min	UTC+2.5h	JST-6.5h	-
2020/01/20	Ab'k 30min	UTC+2.0h	JST-7.0h	-
2020/01/21	Ab'k 30min	UTC+1.5h	JST-7.5h	-
2020/02/11	Ah'd 30min	UTC+2.0h	JST-7.0h	-
2020/02/13	Ah'd 30min	UTC+2.5h	JST-6.5h	-
2020/02/15	Ah'd 30min	UTC+3.0h	JST-6.0h	-
2020/02/16	Ah'd 30min	UTC+3.5h	JST-5.5h	-
2020/02/17	Ah'd 30min	UTC+4.0h	JST-5.0h	-
2020/02/25	Ah'd 30min	UTC+4.5h	JST-4.5h	Resumed transit survey leaving MU EEZ
2020/02/26	Ah'd 30min	UTC+5.0h	JST-4.0h	-
2020/02/27	Ah'd 30min	UTC+5.5h	JST-3.5h	-
2020/02/28	Ah'd 30min	UTC+6.0h	JST-3.0h	-
2020/03/03	Ah'd 30min	UTC+6.5h	JST-2.5h	-
2020/03/04	Ah'd 30min	UTC+7.0h	JST-2.0h	-
2020/03/09	Ah'd 30min	UTC+7.5h	JST-1.5h	-
2020/03/10	Ah'd 30min	UTC+8.0h	JST-1.0h	-
2020/03/12	Ah'd 30min	UTC+8.5h	JST-0.5h	-
2020/03/13	Ah'd 30min	UTC+9.0h	JST	-
2020/03/19	-	UTC+9.0h	JST	Arrived at Japan (Shiogama)

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

WP	Latitude			Longitude			Survey mode	Course	Plan (n.miles)	Effort (n.miles)	Coverage
	deg	min	N/S	deg	min	E/W					
201	68	40.3	S	0	00.0		NSP	061°	11.0	11.0	100%
202	68	35.0	S	0	26.4	E	IO	061°	31.3	25.3	81%
203	68	20.0	S	1	41.0	E	NSP	110°	29.4	29.5	100%
204	68	30.0	S	2	55.8	E	IO	110°	29.4	22.3	76%
205	68	40.0	S	4	11.0	E	-	-	-	-	-
205A	68	34.0	S	4	11.0	E	NSP	039°	44.6	42.1	94%
206	67	59.5	S	5	26.9	E	IO	039°	44.6	41.4	93%
207	67	25.0	S	6	41.0	E	NSP	145°	49.0	48.8	100%
208	68	05.0	S	7	54.9	E	IO	145°	49.0	40.8	83%
208A	68	45.0	S	9	11.1	E	IO	180°	20.0	16.6	83%
209	69	05.0	S	9	11.1	E	NSP	048°	37.1	18.6	50%
210	68	40.0	S	10	26.7	E	IO	048°	37.1	21.4	58%
211A	68	15.0	S	11	41.0	E	-	-	-	-	-
211B	68	35.0	S	11	41.0	E	NSP	119°	31.0	25.8	83%
212	68	50.0	S	12	55.6	E	IO	119°	6.0	2.9	49%
212A	68	52.9	S	13	10.2	E	-	-	-	-	-
212B	68	26.0	S	14	11.0	E	IO	180°	8.3	8.3	100%
213	68	34.3	S	14	11.0	E	NSP	360°	8.3	8.3	100%
214A	68	26.0	S	14	11.0	E	NSP	069°	19.4	12.7	65%
214	68	19.2	S	15	00.0	E	-	-	-	-	-
Total									455.4	375.7	83%

Table 1d. Way Points (WP) in the northern stratum.

WP	Latitude			Longitude			Survey mode	Course	Plan (n.miles)	Effort (n.miles)	Coverage
	deg	min	N/S	deg	min	E/W					
101	65	48.4	S	0	00.0	E	NSP	345°	27.6	22.9	83%
102	66	15.1	S	0	17.0	E	IO	345°	64.7	62.4	97%
103	67	17.5	S	0	58.1	E	NSP	345°	64.7	35.9	55%
104	68	20.0	S	1	41.0	E	IO	195°	64.7	63.5	98%
105	67	17.5	S	2	23.9	E	NSP	195°	64.7	57.7	89%
106	66	15.1	S	3	05.0	E	IO	195°	64.7	11.0	17%
107	65	12.6	S	3	44.4	E	NSP	195°	64.7	19.0	29%
108	64	10.1	S	4	22.3	E	IO	195°	64.7	55.7	86%
109	63	07.6	S	4	58.8	E	NSP	195°	64.7	21.1	33%
110	62	05.1	S	5	34.0	E	IO	195°	64.7	55.9	86%
111	61	02.5	S	6	08.1	E	NSP	195°	64.7	21.4	33%
112	60	00.0	S	6	41.0	E	IO	345°	64.1	62.6	98%
113	61	01.9	S	7	14.0	E	NSP	345°	64.1	53.1	83%
114	62	03.8	S	7	48.1	E	IO	345°	64.1	56.0	87%
115	63	05.7	S	8	23.3	E	NSP	345°	64.1	15.0	23%
116	64	07.6	S	8	59.8	E	IO	345°	64.1	28.7	45%
117	65	09.4	S	9	37.7	E	NSP	345°	64.1	62.2	97%
118	66	11.3	S	10	17.1	E	IO	345°	64.1	31.5	49%
119	67	13.2	S	10	58.2	E	NSP	345°	64.1	58.1	91%
120A	68	15.0	S	11	41.0	E	-	-	-	-	-
120B	68	20.0	S	11	41.0	E	IO	015°	64.7	63.7	98%
121	67	17.5	S	12	23.9	E	NSP	015°	64.7	64.6	100%
122	66	15.1	S	13	05.0	E	IO	015°	64.7	63.4	98%
123	65	12.6	S	13	44.4	E	NSP	015°	64.7	20.5	32%
124	64	10.1	S	14	22.3	E	IO	015°	64.7	64.2	99%
125	63	07.6	S	14	58.8	E	NSP	015°	2.2	2.2	99%
126	63	05.5	S	15	00.0	E	-	-	-	-	-
Total									1,512.3	1,072.0	71%

Table 1e. Summary of searching effort (time and distance) and time (hours) spent on experiments.

Survey Sections	Date and time		Searching effort (time and distance [n.miles])				Experiments time	
	Start	End	NSP		IO		Photo-ID, Biopsy, Satellite tag experiment	Estimated angle and distance training/ experiment
Transit survey (10°S - Entering MU EEZ)	2019/12/19 07:10	2019/12/24 07:16	347.6	30:26:28	-	-	00:00:00	0:00:00
Transit survey (Leaving MU EEZ - 0°)	2019/12/31 06:10	2020/01/12 14:16	821.5	71:48:55	-	-	01:59:05	0:00:00
Research area (Area IIIW 0°-15°E)	2020/01/13 06:00	2020/02/06 14:44	650.3	61:19:42	797.6	73:31:38	20:35:38	6:14:14
Transit survey (15°E - Entering MU EEZ)	2020/02/06 14:44	2020/02/18 17:45	813.8	70:28:20	-	-	0:29:49	0:00:00
Transit survey (Leaving MU EEZ - 10°S)	2020/02/25 10:50	2020/3/1 09:02	557.0	45:53:15	-	-	0:00:00	0:00:00
Total	2019/12/19 06:00	2020/3/1 09:02	3,190.2	279:56:40	797.6	73:31:38	23:04:32	06:14:14

Table 2a. Number of sightings for whale species in the research area, by stratum and species.

