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**Results of the Japanese dedicated cetacean sighting survey in the western North Pacific in 2020 summer season**

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## ABSTRACT

A systematic large-scale vessel-based sighting survey was conducted in 2020 by Japan to examine the distribution and abundance of large whales in the western North Pacific. The research area was set between 30ºN-48ºN and 140ºE-170ºE. The survey was conducted between 31 July and 24 September. The research vessels *Yushin-Maru, Yushin-Maru No.3* and *Kaiyo-Maru No.7* were engaged in the surveys. A total of 6,698.6 n.miles was searched by the passing mode in the research area. Coverage of the searching efforts on the planned cruise track line was 89.5%. In total, seven large whale species including blue (4 schools/4 individuals), fin (58/76), sei (52/63), Bryde's (298/391), common minke (2/2), humpback (2/2) and sperm (224/574) whales were sighted during the whole research. Photo-ID images were collected from blue (4 individuals), humpback (1 individuals), and killer (4 individuals) whales. Biopsy skin samples using a Larsen system were collected from blue (n=2), fin (n=12), sei (n=15) and humpback (n=2) whales. Satellite tags were attached on fin (n=6), sei (n=11) whales. The sighting data will contribute to the work on management and conservation of large whales.

KEYWORDS: BLUE WHALE, FIN WHALE, BRYDE'S WHALE, SEI WHALE, COMMON MINKE WHALE, HUMPBACK WHALE, SPERM WHALE, SURVEY VESSEL, NORTH PACIFIC

## INTRODUCTION

Dedicated cetacean sighting surveys in the western North Pacific were conducted in the summer season since 1995 as a part of the Japanese Whale Research Program under Special Permit in the western North Pacific (JARPN/JARPNII) and the New Scientific Whale Research Program in the western North Pacific (NEWREP-NP) based on the survey procedures of the International Whaling Commission/Southern Ocean Whale and Ecosystem Research (IWC/SOWER). Based on the collected data the distribution patterns of large whales such as blue, fin, sei, Bryde's, common minke, humpback, North Pacific right and sperm whales, and abundance estimates of common minke, sei and Bryde's whales were investigated and reported to the IWC SC (IWC, 2001, 2010, 2016, Pastene *et al*., 2009, Hakamada *et al.*, 2009, Matsuoka *et al*., 2014, 2016, Murase *et al*., 2009).

The National Research Institute of Far Seas Fisheries (NRIFSF) has also conducted dedicated sighting surveys for cetaceans in the North Pacific since the 1980s (Buckland *et al.,* 1992; Miyashita *et al.*, 1995, Miyashita and Kato, 2004; 2005, Shimada, 2004, Kanaji, 2012). In 2019 the Government of Japan decided to continue the sighting surveys in the North Pacific (IWC, 2019) under the rational that the collection of sighting data to estimate abundance and biopsy/photo-identification data to examine stock structure have contributed in the past to the work on management and conservation of large whales by the IWC SC (IWC, 2010, 2016).

This paper reports the result of the Japanese dedicated sighting surveys conducted during July to September 2020. The plan for the survey had been presented to the 2020 IWC SC meeting (Hakamada *et al*., 2020) and endorsed by the SC (IWC, 2020).

## MATERIALS AND METHODS

### Research vessels

The surveys in 2020 were conducted by the research vessels *Yushin-Maru* (*YS1*), *Yushin-Maru No.3* (*YS3*) and *Kaiyo-Maru No.7* (*KY7*). The vessels were equipped with a top barrel platform (TOP), IO barrel platform (IOP) and upper bridge. Specifications of these vessels are shown in Appendix A.

### Research period and area

In 2020, surveys were conducted in late summer (July to September), and the research area was set up between 30°N-48°N and 140°E-170°E. The whole research area was stratified into three blocks: Pelagic North, Pelagic South and Offshore. Vessel *YS1* was assigned to survey the Pelagic North block; *YS3* the Pelagic South block; and *KY7* and *YS3* the Offshore block. The Offshore block was further divided between north and south at35°N (Figure 1).

**Track line design**
The survey block and pre-determined track lines are shown in Figure 1. The waypoints of each survey block are summarized in Tables 2a-c. The start point of the track lines were decided randomly using the "Distance program ver. 7.0" (Thomas *et al.*, 2010) and the number of the line (width in the longitude) was decided by the research schedule based on the IWC survey guidelines (IWC, 2012).

**Sighting procedure**
The sighting survey was conducted using (1) Normal Passing mode (NSP) and (2) Passing with Independent Observer mode (IO) in order to estimate whale abundance considering estimated g(0). Both survey modes followed the protocol endorsed for the SOWER surveys (e.g. Matsuoka *et al*., 2003; IWC, 2008, 2012).

For NSP mode, there were two primary observers in the top barrel (TOP) and two in the upper bridge (captain and helmsman). All primary observers conducted searching for cetaceans by using angle board and scaled binoculars (7x).

For IO mode, there were two primary observers on the TOP and two in the independent observer platform (IOP). These observers conducted searching for cetaceans by using angle board and scaled binoculars (7x). There was no open communication between the IOP and the TOP. The observers and researchers on the upper bridge communicated to the TOP (or IOP) independently, only to clarify information and did not distract the top-men from their normal searching procedure. These primary observers report sighting-information to researchers and other observers on the upper bridge for data recording.

The survey effort began 60 minutes after sunrise and ended 60 minutes before sunset, with a maximum of 12 hours per day (maximum 06:00-19:00, including 30 minutes for mealtime for lunch and supper, when surveying in IO mode) when the weather conditions were acceptable for observations: visibility better than 2.0 n.miles and wind speed less than 21 knots. The searching speed was planned to be 10.0 to 11.0 knots with slight adjustment to avoid vibration of the vessel.

**Research personnel**
Two Japanese researchers were on board of each research vessel. The researchers had considerable experience in whale line-transect surveys in the North Pacific and the Antarctic as well as experience conducting photo-ID and biopsy experiments through participation in the JASS-A and NEWREP-NP programs.

*Yushin-Maru* (*YS1*)
Takashi Yoshida – sighting data, photo-ID, biopsy, satellite tag
Masahiro Yamazaki – sighting data, photo-ID, biopsy

*Yushin-Maru No.3* (*YS3*)
Futoshi Yamaguchi – sighting data, photo-ID, biopsy, satellite tag
Haruna Murata – sighting data, photo-ID, biopsy

*Kaiyo-Maru No.7* (*KY7*)
Tatsuya Isoda – sighting data, photo-ID, biopsy, satellite tag
Megumi Takahashi – sighting data, photo-ID, biopsy

**Experiments**
Distance and angle experiments were conducted in the middle of the survey period. The experiment was conducted to evaluate measurement error, and followed the protocol of the IWC/SOWER and IWC-POWER surveys (IWC, 2012).

When large cetaceans such as blue and humpback whales were found, photo-id images were obtained using Canon EOS 7D Mark II (with 100-400 mm lens) from the bow or upper deck. Further, biopsy skin sampling using the Larsen system (Larsen, 1998) was conducted when blue, fin, sei, humpback whales were sighted. Satellite tagging experiment using the Air Rocket Transmitter System (LK-ARTS) was also conducted for fin and sei whales.

**RESULTS AND DISCUSSION**

**Brief narrative of the surveys**
The survey was conducted between 31 July and 24 September. Table 1 shows the details of the itinerary of each

research vessel.

The *YS1* and *YS3* departed Ishinomaki, Miyagi, Japan on 31 July, and started the transit survey on 1 August. On 4 August, the *YS1* reached the start point of the Pelagic North block, and completed the survey on 19 September. The *YS3* reached at start point of the Pelagic South block on 6 August, and completed the survey on 4 September. After that, *YS3* started the survey in the Offshore block (south of 34ºN) on 6 September and completed it on 19 September. The *YS1* and *YS3* arrived in Ishinomaki, Miyagi on 24 September.

The *KY7* departed Hachinohe, Aomori, Japan on 5 August, and started the transit survey on 6 August. On 7 August, the *KY7* started the survey in the Offshore block, and completed the survey on 11 September. The *KY7* arrived in Kurihama, Kanagawa, Japan on 18 September.