Species	Area Ⅲ								Sub-total				Total	
	West-South				West-North									
	Prim.		Second.		Prim.		Second.		Prim.		Second.			
	sch.	Ind.	sch.	Ind.	sch.	Ind.	sch.	Ind.	sch.	Ind.	sch.	Ind.	sch.	Ind.
Blue whale	11	11	2	2	6	7	0	0	17	18	2	2	19	20
Fin whale	7	16	1	6	63	113	1	1	70	129	2	7	72	136
Like fin	0	0	1	3	2	3	0	0	2	3	1	3	3	6
Antarctic minke whale	51	106	14	15	48	73	6	9	99	179	20	24	119	203
Like minke	5	6	1	1	4	4	0	0	9	10	1	1	10	11
Humpback whale	13	22	12	16	62	123	3	7	75	145	15	23	90	168
Like humpback	0	0	0	0	2	2	0	0	2	2	0	0	2	2
Baleen whale	2	3	1	1	5	6	1	1	7	9	2	2	9	11
Sperm whale	0	0	0	0	5	5	0	0	5	5	0	0	5	5
Killer whale (Undetermined)	1	1	0	0	0	0	0	0	1	1	0	0	1	1
Southern bottlenose whale	4	10	0	0	3	12	0	0	7	22	0	0	7	22
Ziphiidae	1	2	0	0	13	22	0	0	14	24	0	0	14	24
Mesoplodon	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified whale	1	1	0	0	3	3	0	0	4	4	0	0	4	4

Table 2b. Number of sightings for whale species observed during this survey including transit and research area.

Species	Transit From 10°S to R.A.				Area Ⅲ West-South				Area Ⅲ West-North				Transit from From R.A. to 10°S				Sub-total				Total	
	Prim.		Second.		Prim.		Second.		Prim.		Second.		Prim.		Second.		Prim.		Second.			
	sch.	Ind.	sch.	Ind.	sch.	Ind.	sch.	Ind.	sch.	Ind.	sch.	Ind.	sch.	Ind.	sch.	Ind.	sch.	Ind.	sch.	Ind.	sch.	Ind.
Blue whale	3	4	0	0	11	11	2	2	6	7	0	0	0	0	0	0	20	22	2	2	22	24
Fin whale	8	11	0	0	7	16	1	6	63	113	1	1	1	3	0	0	79	143	2	7	81	150
Like fin	0	0	0	0	0	0	1	3	2	3	0	0	0	0	0	0	2	3	1	3	3	6
Sei whale	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	1	1
Antarctic minke whale	5	8	0	0	51	106	14	15	48	73	6	9	0	0	0	0	104	187	20	24	124	211
Like minke	0	0	0	0	5	6	1	1	4	4	0	0	0	0	0	0	9	10	1	1	10	11
Humpback whale	8	15	1	2	13	22	12	16	62	123	3	7	3	6	0	0	86	166	16	25	102	191
Like humpback	1	3	0	0	0	0	0	0	2	2	0	0	0	0	0	0	3	5	0	0	3	5
Baleen whale	2	2	0	0	2	3	1	1	5	6	1	1	1	1	0	0	10	12	2	2	12	14
Sperm whale	5	5	1	1	0	0	0	0	5	5	0	0	3	4	0	0	13	14	1	1	14	15
Killer whale (Undetermined)	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1
Killer whale (Type A)	0	0	0	0	0	0	0	0	0	0	0	0	1	17	0	0	1	17	0	0	1	17
Southern bottlenose whale	1	4	0	0	4	10	0	0	3	12	0	0	1	4	0	0	9	30	0	0	9	30
Ziphiidae	9	18	0	0	1	2	0	0	13	22	0	0	5	11	1	2	28	53	1	2	29	55
Mesoplodon	1	4	0	0	0	0	0	0	0	0	0	0	2	5	0	0	3	9	0	0	3	9
Unidentified whale	3	4	0	0	1	1	0	0	3	3	0	0	3	12	0	0	10	20	0	0	10	20

Table 2c. Identification of duplicate sightings during surveys 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 all schools sighted by TOP & IOP	Number of schools sighted by IOP	Duplicate Status			
			D	P	R	N
Blue whale	10	5	5	0	0	0
Fin whale	66	32	27	0	0	5
Like fin	2	0	0	0	0	0
Antarctic minke whale	55	16	12	0	0	4
Like minke	2	0	0	0	0	0
Humpback whale	61	25	23	0	0	2
Like humpback	1	0	0	0	0	0
Baleen whale	5	1	0	0	0	1
Sperm whale	7	3	3	0	0	0
Killer whale (Undetermined)	1	0	0	0	0	0
Southern bottlenose whale	4	2	2	0	0	0
Ziphiidae	8	3	3	0	0	0
Unidentified whale	2	1	0	0	0	1

Table 3. Summary of the photo-ID data by 2019/20 JASS-A.

Photo-ID	Transit From 10°S to R.A.	Area Ⅲ West-South	Area Ⅲ West-North	Transit From R.A. to 10°S	Total
Blue whale	4	11	5	0	20
Humpback whale	2	0	11	1	14
Killer whale	0	0	0	5	5
Total	6	11	16	6	39

Table 4. Summary of biopsy samples collected by 2019/20 JASS-A.

Biopsy	Transit	Area Ⅲ		Transit	Total
	From 10°S to R.A.	West-South	West-North	From R.A. to 10°S	
Blue whale	1	5	4	0	10
Fin whale	0	4	6	1	11
Antarctic minke whale	0	7	1	0	8
Total	1	16	11	1	29

Table 5. Summary of Oceanographic observations by 2019/20 JASS-A.

Area	Transit to R.A.	Area III West-South	Area III West-North	Transit from R.A.	Total
Number of station	10	26	37	2	75

Table 6. Summary of observed marine debris in research area by 2019/20 JASS-A.

No.	Date (y/m/d)	Latitude	Longitude	Description	Note
1	2020/1/21	67°26'S	011°07'E	plastic bottle	Length 0.3m. Photographed.
2	2020/1/21	67°18'S	011°01'E	fishing buoy, red	Diameter 0.5m. Photographed.
3	2020/1/28	67°14'S	002°26'E	plastic bottle white	Length 0.3m. Photographed.

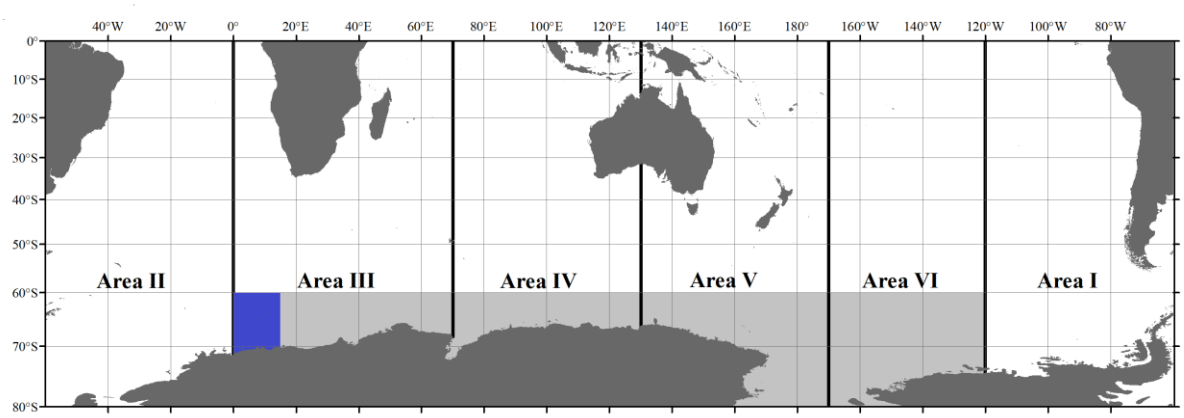

Figure 1a. Research area of the JASS-A dedicated sighting survey. Blue area indicates the researched area of the dedicated sighting survey in 2019/20 JASS-A.

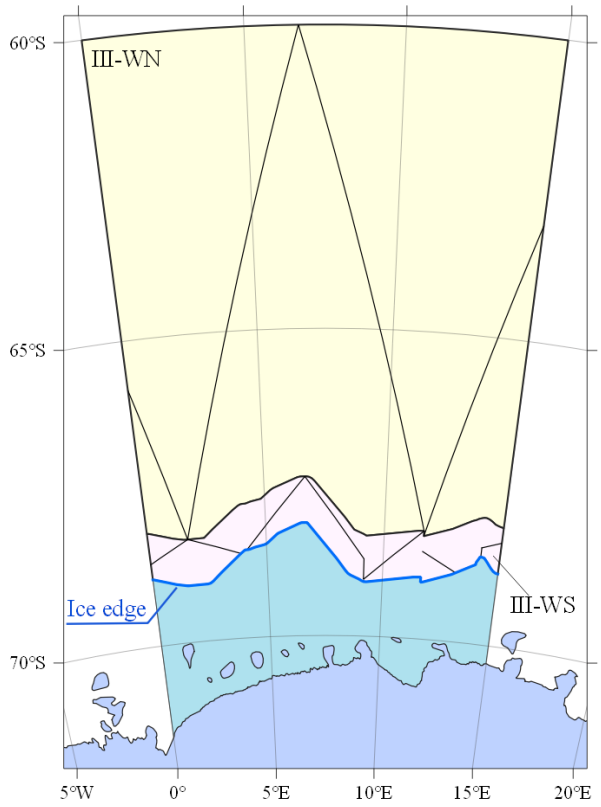

Figure 1b. Research area (000°-15°E) and track line of the 2019/20 JASS-A dedicated sighting survey. WN: West-North stratum, WS: West-South stratum.

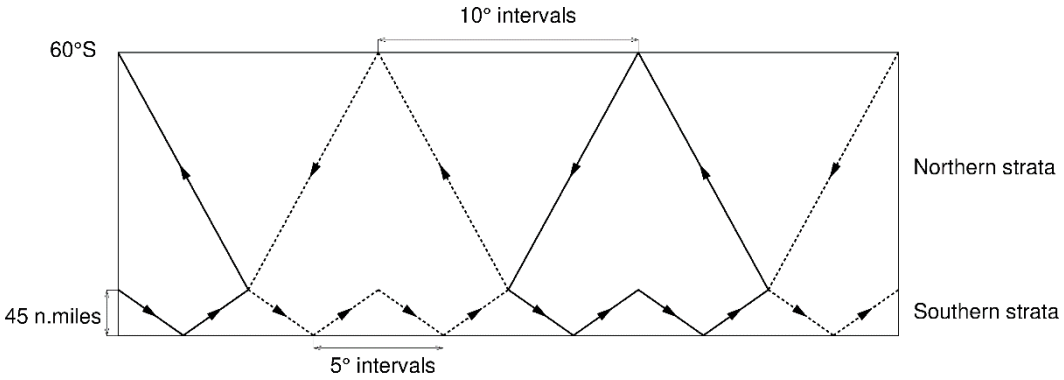

Figure 1c. Basic design for pre-determined cruise track lines in the Antarctic using one vessel. Track lines are decided based on the original longitudinal line, which is selected at random. The interval of legs and number of legs in each stratum could be changed in consideration of delay caused by bad weather conditions and other factors. Considerable flexibility may be needed by the Cruise Leader in determining the final cruise tracks.

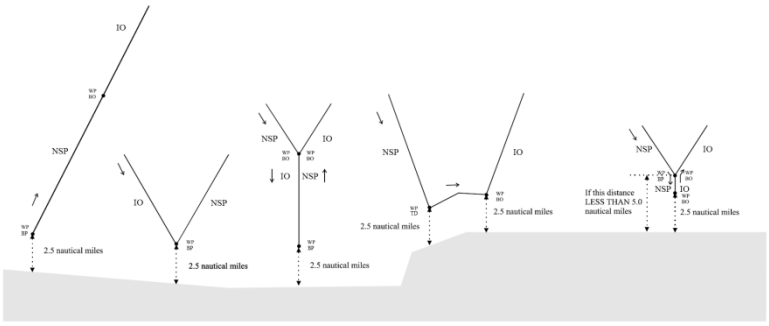

Figure 1d. Standard procedures for modifications to the cruise track line in the southern strata (IWC, 2008). If the ice edge is encountered prior to reaching a planned waypoint, 2.5n.miles from the estimated ice edge, the vessel shall follow the ice edge, off-effort, until survey can be resumed on the planned track line. 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 5n.miles of the waypoint), and again on reversing direction when the true ice edge is encountered.

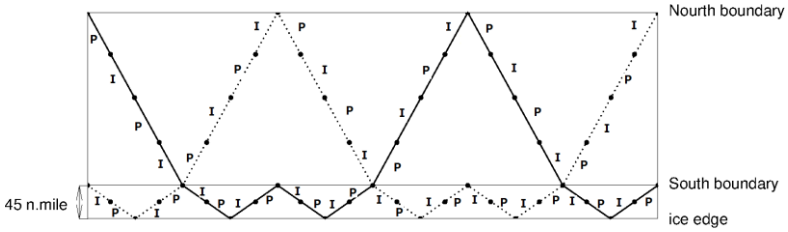

Figure 1e. The survey modes (NSP (P) and IO (I) modes) were set alternately in each track line.