**Searching effort**

A summary of searching effort and coverage in each survey block is shown in Table 3. A total of 6,698.6 n.miles 12,405.8 km) were searched. In the Pelagic North block, the total searching effort was 1,570.0 n.miles (3,175.6km), and the coverage was 80%. In the Pelagic South block, searching effort was 1,901.5 n.miles (3,521.6 km), and the coverage exceeded 95%. In the offshore block, the total searching effort was 3,227.1 n.miles (5,976.6 km), and the coverage was 91%.

**Sightings**

Sightings were summarized in Table 4. Table 5 shows the identification of duplicate sightings observed when surveying in IO mode by each vessel. The sighting location of each species in each survey block is shown in Figures 2a-g, and average sea surface temperature (SST) during the period when the survey was being conducted is illustrated in each figure.

*Sightings by each species*

Blue whale

A total of 4 schools (4 individuals) were sighted, all in the Pelagic North block (Figure 2a), and no mother & calf pair were sighted. Range of SST in the sighting positions was 11.4°C – 23.0°C. All 4 individuals were photographed, and biopsy samples were collected from 2 individuals.

Fin whale

This species was sighted in all survey blocks. A total of 58 schools (76 individuals) were sighted, and no mother & calf pair were observed. High density was observed in the most northern part of Pelagic North block (Figure 2b). Observed mean school size was 1.31. Range of SST in the sighting positions was 10.1°C – 29.7°C (mean SST 16.2°C).

Sei whale

This species was sighted in north of 39 °N of the Offshore and Pelagic North block. A total of 52 schools (63 individuals) were sighted, and no mother & calf pair were observed. High density was observed in the Pelagic North block, partly overlapped with fin whales (Figure 2c). Observed mean school of size was 1.21. Range of SST in the sighting positions was 10.7°C – 24.2°C (mean SST 16.2°C).

Bryde's whale

This species was the most frequently sighted baleen whale in all survey blocks. A total of 298 schools (391 individuals) including 13 mother & calf pairs were sighted. This species was distributed widely between 35ºN and 43ºN (Figure 2d). In general, Bryde's whales were widely distributed in summer (from July to September) in the western North Pacific north of 35ºN based on the previous dedicated sighting surveys (Shimada, 2004; Pastene *et al*., 2009; Hakamada *et al*., 2017). Observed mean school of size was 1.11. Range of SST in the sighting positions was 19.7°C – 30.9°C (mean SST 25.5°C).

Common minke whale

A total of 2 schools (2 individuals) of common minke whales were sighted. Both individuals were sighted in the northern coastal part of Offshore block (Figure 2e). SST in the sighting positions was 14.0°C and 14.9°C, respectively. In this season, relatively warm water was spread at a depth 100m in the research area (Figure 3). According to Watanabe *et al*. (2012), in the western North Pacific, common minke whales were distributed in waters where the water temperature at a depth 100m was lower than 6°C during summer. It seems that environmental conditions constrained the distribution of this species in the research area. In the northern part of Pelagic North block, these water temperatures were lower than 6°C, however these areas were occupied by large baleen whales (fin, sei and Bryde's) (Figures 2b-d).

Humpback whale

A total of 2 schools (2 individuals) and no mother & calf pair of this species were sighted. Sightings were made north of 43ºN in the Offshore and Pelagic North block (Figure 2f). SST in the sighting position was 12.6°C and 18.4°C. One individual was photographed, and biopsy samples were collected from both individuals.

Sperm whale
A total of 224 schools (574 individuals) of this species were sighted (Figure 2g). This species was widely distributed in all survey blocks. Observed mean school size was 2.56. Because of limited approaching to the schools, there was little information on body length and calves. Range of SST in the sighting positions was 10.6°C – 30.9°C.

Resighting during IO Mode
A total of 433 resightings of large cetaceans were recorded during IO mode. Table 5 shows the duplicates by each vessel based on the number of sightings made by the IOP and TOP.

For blue whales, there were 5 school sightings made by TOP and IOP and 2 schools made by IOP in all three vessels. This included 2 'definite duplicate'. For fin whales, there were 33 school sightings made by TOP and IOP and 14 schools made by IOP in all three vessels. This included 10 'definite duplicate' and 5 'not duplicate'. For sei whales, there were 24 school sightings made by TOP and IOP and 13 schools made by IOP in all three vessels. This included include 4 'definite duplicate' and 9 'not duplicate'. For Bryde's whales, there were 209 school sightings made by TOP and IOP and 99 schools made by IOP in all three vessels. This included 66 'definite duplicate', 1 'probably duplicate' and 32 'not duplicate'. For common minke whales, there was 1 school sighting made by TOP. This sighting was 'not duplicate' with IOP. For humpback whales, there were 3 school sightings made by TOP and IOP and 2 schools made by IOP. This included 2 'definite duplicate'.

The data obtained during the IO survey mode will be valuable when the estimations of g(0) are made for those species.

**Experiments**
*Sighting distance and angle experiment*
The Estimated Angle and Distance Training Exercise was conducted early in the surveys using a buoy that resembles a blow with a reflector. During the exercise, the observers familiarized themselves with distance estimates from the TOP and Upper Bridge. The Estimated Angle and Distance Experiment was conducted on 6 September by *YS1*, on 20 August by *YS3* and on 26 August by *KY7*. The results of this experiment will be used for the calculation of abundance estimates.

*Photo-ID*
Photographs were taken of blue (n=4), humpback (n=1) and killer (n=4) whales (Table 6a). All photographs were stored in the ICR catalogues and will be used for investigating their stock structure and movement in the future.

*Biopsy sampling*
Allocation of research time to biopsy sampling was initially restricted with the aim of maximizing the sighting searching effort to cover the research area. A total of 31 biopsy samples were collected from blue (n=2), fin (n=12), sei (n=15) and humpback (n=2) whales (Tables 6b). Details of all attempts are summarized in the table 6c. All samples were stored at the ICR laboratory, and will be used in genetic analyses for investigating their stock structure in the future.

*Satellite tagging*
Satellite tags were successfully attached on fin (n=6) and sei (n=11) whales (Table 6d). Tracking data will be used for investigating their pattern of distribution and migration in the future.

**Report of the IWC oversight**
A detailed report of the IWC oversight person is shown in Appendix B.

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**REFERENCES**


Buckland, S.T., Cattanach, K.L. and Miyashita, T. 1992. Minke whale abundance in the northwest Pacific and the Okhotsk Sea, estimated from 1989 and 1990 sighting surveys. *Rep. int. Whal. Comn* 42:387-392.

Hakamada, T., Matsuoka, K. and Miyashita, T. 2009. Distribution and the number of western North Pacific common minke, Bryde's, sei and sperm whales distributed in JARPNII Offshore component survey area. SC/J09/JR15. 18pp. [Paper available at the IWC Office].

Hakamada, T., Takahashi, M., Matsuoka, K. and Miyashita, T. 2017. Abundance estimate for western North Pacific Bryde's whale by sub-areas based on IWC-POWER and JARPNII sighting surveys. SC/M17/RMP2. 11pp. [Paper available at the IWC Office].

Hakamada, T., Takahashi, M., Matsuoka, K. and Miyashita, T. 2020. Outline of the research plan for Japan's dedicated cetacean sighting surveys in the western North Pacific Ocean in summer 2020. SC/68B/ASI/14. 7pp. [Paper available at the IWC Office].

IWC. 2001. Report of the Workshop to Review the Japanese Whale Research Program under special permit for North Pacific minke whales (JARPN). *J. Cetacean Res. Manage.* 3 (Supp.):377-413.

IWC. 2008. IWC SOWER Cruise 2008/09, Information for Researchers. https://iwc.int/private/downloads/-m4RVc06JhBVw3ymd3oPcw/Guide%20%20for%20Researchers%202008-09.pdf.

IWC. 2010. The Report of the Expert Workshop to review the ongoing JARPN II Programme. *J. Cetacean Res. Manage.* 11 (Supp.2):405-450.