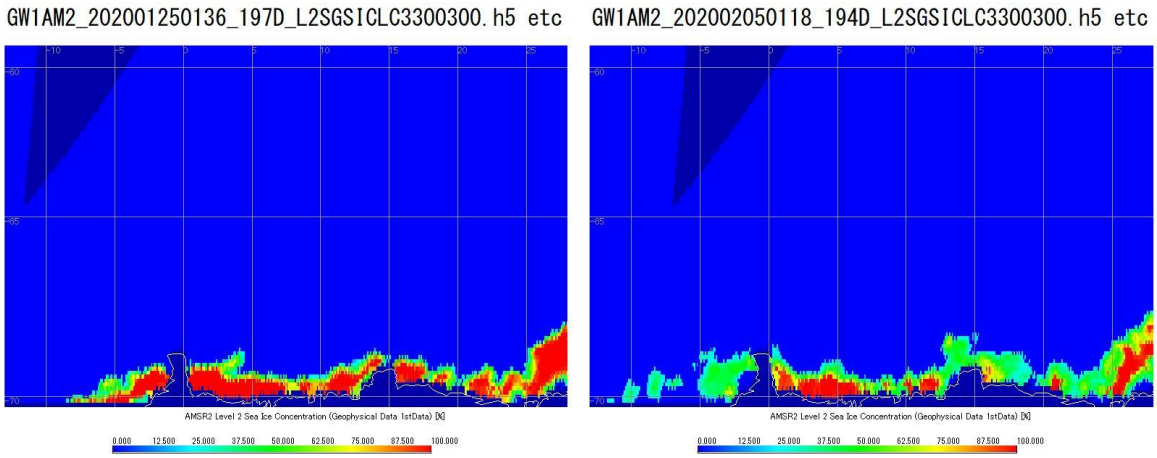

Figure 2. The pack-ice distributions in the research area, dated 25 January (left) and 5 February (right) 2020 using observational data acquired by the Advanced Microwave Scanning Radiometer 2 (AMSR2). Data from the Japan Aerospace Exploration Agency (JAXA), http://global.jaxa.jp/projects/sat/gcom_w/.

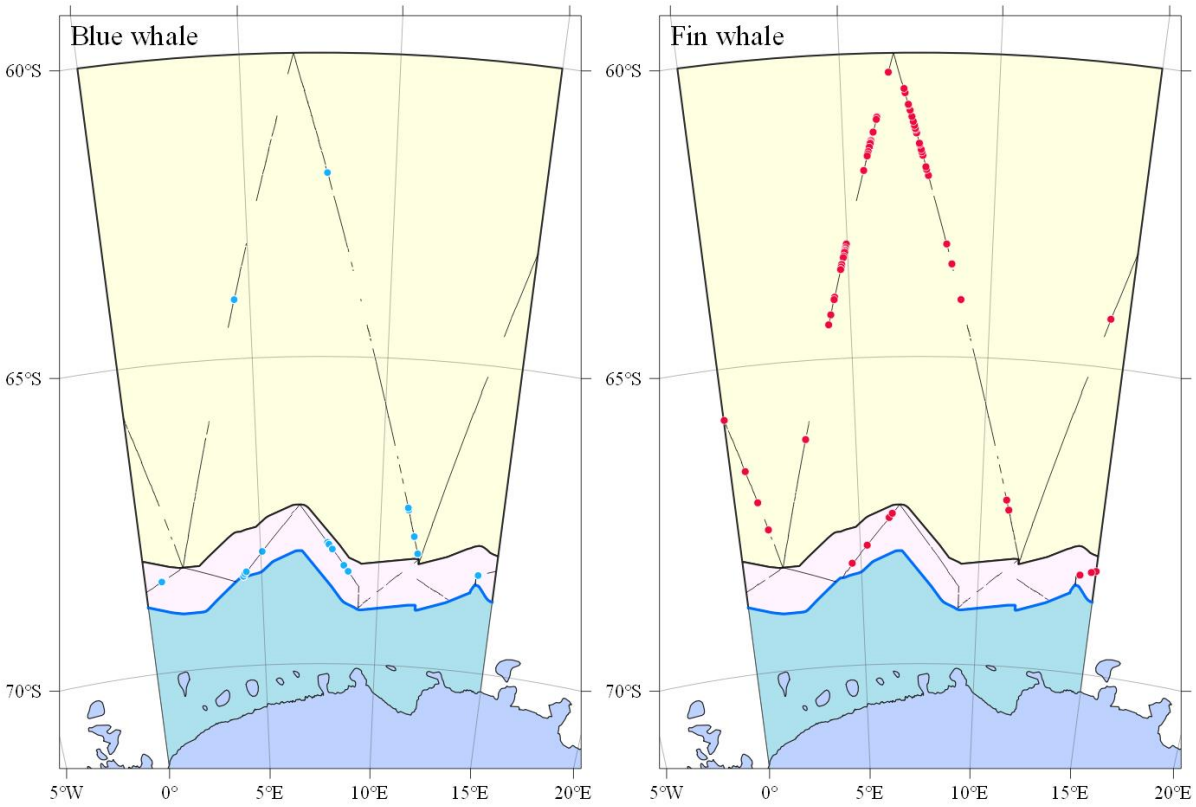

Figure 3a. Primary sighting positions of blue (left) and fin (right) whales with searching effort in the research area.

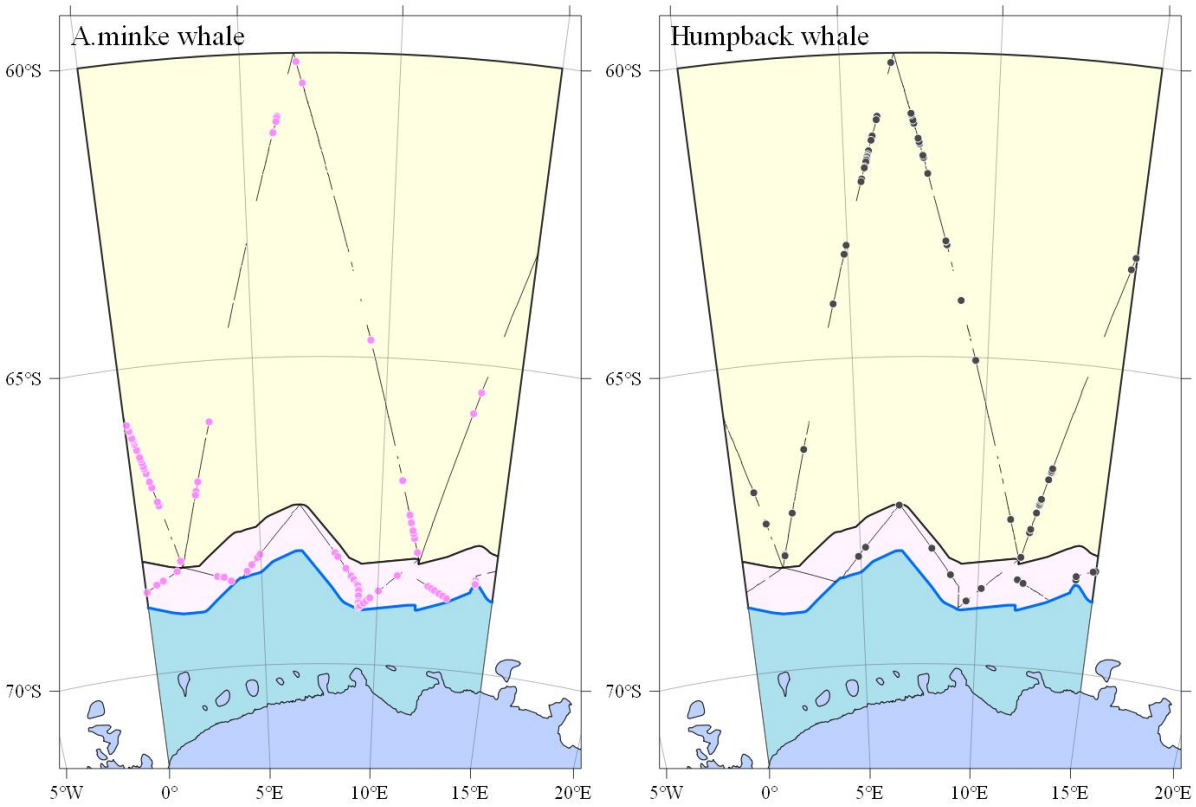

Figure 3b. Primary sighting positions of Antarctic minke (left) and humpback (right) whales with searching effort in the research area.

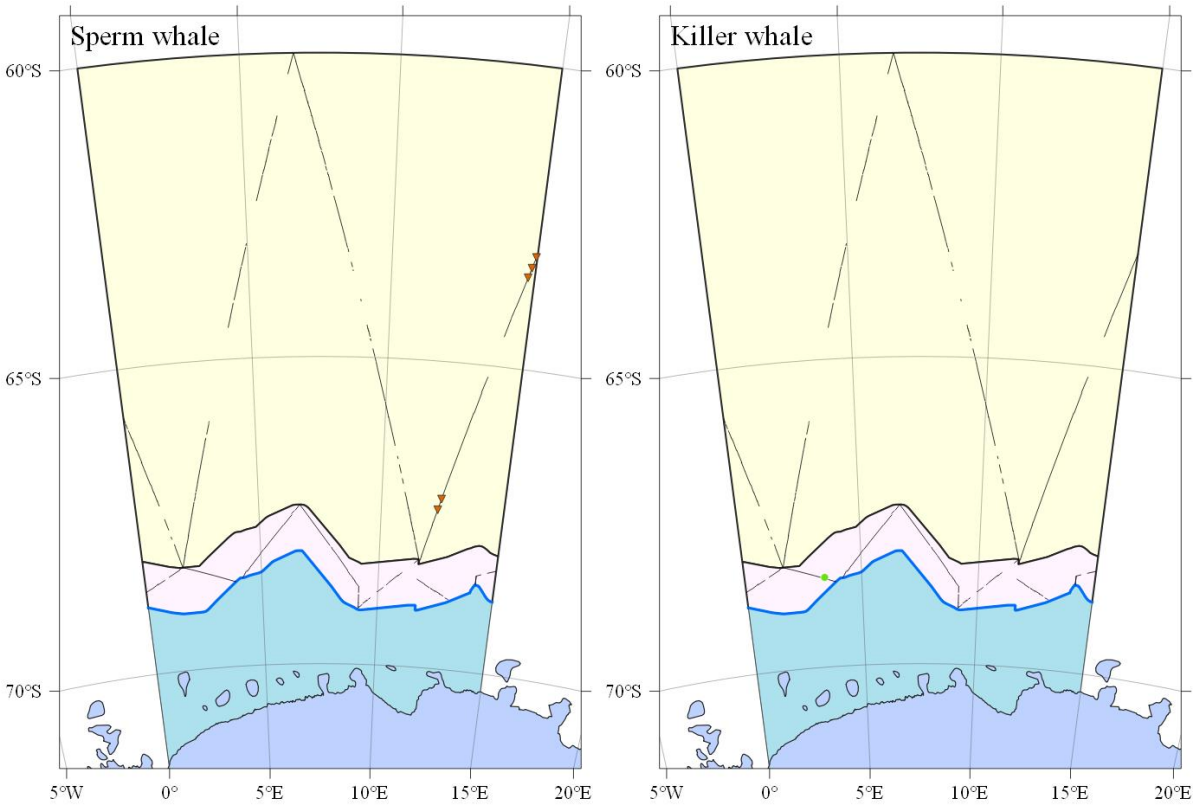

Figure 3c. Primary searching positions of sperm (left) and Killer (right) whales with searching effort in the research area.

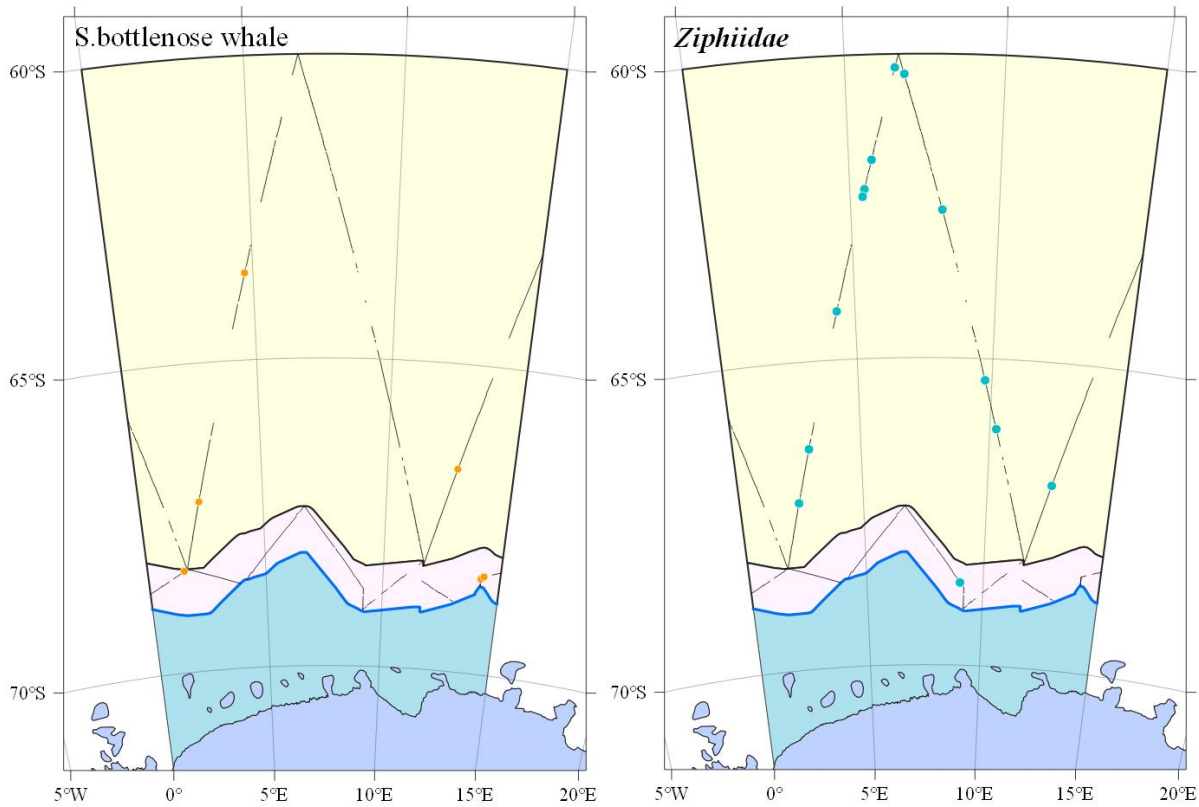

Figure 3d. Primary sighting positions of southern bottlenose whale (left) and *Ziphiidae* (right) with searching effort in the research area.