IWC. 2012. Requirements and Guidelines for Conducting Surveys and Analyzing Data within the Revised Management Scheme. *J. Cetacean Res. Manage.* 13 (Supp.):509-517

IWC. 2016. Report of the Expert Panel of the final review on the western North Pacific Japanese Special Permit programme (JARPN II). SC/66b/REP/06. 96pp. [Paper available at the IWC Office].

IWC. 2019. Report of the Scientific Committee. Annex U: Statement from Japan regarding Japan's withdrawal from the IWC. 1pp. Nairobi, Kenya, 2019. [Paper available at the IWC Office].

IWC. 2020. Report of the Scientific Committee. Report of the Scientific Committee. 131pp. Virtual Meetings, 2020. [Paper available at the IWC Office].

Kanaji, Y., Iwasaki, T., Kishiro, T. and Miyashita, T. 2012. Cruise report of the sighting and satellite tagging survey for common minke whales in the sub-area 7 in 2011. SC/64/O9. 10pp. [Paper available at the IWC Office].

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

Matsuoka, K., Ensor, P., Hakamada, T., Shimada, H., Nishiwaki, S., Kasamatsu, F. and Kato, H. 2003. Overview of minke whale sightings surveys conducted on IWC/IDCR and SOWER Antarctic cruises from 1978/79 to 2000/01. *J. Cetacean Res. Manage*. 5(2):173–201.

Matsuoka, K., Hakamada, T. and Miyashita, T. 2014. Recent sightings of the North Pacific Right (*Eubalaena japonica*) whales in the western North Pacific based on JARPN and JARPN II surveys (1994 to 2013). SC/65b/BRG11. 8pp. [Paper available at the IWC Office].

Matsuoka, K., Hakamada, T. and Miyashita, T. 2016. Distribution of blue (*Balaenoptera musculus*), fin (*B. physalus*), humpback (*Megaptera novaeangliae*) and north pacific right (*Eubalaena japonica*) whales in the western North Pacific based on JARPN and JARPN II sighting surveys (1994 to 2014). SC/J09/JR35. 12pp. The IWC/SC JARPNII review meeting, Yokohama, 26-30, January. [Paper available at the IWC Office].

Miyashita, T., Kato, H. and Kasuya, T. 1995. *Worldwide Map of Cetacean Distribution based on Japanese Sighting Data (Volume 1)*. pp43-56.

Miyashita, T. and Kato H. 2004. Plan for the North Pacific minke whale sighting surveys in 2004. SC/56/RMP3. 3pp. [Paper available at the IWC Office].

Miyashita, T. and Kato H. 2005. Plan for the minke whale sighting surveys in the North Pacific in 2005. SC/57/NPM2. 5pp. [Paper available at the IWC Office].

Murase, H., Hakamada, T., Kiwada, H., Inagake, D., Okazaki, M., Tojyo, N. and Matsuoka, K. 2009. Preliminary results of estimation of sei whale (*Balaenoptera borealis*) distribution and abundance in the whole North Pacific basin. Appendix 2. 11pp. *In:* Hakamada, T., Examination of the effects on whale stocks of future JARPN II catches. SC/J09/JR36. 56pp.

Pastene, L,A., Hatanaka, H., Fujise, Y., Kanda, N., Murase, H., Tamura, T., Miyashita, T. and Kato, H., 2009. The Japanese Whale Research Program under Special Permit in the western North Pacific Phase-II (JARPN II): origin, objectives and research progress made in the period 2002-2007, including scientific considerations for the next research period. SC/J09/JR1 (Rev 1). 73pp.

Shimada, H. 2004. Abundance estimate of the western North Pacific stock of Bryde's whales using sighting data from 1998 to 2002. SC/56/PIF6. 8pp.

Thomas, L., Buckland, S. T., Rexstad, E. A., Laake, J. L., Strindberg, S., Hedley, S. L., Bishop, J. R.B., Marques, T. A. and Burnham, K. P. 2010. Distance software: design and analysis of distance sampling surveys for estimating population size. *Journal of Applied Ecology* 47(1): 5-14.

Watanabe, H., Okazaki, M., Tamura, T., Konishi, K., Inagake, D., Bando, T., Kiwada, H. and Miyashita, T. 2012. Habitat and prey selection of common minke, sei, and Bryde's whales in mesoscale during summer in the subarctic and transition regions of the western North Pacific. *Fish Sci* 78: 557–567.

Table 1. Itinerary of the dedicated sighting survey in 2020.

| Vessel | YY/MM/DD | Event |
|---|---|---|
| *Yushin-Maru* (*YS1*) | 20/07/27 | Pre-cruise meeting at Ishinomaki, Japan |
| | 20/07/31 | *YS1* departed at Ishinomaki, Japan |
| | 20/08/01 | Started transit survey at 39°-50'N, 145°-09'E (JAPAN EEZ and High sea) |
| | 20/08/01 | Interrupted transit survey at 40°-45'N, 147°-13'E (Entering RUSSIA EEZ) |
| | 20/08/03 | Resumed transit survey at 44°-21'N, 155°-33'E (High sea) |
| | 20/08/03 | Finished transit survey at 45°-28'N, 158°-15'E |
| | 20/08/04 | Started survey in the Pelagic North block at 46°-11'N, 160°-00'E |
| | 20/09/19 | Completed survey in the Pelagic North block (47days) and start transit survey at 40°-28'S, 150°-00'E |
| | 20/09/24 | *YS1* arrived and post cruise meeting at Ishinomaki, Japan. |
| *Yushin-Maru No.3* (*YS3*) | 20/07/27 | Pre-cruise meeting at Ishinomaki, Japan |
| | 20/07/31 | *YS3* departed at Ishinomaki, Japan |
| | 20/08/01 | Started transit survey at 38°-12'N, 145°-30'E |
| | 20/08/05 | Finished transit survey at 36°-59'N, 169°-14'E |
| | 20/08/06 | Started survey in the Pelagic South block at 37°-00'N, 170°-00'E |
| | 20/09/04 | Finished survey in the Pelagic South block at 37°-58'N, 150°-00'E<br>Started travel for the Offshore block. |
| | 20/09/06 | Started survey in the Offshore block at 34°-12'N, 142°-31'E |
| | 20/09/18 | Finished survey in the Offshore block at 30°-00'N, 147°-55'E |
| | 20/09/19 | Completed survey in the research area (45 days) start transit survey at 63°-05'S, 15°-00'E |
| | 20/09/24 | *YS3* arrived and post cruise meeting at Ishinomaki, Japan. |
| *Kaiyo-Maru No.7* (*KY7*). | 20/08/03 | Pre-cruise meeting at Hachinohe, Japan |
| | 20/08/05 | *KY7* departed at Hachinohe, Japan |
| | 20/08/06 | Started transit survey at 41°-20'N, 142°-49'E |
| | 20/08/06 | Finished transit survey at 41°-39'N, 143°-30'E |
| | 20/08/07 | Started survey in the Offshore block at 42°-38'N, 144°-02'E |
| | 20/09/11 | Completed survey in the Offshore block (36 days) at 35°-33'N, 145°-55'E |
| | 20/09/18 | *KY7* arrived and post cruise meeting at Kurihama, Japan. |

Table 2a. Waypoints (WP) by each survey mode in the survey block Pelagic North. The planned original cruise track line distance in the survey block was 1,960.8 n.miles.

**Pelagic North (*YS1*)**

| WP | Latitude | | | Longitude | | | Survey | Course | Plan | WP | Latitude | | | Longitude | | | Survey | Course | Plan |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | deg | min | N/S | deg | min | E/W | mode | | (n.miles) | | deg | min | N/S | deg | min | E/W | mode | | (n.miles) |
| 701 | 46 | 10.6 | N | 160 | 00.0 | E | NSP | 353.0 | 50.6 | 716 | 41 | 22.1 | N | 155 | 47.4 | E | IO | 192.0 | 83.7 |
| 702 | 47 | 00.9 | N | 159 | 50.5 | E | IO | 353.0 | 50.6 | 717 | 40 | 00.0 | N | 155 | 24.8 | E | NSP | 192.0 | 57.3 |
| 703 | 47 | 51.1 | N | 159 | 40.8 | E | NSP | 353.0 | 79.0 | 718 | 40 | 55.6 | N | 155 | 06.0 | E | IO | 345.0 | 57.3 |
| 704 | 46 | 32.6 | N | 159 | 25.8 | E | IO | 187.0 | 79.0 | 719 | 41 | 51.2 | N | 154 | 46.9 | E | NSP | 345.0 | 57.3 |
| 705 | 45 | 14.1 | N | 159 | 11.1 | E | NSP | 187.0 | 79.0 | 720 | 42 | 46.8 | N | 154 | 27.5 | E | IO | 345.0 | 57.3 |
| 706 | 43 | 55.6 | N | 158 | 56.7 | E | IO | 187.0 | 79.0 | 721 | 43 | 42.4 | N | 154 | 07.8 | E | NSP | 345.0 | 58.2 |
| 707 | 42 | 37.1 | N | 158 | 42.7 | E | NSP | 187.0 | 79.0 | 722 | 42 | 46.8 | N | 153 | 43.9 | E | IO | 197.0 | 58.1 |
| 708 | 41 | 18.6 | N | 158 | 29.0 | E | IO | 187.0 | 79.0 | 723 | 41 | 51.2 | N | 153 | 20.3 | E | NSP | 197.0 | 58.2 |
| 709 | 40 | 00.0 | N | 158 | 15.5 | E | NSP | 187.0 | 83.1 | 724 | 40 | 55.6 | N | 152 | 57.1 | E | IO | 197.0 | 58.2 |
| 710 | 41 | 22.1 | N | 157 | 56.8 | E | IO | 350.0 | 83.1 | 725 | 40 | 00.0 | N | 152 | 34.2 | E | NSP | 333.0 | 71.0 |
| 711 | 42 | 44.2 | N | 157 | 37.7 | E | NSP | 350.0 | 83.1 | 726 | 41 | 03.5 | N | 151 | 51.9 | E | IO | 333.0 | 71.0 |
| 712 | 44 | 06.3 | N | 157 | 18.2 | E | IO | 350.0 | 83.1 | 727 | 42 | 06.9 | N | 151 | 08.9 | E | NSP | 207.0 | 57.2 |
| 713 | 45 | 28.3 | N | 156 | 58.2 | E | NSP | 350.0 | 83.7 | 728 | 41 | 15.9 | N | 150 | 34.2 | E | IO | 207.0 | 57.1 |
| 714 | 44 | 06.3 | N | 156 | 34.1 | E | IO | 192.0 | 83.7 | 729 | 40 | 24.8 | N | 150 | 00.0 | E | NSP | 207.0 | - |
| 715 | 42 | 44.2 | N | 156 | 10.5 | E | NSP | 192.0 | 83.7 | - | - | - | - | - | - | - | - | - | - |

Table 2b. Waypoints (WP) by each survey mode in the survey block Pelagic South. The planned original cruise track line distance in the survey block was 1,981.2 n.miles.

**Pelagic South (*YS3*)**

| WP | Latitude | | | Longitude | | | Survey | Course | Plan | WP | Latitude | | | Longitude | | | Survey | Course | Plan |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | deg | min | N/S | deg | min | E/W | mode | | (n.miles) | | deg | min | N/S | deg | min | E/W | mode | | (n.miles) |
| 601 | 36 | 59.5 | N | 170 | 00.0 | E | NSP | 209° | 67.9 | 614 | 38 | 45.0 | N | 159 | 12.4 | E | IO | 331° | 85.3 |
| 602 | 35 | 59.8 | N | 169 | 19.4 | E | IO | 209° | 67.9 | 615 | 40 | 00.0 | N | 158 | 19.4 | E | NSP | 209° | 85.3 |
| 603 | 35 | 00.0 | N | 168 | 39 | E | NSP | 331° | 85.3 | 616 | 38 | 45.0 | N | 157 | 26.4 | E | IO | 209° | 85.3 |
| 604 | 36 | 15.0 | N | 167 | 48.9 | E | IO | 331° | 85.3 | 617 | 37 | 30.0 | N | 156 | 34.3 | E | NSP | 209° | 85.3 |
| 605 | 37 | 30.0 | N | 166 | 57.7 | E | NSP | 331° | 85.3 | 618 | 36 | 15.0 | N | 155 | 43.1 | E | IO | 209° | 85.3 |
| 606 | 38 | 45.0 | N | 166 | 05.7 | E | IO | 331° | 85.3 | 619 | 35 | 00.0 | N | 154 | 52.7 | E | NSP | 331° | 85.3 |
| 607 | 40 | 00.0 | N | 165 | 12.7 | E | NSP | 209° | 85.3 | 620 | 36 | 15.0 | N | 154 | 02.3 | E | IO | 331° | 85.3 |
| 608 | 38 | 45.0 | N | 164 | 19.7 | E | IO | 209° | 85.3 | 621 | 37 | 30.0 | N | 153 | 11.1 | E | NSP | 331° | 85.3 |
| 609 | 37 | 30.0 | N | 163 | 27.6 | E | NSP | 209° | 85.3 | 622 | 38 | 45.0 | N | 152 | 19.1 | E | IO | 331° | 85.3 |
| 610 | 36 | 15.0 | N | 162 | 36.4 | E | IO | 209° | 85.3 | 623 | 40 | 00.0 | N | 151 | 26.1 | E | NSP | 209° | 69.7 |
| 611 | 35 | 00.0 | N | 161 | 46.0 | E | NSP | 331° | 85.3 | 624 | 38 | 58.8 | N | 150 | 42.8 | E | IO | 209° | 69.7 |
| 612 | 36 | 15.0 | N | 160 | 55.6 | E | IO | 331° | 85.3 | 625 | 37 | 57.5 | N | 150 | 00.0 | E | - | - | - |
| 613 | 37 | 30.0 | N | 160 | 04.4 | E | NSP | 331° | 85.3 | - | - | - | - | - | - | - | - | - | - |

Table 2c. Waypoints (WP) by each survey mode in the survey block Offshore. The planned original cruise track line distance in the survey block was 3,541.8 n.miles. The *KY7* surveyed between WP801 and WP838, the *YS3* surveyed between WP838 and WP858.