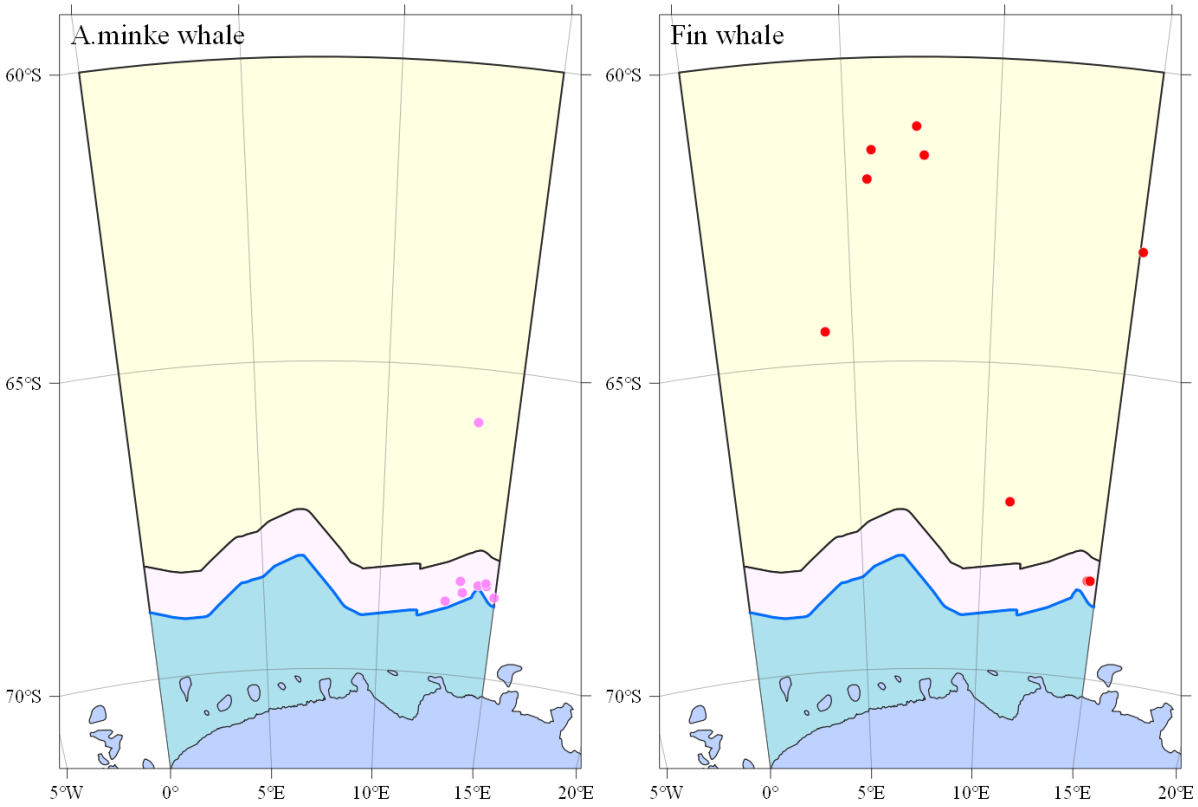

Figure 4. Satellite deployed positions of Antarctic minke (left) and fin (right) whales in the research area.

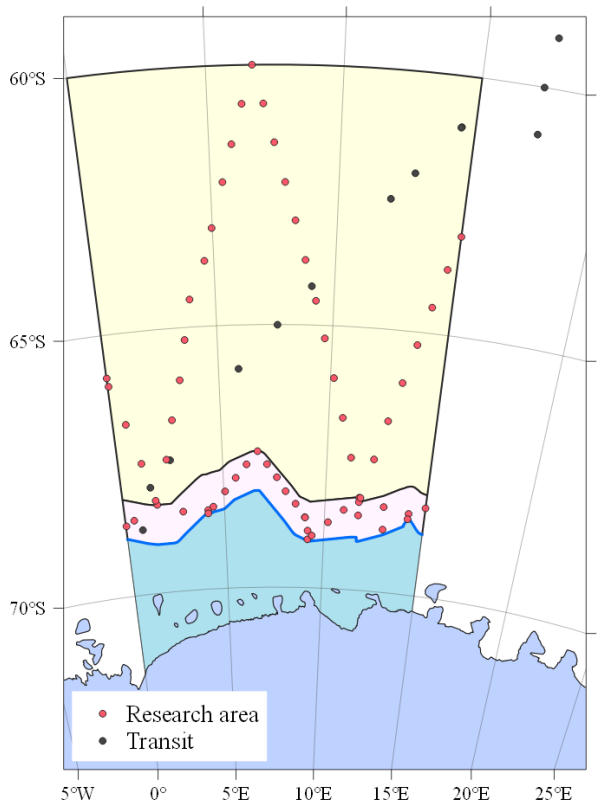

Figure 5. Oceanographic observation stations (XCTD casting points) in the 2019/20 JASS-A.

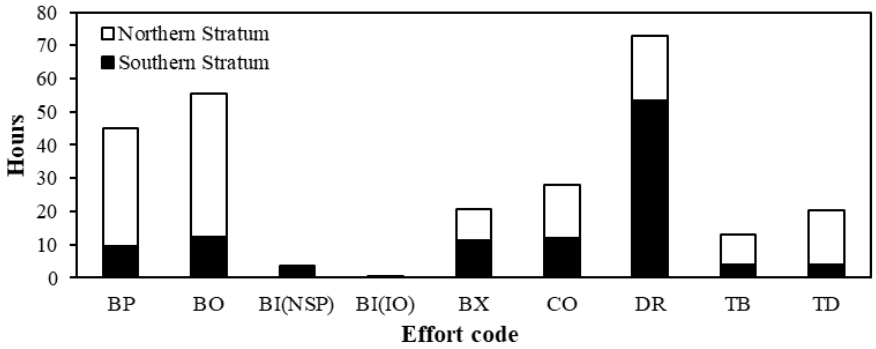

Figure 6a. Breakdown of research time in hours, by effort code in the research area. BP: Normal Passing mode searching (NSP); BO: Passing with Independent Observer searching (IO); BI: NSP and BO with in the ice area; BX: Sighting distance and angle estimate experiment, Photo-ID, Biopsy experiments, Satellite tagging experiments; CO: Confirmation of school; DR: Drifting; TB: Time back to track line; TD: Top down steaming.

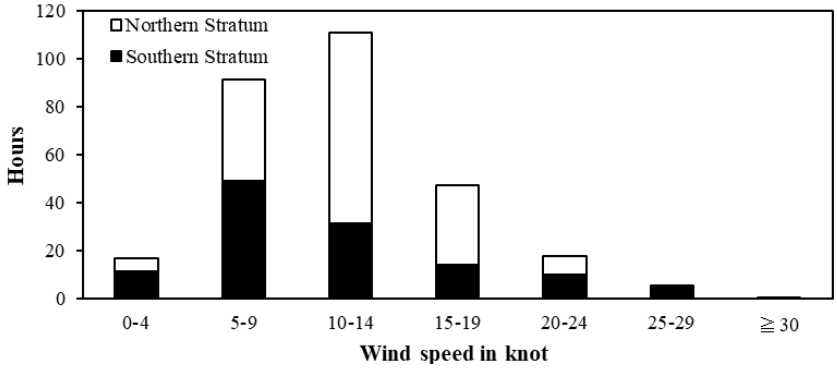

Figure 6b. Breakdown of research time in hours in the research area, by wind speed in knots.

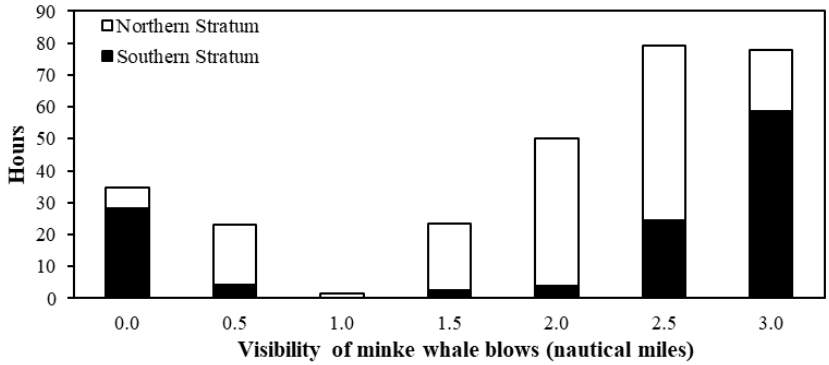

Figure 6c. Breakdown of research time in hours in the research area, by visibility (minke whale visibility) in nautical mile.

Appendix 1

Ship specifications of *Yushin-Maru No.2*

Vessel photos:

Yushin-Maru No.2

Vessel specifications:

	Yushin-Maru No.2
Call sign	JPPV
Length overall [m]	69.61
Molded breadth [m]	10.8
Gross tonnage [GT]	747
Top barrel height [m]	19.5
IO platform heigh [m]	13.5
Upper bridge height [m]	11.5
Bow height [m]	6.5
Engine power [PS / kW]	5,280 / 3,900

Appendix 2

RESULTS OF THE SATELLITE TRACKING OF ANTARCTIC MINKE AND FIN WHALES UNDER THE FIRST CRUISE OF JASS-A IN 2019/2020

Kenji Konishi, Tatsuya Isoda, Taiki Katsumata and Koji Matsuoka

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Satellite-monitored tagging is a part of main objective 2 in JASS-A program regarding distribution, movement and stock structure of baleen whales (Government of Japan, 2019). Implantable satellite-monitored tags in a stainless steel housing (113 mm SPOT6 with triangle stop plate; Wildlife Computers, Redmond, Washington, USA) were used for tracking whales. The tags were deployed with the Air Rocket Transmitter System (ARTS) (LK-ARTS, Skutvik, Norway), a pneumatic air launcher. The tags were deployed from the bow deck (6.5 m height from sea surface) of the R/V *Yushin-Maru No.2* (747GT, 70m-length). Skin biopsies were also collected for genetic analyses using a biopsy Larsen gun system (Larsen, 1998). Biopsies were simultaneously sampled after the deployment of the satellite tags if possible and stored at -20°C for later molecular analyses. The details of the deployment system is described in Konishi *et al*. (2020).

The tag deployments were conducted during end of January to early February 2020 in western part of Area III (010-015°E). The tags were successfully deployed on eight Antarctic minke whales and ten fin whales (Table 1; Figures 1 and 2). The tracking for two minke whales were still ongoing by 8th April 2020. Both Antarctic minke and fin whales appear to stay around the areas where they were tagged. In the later period, two Antarctic minke whales showed longitudinal movements westward and eastward movements, respectively. Antarctic minke whales tended to occur at rather southern area near the vicinity of ice edge and the sea shore than fin whales. These tracking data will be analysed with those of previous and the coming years to investigate distribution, movement and stock structures of these whales.

It can be concluded that satellite tracking experiments were conducted successfully during the first survey of JASS-A. Further improvements of the technique will be considered and applied in future surveys.

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Konishi, K., Isoda, T., Bando, T., Minamikawa, S. and Kleivane, L. 2020. Antarctic minke whales find ice gaps along the ice edge in foraging grounds of the Indo-Pacific sector (60° E and 140° E) of the Southern Ocean', *Polar Biology*. 43(4), pp. 343–357. doi: 10.1007/s00300-020-02638-x.

Larsen, F. 1998. Development of a biopsy system primarily for use on large cetaceans. Paper SC/50/O15 presented to the IWC Scientific Committee, May 1998. 8pp. [Paper available at the IWC Office].

Table 1.
Summary of the satellite-monitored tags for Antarctic minke and fin whales in 2019/20 JASS-A.
Two Antarctic minke whales are still being tracked by 8th April 2020.

No.	Vessel	Date	Species	School size	Latitude (degree)	Longitude (degree)	Estimated body length (m)*	PTT ID	Biopsy samples
1	YS2	2020/1/21	Fin	1	-67.3	11.0	23.1	66629	Y
2	YS2	2020/1/24	Fin	2	-61.6	7.6	20.1	66641	N
3	YS2	2020/1/24	Fin	1	-61.2	7.3	19.7	66628	Y
4	YS2	2020/1/26	fin	4	-61.5	5.9	19.4	181812	Y
5	YS2	2020/1/26	fin	3	-61.9	5.7	20.5	181818	Y
6	YS2	2020/1/27	fin	5	-64.4	4.2	19.5	181816	N
7	YS2	2020/1/30	Ant. Minke	2	-68.8	12.8	7.6	181813	Y
8	YS2	2020/2/1	Ant. Minke	1	-68.7	13.7	7.5	181811	Y
9	YS2	2020/2/1	Ant. Minke	1	-68.5	14.1	7.9	181821	Y
10	YS2	2020/2/1	fin	2	-68.4	14.3	19.6	181819	N
11	YS2	2020/2/1	fin	6	-68.4	14.5	20.1	181824	Y
12	YS2	2020/2/1	fin	6	-68.4	14.5	20.3	181820	Y
13	YS2	2020/2/2	Ant. Minke	2	-68.5	14.6	7.6	181817	Y
14	YS2	2020/2/2	Ant. Minke	1	-68.6	15.0	7	181815	Y
15	YS2	2020/2/2	Ant. Minke	1	-68.5	14.5	6.2	181810	Y
16	YS2	2020/2/3	Ant. Minke	1	-68.4	13.5	6.4	66627	Y
17	YS2	2020/2/4	Ant. Minke	1	-65.8	13.4	5.7	181822	Y
18	YS2	2020/2/6	fin	3	-63.0	15.1	18.8	181814	Y

* Body lengths of whales were estimated by the researcher on board.
Tagging experiments in No.11 and 12 were conducted for a same school.