**Offshore (*KY7* and *YS3*)**

| WP | Latitude | | | Longitude | | | Survey | Course | Plan | WP | Latitude | | | Longitude | | | Survey | Course | Plan |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | deg | min | N/S | deg | min | E/W | mode | | (n.miles) | | deg | min | N/S | deg | min | E/W | mode | | (n.miles) |
| 801 | 42 | 56.8 | N | 144 | 04.9 | E | NSP | 104° | 46.1 | 830 | 35 | 48.0 | N | 147 | 27.9 | E | NSP | 259° | 62.8 |
| 802 | 42 | 45.7 | N | 145 | 05.8 | E | IO | 104° | 46.1 | 831 | 35 | 36.0 | N | 146 | 12.1 | E | IO | 259° | 62.8 |
| 803 | 42 | 34.6 | N | 146 | 06.5 | E | - | - | - | 832 | 35 | 24.0 | N | 144 | 56.5 | E | NSP | 259° | 62.8 |
| 804 | 41 | 55.0 | N | 146 | 27.9 | E | NSP | 256° | 58.8 | 833 | 35 | 12.0 | N | 143 | 41.1 | E | IO | 259° | 62.8 |
| 805 | 41 | 40.9 | N | 145 | 11.4 | E | IO | 256° | 58.8 | 834 | 35 | 00.0 | N | 142 | 25.9 | E | NSP | 259° | 61.1 |
| 806 | 41 | 26.9 | N | 143 | 55.2 | E | NSP | 256° | 58.8 | 835 | 34 | 48 | N | 141 | 13 | E | IO | 079° | 61.1 |
| 807 | 41 | 12.8 | N | 142 | 39.3 | E | IO | 256° | 58.8 | 836 | 34 | 37 | N | 140 | 0 | E | NSP | 101° | 63.6 |
| 808 | 40 | 58.7 | N | 141 | 23.6 | E | - | - | - | 837 | 34 | 25 | N | 141 | 16 | E | IO | 101° | 63.6 |
| 809 | 40 | 34.0 | N | 141 | 29.4 | E | NSP | 101° | 66.6 | 838 | 34 | 12 | N | 142 | 31 | E | NSP | 101° | 63.6 |
| 810 | 40 | 21.1 | N | 142 | 55.2 | E | IO | 101° | 66.6 | 839 | 34 | 0.2 | N | 143 | 47 | E | IO | 101° | 63.6 |
| 811 | 40 | 08.1 | N | 144 | 20.7 | E | NSP | 101° | 66.6 | 840 | 33 | 48 | N | 145 | 1.7 | E | NSP | 101° | 63.6 |
| 812 | 39 | 55.2 | N | 145 | 45.9 | E | IO | 101° | 66.6 | 841 | 33 | 36 | N | 146 | 17 | E | IO | 101° | 63.6 |
| 813 | 39 | 42.2 | N | 147 | 10.9 | E | NSP | 101° | 66.6 | 842 | 33 | 24 | N | 147 | 31 | E | NSP | 101° | 63.6 |
| 814 | 39 | 29.3 | N | 148 | 35.6 | E | IO | 101° | 66.6 | 843 | 33 | 12 | N | 148 | 46 | E | IO | 101° | 63.6 |
| 815 | 39 | 16.3 | N | 150 | 0.0 | E | NSP | 259° | 72.3 | 844 | 32 | 60 | N | 150 | 0 | E | NSP | 259° | 64.7 |
| 816 | 39 | 02.4 | N | 148 | 28.6 | E | IO | 259° | 72.3 | 845 | 32 | 47 | N | 148 | 44 | E | IO | 259° | 64.7 |
| 817 | 38 | 48.5 | N | 146 | 57.6 | E | NSP | 259° | 72.3 | 846 | 32 | 35 | N | 147 | 29 | E | NSP | 259° | 64.7 |
| 818 | 38 | 34.7 | N | 145 | 26.8 | E | IO | 259° | 72.3 | 847 | 32 | 22 | N | 146 | 14 | E | IO | 259° | 64.7 |
| 819 | 38 | 20.8 | N | 143 | 56.4 | E | NSP | 259° | 72.3 | 848 | 32 | 9.8 | N | 144 | 59 | E | NSP | 259° | 64.7 |
| 820 | 38 | 06.9 | N | 142 | 26.2 | E | IO | 259° | 72.3 | 849 | 31 | 57 | N | 143 | 44 | E | IO | 259° | 64.7 |
| 821 | 37 | 53.0 | N | 140 | 56.3 | E | - | - | - | 850 | 31 | 45 | N | 142 | 29 | E | NSP | 259° | 64.7 |
| 822 | 37 | 36.4 | N | 141 | 01.7 | E | NSP | 101° | 73.2 | 851 | 31 | 32 | N | 141 | 15 | E | IO | 259° | 64.7 |
| 823 | 37 | 22.3 | N | 142 | 32.1 | E | IO | 101° | 73.2 | 852 | 31 | 20 | N | 140 | 0 | E | NSP | 101° | 69.4 |
| 824 | 37 | 08.3 | N | 144 | 02.3 | E | NSP | 101° | 73.2 | 853 | 31 | 6.7 | N | 141 | 20 | E | IO | 101° | 69.4 |
| 825 | 36 | 54.2 | N | 145 | 32.1 | E | IO | 101° | 73.2 | 854 | 30 | 53 | N | 142 | 39 | E | NSP | 101° | 69.4 |
| 826 | 36 | 40.1 | N | 147 | 01.7 | E | NSP | 101° | 73.2 | 855 | 30 | 40 | N | 143 | 58 | E | IO | 101° | 69.4 |
| 827 | 36 | 26.1 | N | 148 | 31.0 | E | IO | 101° | 73.2 | 856 | 30 | 27 | N | 145 | 17 | E | NSP | 101° | 69.4 |
| 828 | 36 | 12.0 | N | 150 | 00.0 | E | NSP | 259° | 62.8 | 857 | 30 | 13 | N | 146 | 36 | E | IO | 101° | 69.4 |
| 829 | 36 | 00.0 | N | 148 | 43.8 | E | IO | 259° | 62.8 | 858 | 30 | 0 | N | 147 | 55 | E | - | - | - |

Table 3. Summary of the survey periods and searching effort by each survey block (n.miles)

| Survey block | Vessel | Research period | Planned cruise track (n.miles) | Searching effort NSP (n.miles) | Searching effort IO (n.miles) | Searching effort Total (n.miles) | Coverage of effort (n.miles) |
|---|---|---|---|---|---|---|---|
| Pelagic North | *YS1* | 2020/08/04-09/19 | 1,960.8 | 778.1 | 791.9 | 1,570.0 | 80.1% |
| Pelagic South | *YS3* | 2020/08/06-09/04 | 1,981.2 | 950.1 | 951.4 | 1,901.5 | 96.0% |
| Offshore | *KY7* | 2020/08/07-09/11 | 2,226.2 | 1,002.4 | 1,032.0 | 2,034.4 | 91.4% |
| | *YS3* | 2020/09/06-09/18 | 1,315.6 | 618.2 | 574.5 | 1,192.7 | 90.7% |
| | Sub-total | 2020/08/07-09/18 | 3,541.8 | 1,620.6 | 1,606.5 | 3,227.1 | 91.1% |
| Total | | 2020/08/04-09/19 | 7,483.8 | 3,348.7 | 3,349.9 | 6,698.6 | 89.5% |

Table 4. Numbers of primary and secondary sightings in each survey block, by species.

| Species | Pelagic North | | | | Pelagic South | | | | Offshore | | | | Total | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Prim. | | Second. | | Prim. | | Second. | | Prim. | | Second. | | Prim. | | Second. | |
| | sch. | Ind. | sch. | Ind. | sch. | Ind. | sch. | Ind. | sch. | Ind. | sch. | Ind. | sch. | Ind. | sch. | Ind. |
| Blue whale | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 0 | 0 |
| Fin whale | 50 | 67 | 2 | 3 | 1 | 1 | 0 | 0 | 5 | 5 | 0 | 0 | 56 | 73 | 2 | 3 |
| Like fin | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| Sei whale | 49 | 60 | 1 | 1 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 51 | 62 | 1 | 1 |
| Like sei | 4 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 5 | 0 | 0 |
| Bryde's whale | 69 | 101 | 0 | 0 | 80 | 104 | 3 | 4 | 144 | 180 | 2 | 2 | 293 | 385 | 5 | 6 |
| Like bryde's | 6 | 6 | 0 | 0 | 1 | 1 | 0 | 0 | 3 | 3 | 0 | 0 | 10 | 10 | 0 | 0 |
| Common minke whale | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 2 | 2 | 0 | 0 |
| Humpback whale | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 2 | 0 | 0 |
| Sperm whale | 61 | 139 | 1 | 1 | 42 | 77 | 0 | 0 | 115 | 330 | 5 | 27 | 218 | 546 | 6 | 28 |
| Unidentified large baleen | 10 | 10 | 0 | 0 | 4 | 4 | 0 | 0 | 10 | 10 | 3 | 3 | 24 | 24 | 3 | 3 |
| Unidentified cetacean | 4 | 4 | 0 | 0 | 1 | 2 | 0 | 0 | 5 | 8 | 0 | 0 | 10 | 14 | 0 | 0 |

Table 5. Identification of duplicate sightings (main species) observed in Independent Observer (IO) mode. Duplicate status was based on the number of sightings made by the Independent Observer Platform (IOP) that were also observed by the Topmen in the Standard TOP Barrel. Status codes: D - Definite duplicate, P - Possible duplicate, R - Remote duplicate, N - No duplicate. Top: Result of *YS1*, Middle: *YS3*, Bottom: *KY7*.

| *YS1* | Number of all schools sighted made by TOP & IOP | Number of schools made by IOP | Duplicate Status | | | |
|---|---|---|---|---|---|---|
| | | | D | P | R | N |
| Blue whale | 5 | 2 | 2 | 0 | 0 | 0 |
| Fin whale | 30 | 13 | 9 | 0 | 0 | 4 |
| Sei whale | 22 | 12 | 3 | 0 | 0 | 9 |
| Bryde's whale | 67 | 34 | 18 | 0 | 0 | 16 |
| Humpback whale | 2 | 1 | 1 | 0 | 0 | 0 |
| Sperm whale | 42 | 19 | 11 | 0 | 0 | 8 |

| *YS3* | Number of all schools sighted made by TOP & IOP | Number of schools made by IOP | Duplicate Status | | | |
|---|---|---|---|---|---|---|
| | | | D | P | R | N |
| Fin whale | 2 | 1 | 1 | 0 | 0 | 0 |
| Bryde's whale | 53 | 24 | 19 | 0 | 0 | 5 |
| Sperm whale | 66 | 30 | 22 | 0 | 0 | 8 |

| *KY7* | Number of all schools sighted made by TOP & IOP | Number of schools made by IOP | Duplicate Status | | | |
|---|---|---|---|---|---|---|
| | | | D | P | R | N |
| Fin whale | 1 | 0 | 0 | 0 | 0 | 0 |
| Sei whale | 2 | 1 | 1 | 0 | 0 | 0 |
| Bryde's whale | 89 | 41 | 29 | 1 | 0 | 11 |
| Common Minke whale | 1 | 0 | 0 | 0 | 0 | 0 |
| Humpback whale | 1 | 1 | 1 | 0 | 0 | 0 |
| Sperm whale | 50 | 25 | 20 | 1 | 0 | 4 |

Table 6a. Number of individuals photographed, by each vessel and each survey block.

| Photo-ID | Pelagic North (*YS1*) | Pelagic South (*YS3*) | Offshore (*KY7*) | Total |
|---|---|---|---|---|
| Blue whale | 4 | 0 | 0 | 4 |
| Humpback whale | 0 | 0 | 1 | 1 |
| Killer whale | 0 | 0 | 4 | 4 |
| Total | 4 | 0 | 5 | 9 |

Table 6b. Number of biopsy samples collected, by each vessel and each survey block.

| Biopsy sampling | Pelagic North (*YS1*) | Pelagic South (*YS3*) | Offshore (*KY7*) | Total |
|---|---|---|---|---|
| Blue whale | 2 | 0 | 0 | 2 |
| Fin whale | 10 | 1 | 1 | 12 |
| Sei whale | 14 | 0 | 1 | 15 |
| Humpback whale | 1 | 0 | 1 | 2 |
| Total | 27 | 1 | 3 | 31 |

Table 6c. Results of biopsy sampling experiments of each vessel.

| Vesl. | Sheet number | Date | Sight No. | Sp. | Scl. size | Area | Est. body length of target ind. [m] | Position struck | number of sample | Sample No. |
|---|---|---|---|---|---|---|---|---|---|---|
| *YS1* | BY101 | 20200804 | 1 | SE | 1 | 9 | 13.8m | - | 0 | - |
| *YS1* | BY102 | 20200804 | 3 | SE | 1 | 9 | 14.9m | - | 0 | - |
| *YS1* | BY103 | 20200804 | 5 | SE | 1 | 9 | 14.5m | - | 0 | - |
| *YS1* | BY104 | 20200805 | 2 | SE | 4 | 9 | 13.8m,14.0m | LB1p | 2 | J20NYS1SE01<br>J20NYS1SE02 |
| *YS1* | BY105 | 20200805 | 8 | SE | 3 | 9 | 14.1m | - | 0 | - |
| *YS1* | BY106 | 20200811 | 1 | F | 4 | 9 | 22.3m,24.3m | RC1 | 2 | J20NYS1F01<br>J20NYS1F02 |
| *YS1* | BY107 | 20200811 | 7 | F | 2 | 9 | 22.5m | RB1p | 1 | J20NYS1F03 |
| *YS1* | BY108 | 20200811 | 6 | SE | 1 | 9 | 14.1m | - | 0 | - |
| *YS1* | BY109 | 20200811 | 10 | B | 1 | 9 | 25.8m | RB1p | 1 | J20NYS1B01 |
| *YS1* | BY110 | 20200811 | 14 | SE | 2 | 9 | 14.0m | RC1 | 1 | J20NYS1SE03 |
| *YS1* | BY111 | 20200819 | 1 | F | 1 | 9 | 19.3m | - | 0 | - |
| *YS1* | BY112 | 20200819 | 2 | F | 1 | 9 | 22.3m | - | 0 | - |
| *YS1* | BY113 | 20200819 | 4 | F | 2 | 9 | 23.8m | - | 0 | - |
| *YS1* | BY114 | 20200819 | 7 | F | 1 | 9 | 20.5m | LC1 | 1 | J20NYS1F04 |
| *YS1* | BY115 | 20200819 | 8 | F | 1 | 9 | 18.6m | - | 0 | - |
| *YS1* | BY116 | 20200819 | 10 | F | 1 | 9 | 19.6m | RC1 | 1 | J20NYS1F05 |
| *YS1* | BY117 | 20200819 | 14 | F | 1 | 9 | 22.4m | - | 0 | - |
| *YS1* | BY118 | 20200820 | 1 | F | 3 | 9 | 22.8m | - | 0 | - |
| *YS1* | BY119 | 20200820 | 4 | F | 3 | 9 | 18.3m,19.2m | - | 0 | - |
| *YS1* | BY120 | 20200821 | 5 | SE | 1 | 9 | 12.8m | C1 | 1 | J20NYS1SE04 |
| *YS1* | BY121 | 20200822 | 1 | SE | 1 | 9 | 12.3m | RA | 1 | J20NYS1SE05 |
| *YS1* | BY122 | 20200822 | 7 | SE | 1 | 9 | 15.2m | LB1a | 1 | J20NYS1SE06 |
| *YS1* | BY123 | 20200822 | 8 | SE | 1 | 9 | 13.7m | RB1a | 1 | J20NYS1SE07 |
| *YS1* | BY124 | 20200822 | 11 | SE | 1 | 9 | 14.3m | RB1p | 1 | J20NYS1SE08 |
| *YS1* | BY125 | 20200823 | 1 | SE | 1 | 9 | 14.4m | LA,LB1a | 1 | J20NYS1SE09 |
| *YS1* | BY126 | 20200823 | 2 | SE | 1 | 9 | 13.0m | LB1a | 1 | J20NYS1SE10 |
| *YS1* | BY127 | 20200823 | 7 | H | 1 | 9 | 12.7m | LC2 | 1 | J20NYS1H01 |
| *YS1* | BY128 | 20200824 | 2 | SE | 1 | 9 | 12.0.m | - | 0 | - |
| *YS1* | BY129 | 20200824 | 4 | F | 1 | 8 | 24.4m | - | 0 | - |
| *YS1* | BY130 | 20200824 | 6 | SE | 1 | 8 | 14.5m | LA | 1 | J20NYS1SE11 |
| *YS1* | BY131 | 20200827 | 2 | SE | 1 | 8 | 12.3m | LC1 | 1 | J20NYS1SE12 |
| *YS1* | BY132 | 20200827 | 4 | SE | 2 | 8 | 13.9m | LC1 | 1 | J20NYS1SE13 |
| *YS1* | BY133 | 20200827 | 5 | SE | 1 | 8 | 13.2m | LB1p | 1 | J20NYS1SE14 |
| *YS1* | BY134 | 20200828 | 3 | F | 1 | 8 | 16.4m | LA | 1 | J20NYS1F06 |
| *YS1* | BY135 | 20200828 | 6 | F | 1 | 8 | 19.8m | LC1 | 1 | J20NYS1F07 |
| *YS1* | BY136 | 20200828 | 8 | F | 1 | 8 | 19.5m | RB1p | 1 | J20NYS1F08 |
| *YS1* | BY137 | 20200905 | 5 | F | 1 | 8 | 23.7m | LB2 | 1 | J20NYS1F09 |
| *YS1* | BY138 | 20200907 | 2 | F | 1 | 8 | 24.3m | - | 0 | - |
| *YS1* | BY139 | 20200909 | 4 | F | 1 | 8 | 18.8m | RB1a | 1 | J20NYS1F10 |
| *YS1* | BY140 | 20200910 | 23 | B | 1 | 8 | 22.8m | LC1 | 1 | J20NYS1B02 |
| *YS3* | BY301 | 20200812 | 1 | F | 1 | 9 | 15.1m | RD1 | 1 | J20NYS3F01 |
| *KY7* | BY701 | 20200808 | 13 | H | 1 | 7 | 11.5 m | LC2, LC2 | 1 | J20NKY7H01 |
| *KY7* | BY702 | 20200808 | 16 | F | 1 | 7 | 22.5 m | - | - | - |
| *KY7* | BY703 | 20200811 | 8 | F | 1 | 7 | 16.0 m | RC2 | 1 | J20NKY7F01 |
| *KY7* | BY704 | 20200814 | 10 | SE | 1 | 7 | 14.2 m | RD3 | 1 | J20NKY7SE01 |
| *KY7* | BY705 | 20200822 | 13 | Ki | 4 | 7 | 5.8 m | LA | 0 | - |