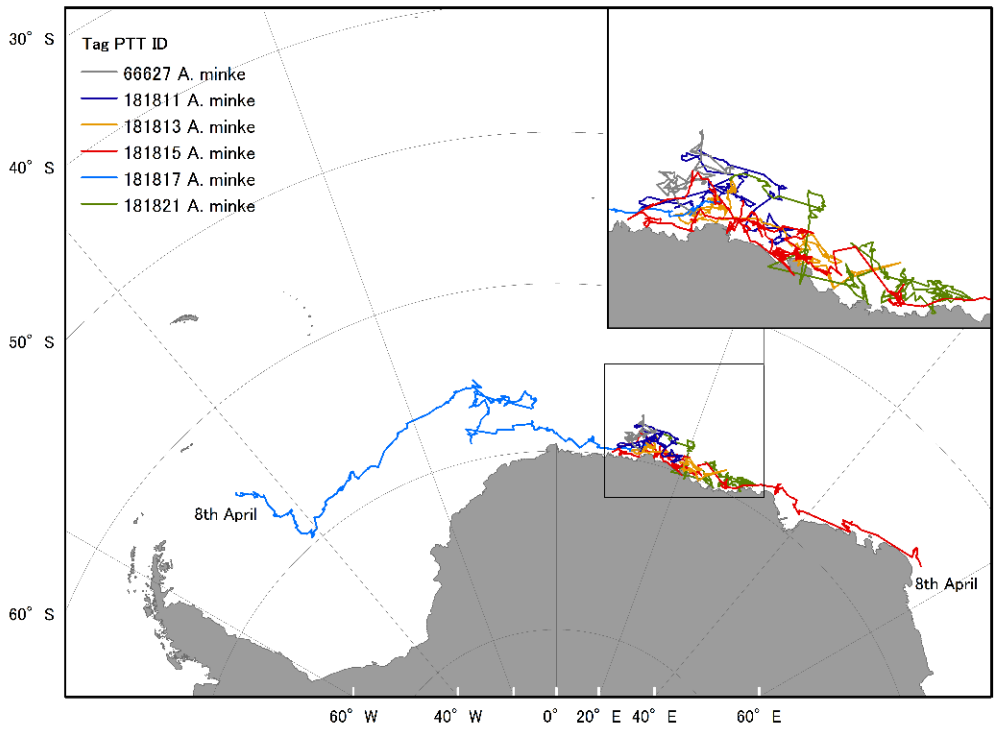

Figure 1. Tracking lines of six Antarctic minke whales by 8th April 2020. The lines are drawn by all ARGOS Location Classes (3, 2, 1, 0, A and B).

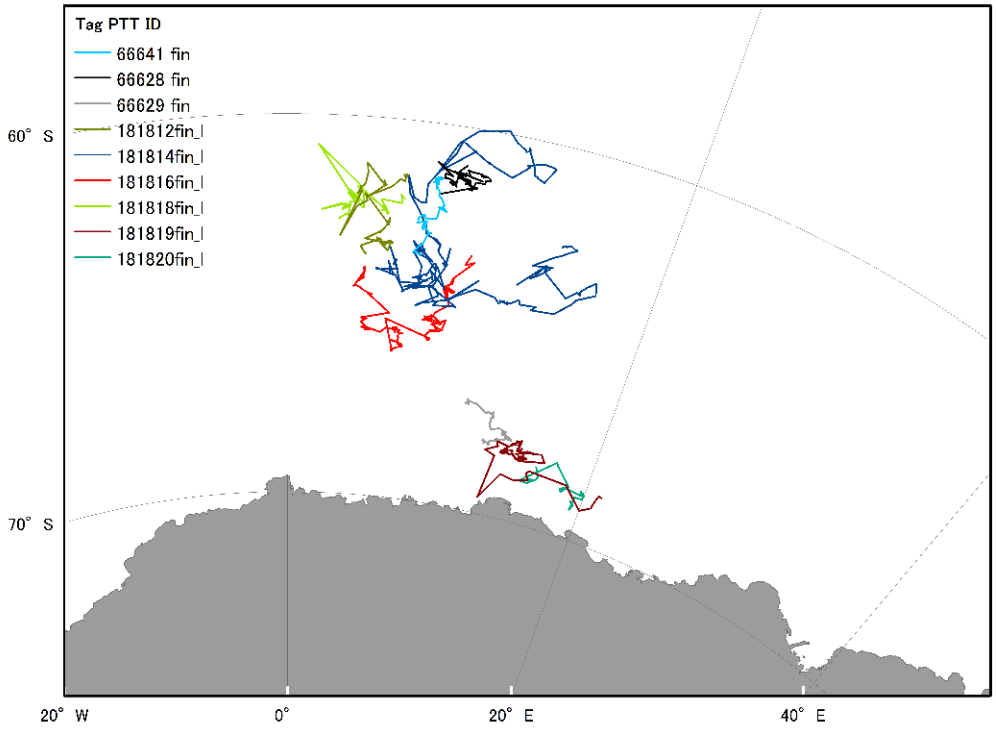

Figure 2. Tracking lines of nine fin whales by 8th April 2020. The lines are drawn by all ARGOS Location Classes (3, 2, 1, 0, A and B).

Appendix 3

Oversight for the 2019/20 JASS-A dedicated sighting survey

Koji Matsuoka

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The plan of this survey was presented to the 2019 IWC/SC meeting (Government of Japan, 2019) and endorsed by the Scientific Committee (IWC, 2019). On behalf of the IWC Scientific Committee I carried out the oversight work during the 2019/20 JASS-A dedicated sighting survey. This is a brief report of the oversight activities conducted on that survey.

Preparatory work

I participated in pre-cruise meetings carried out in Shiogama, Japan on 30 November 2019 and in Port Louis, Republic of Mauritius on 28 December 2019. The survey organizers, cruise leader, researchers, captain and crew members also participated in that meetings. During the meetings the organizers explained the objective of the survey and the procedure to be used for sighting surveys, experiments and oceanographic survey using latest sea ice information of the research area. The planned sighting procedure was in order with that agreed by the Scientific Committee. Research vessel was available for the surveys, the R/V *Yushin-Maru No.2* (*YS2*) (747GT). This vessel was assigned to cover the research area, south of 60°S in IWC Antarctic Area III West and in the longitudinal range of 000°-015°E, and also to cover predetermined transects, normal passing mode and passing with Independent Observer mode. Cruise leader and two experienced researchers were assigned to the vessel.

Oversight period and method

I was carried out the oversight work through the planning and the execution of this sighting survey conducted by the Institute of Cetacean Research (ICR). The research activities in the research vessel was oversight by examining the daily report prepared by the cruise leader and researchers on board with weather forecast and sea ice information. In some instances, telephone calls were made for further clarification of the activities, procedure and sightings made. Geographical positions and weather information of the vessel was tracked every day from ICR. Thus, the total survey was oversighted.

Brief narrative of the oversight vessel

The duration of this cruise was 109 days. The *YS2* departed from Shiogama, in Japan on 2 December 2019 and started the transit survey on 19 December. They arrived Port Louis, Republic of Mauritius on 27 December and departed Port Louis on 29 December 2019. The transit survey was completed on 12 January 2020 and started survey in the research area on 13 January. They completed the research area when the western part of the Area III West was finished and started the transit survey on 6 February. It arrived Port Louis on 20 February and departed Port Louis on 23 February 2020. The transit survey was completed on 1 March and the vessel arrived at Shiogama, in Japan on 19 March.

Post-cruise meeting

I participated in a post-cruise meeting held on 19 March 2020 in Shiogama, in Japan. Survey organizers, cruise leader, researchers and 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 vessel were the same as in the past sighting surveys. The design of the survey strata and track lines were improved to cover each stratum completely. The planned sighting procedure was in accordance with the guideline agreed by the SC (IWC, 2012). 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 2019/20 JASS-A dedicated sighting survey.

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Government of Japan. 2019. Outline of a research program to investigate the abundance, abundance trends and stock structure of large whales in the Indo-Pacific region of the Antarctic, including a survey plan for the 2019/20 austral summer season. Paper SC/68a/ASI8 presented to the IWC Scientific Committee, May 2019 (unpublished). 16pp. [Paper available at the IWC Office].

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