Table 6d. Number of satellite-tagged individuals, by each survey block.

| Satellite tagging | Pelagic North (*YS1*) | Pelagic South (*YS3*) | Offshore (*KY7*) | Total |
|---|---|---|---|---|
| Fin whale | 5 | 0 | 1 | 6 |
| Sei whale | 10 | 0 | 1 | 11 |
| Total | 15 | 0 | 2 | 17 |

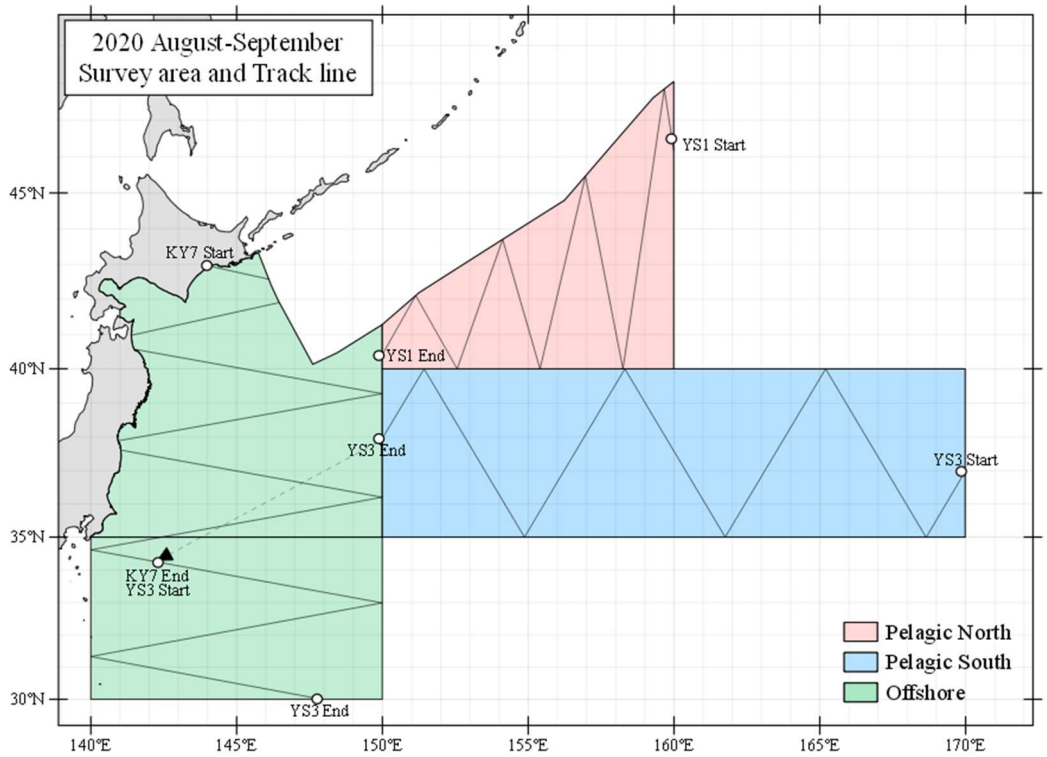



Figure 1. The survey block and pre-determined track lines. The *YS1* and the *YS3* surveyed Pelagic North and Pelagic South block from east to west, respectively. The *KY7* surveyed north of 34 °N and the *YS3* surveyed south of 34 °N in the Offshore block from north to south, taking into account the seasonal migration of baleen whales to avoid double counting.

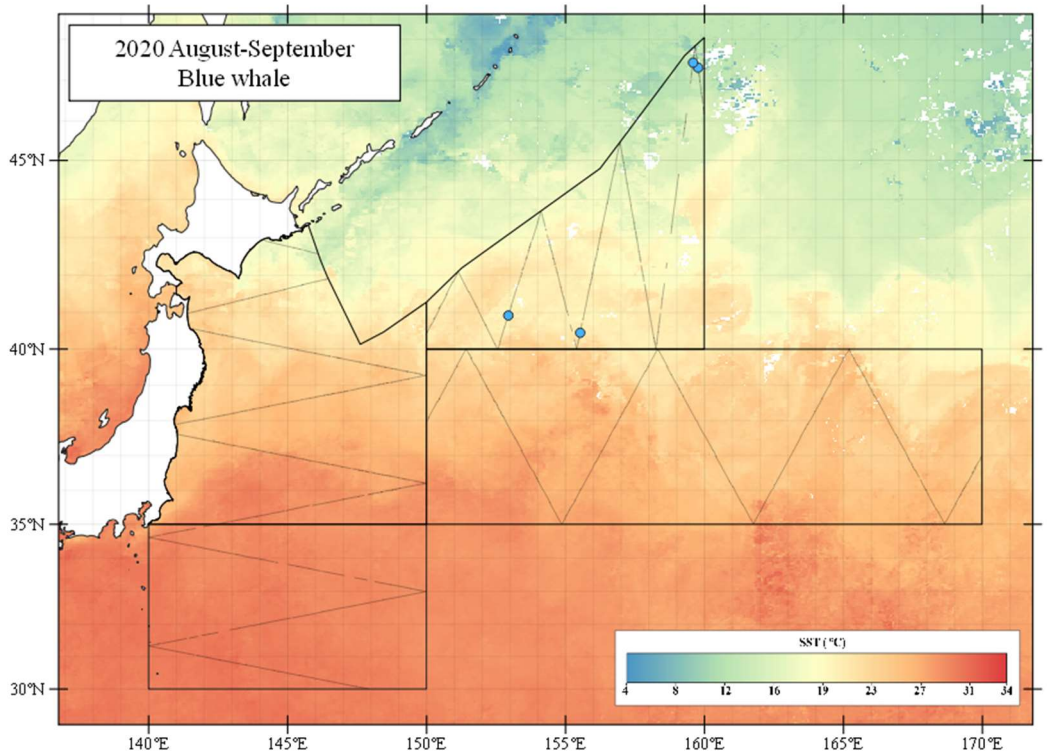



Figure 2a. The sighting locations of blue whales and sea surface temperature in the middle date of survey period (August-September) 2020. The average sea surface temperature of western North Pacific between 12 August, and 12 September (original data: Ocean color web, from https://oceancolor.gsfc.nasa.gov/).

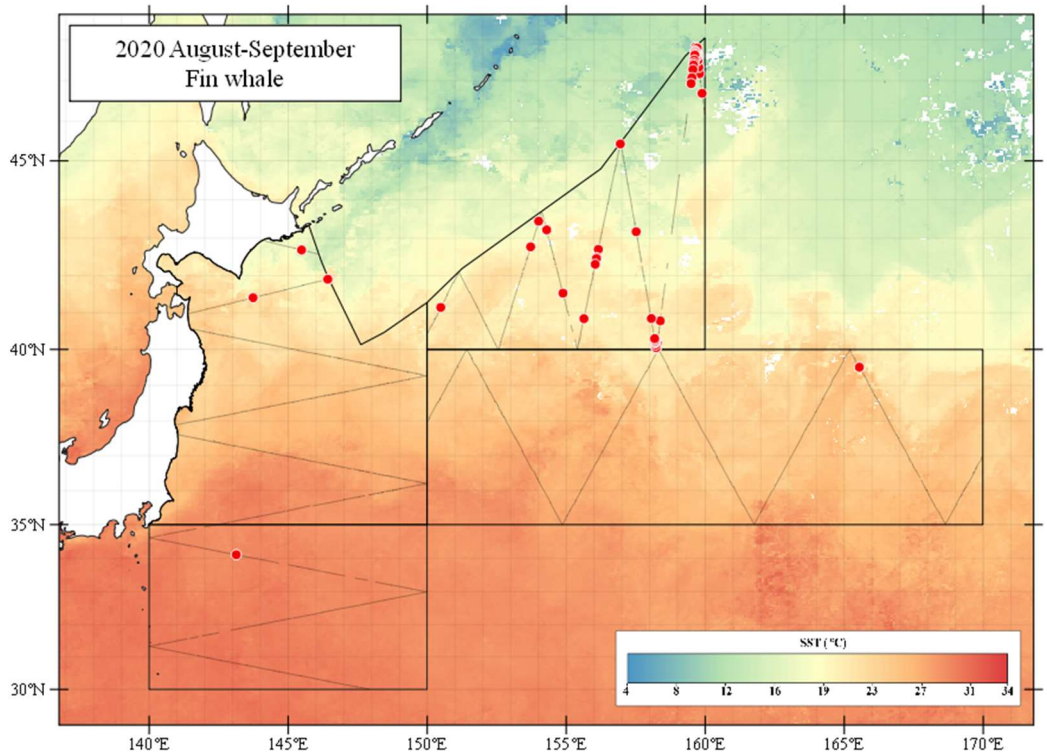



Figure 2b. The sighting locations of fin whales and sea surface temperature in the middle date of survey period (August-September). The average sea surface temperature of western North Pacific between 12 August, and 12September (original data: Ocean color web, from https://oceancolor.gsfc.nasa.gov/).

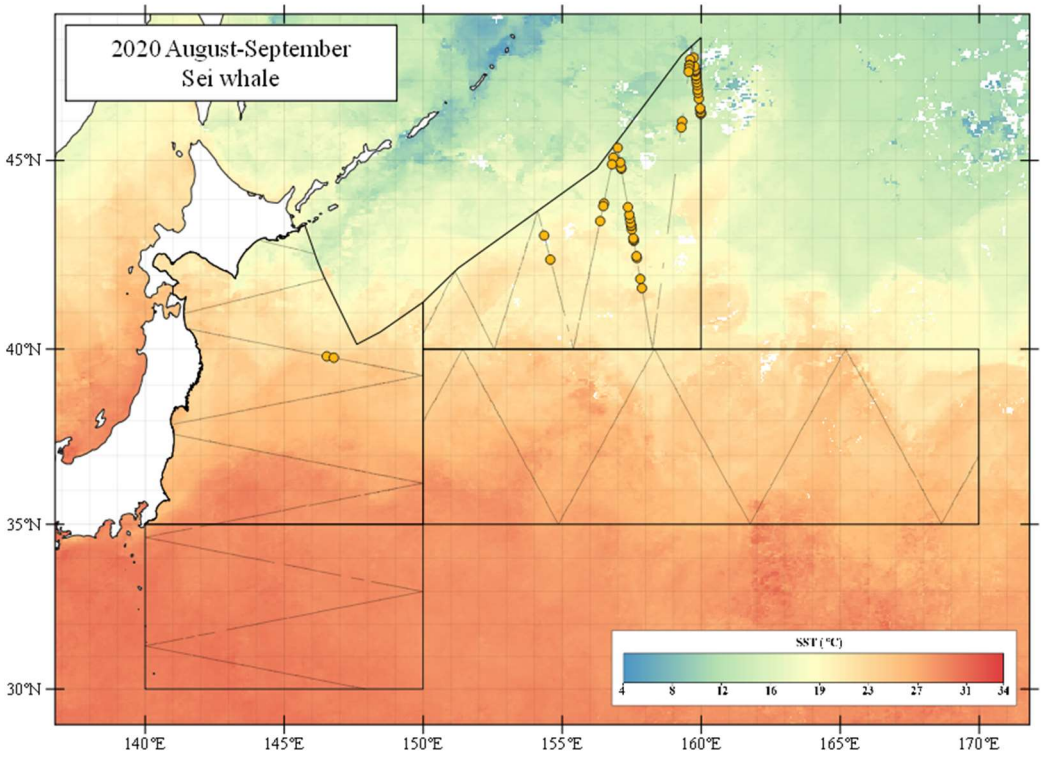



Figure 2c. The sighting locations of sei whales and sea surface temperature in the middle date of survey period (August-September). The average sea surface temperature of western North Pacific between 12 August, and 12 September(original data: Ocean color web, from https://oceancolor.gsfc.nasa.gov/).

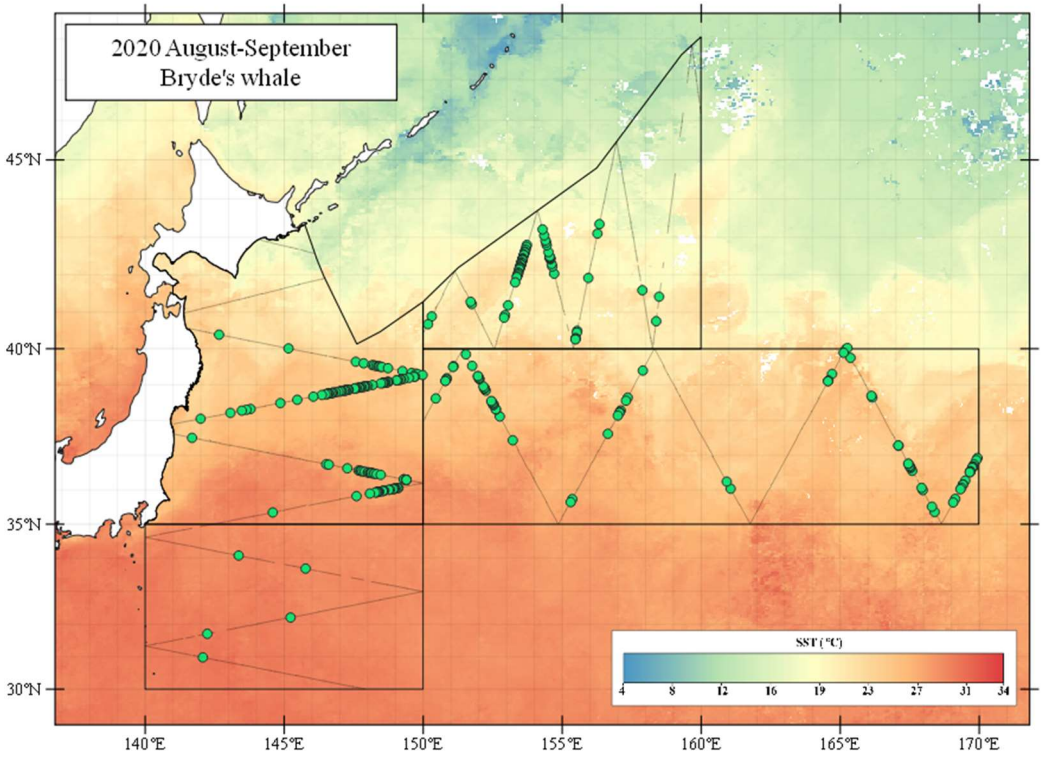



Figure 2d. The sighting locations of Bryde's whales and sea surface temperature in the middle date of survey period (August-September). The average sea surface temperature of western North Pacific between 12 August, and 12 September (original data: Ocean color web, from https://oceancolor.gsfc.nasa.gov/).

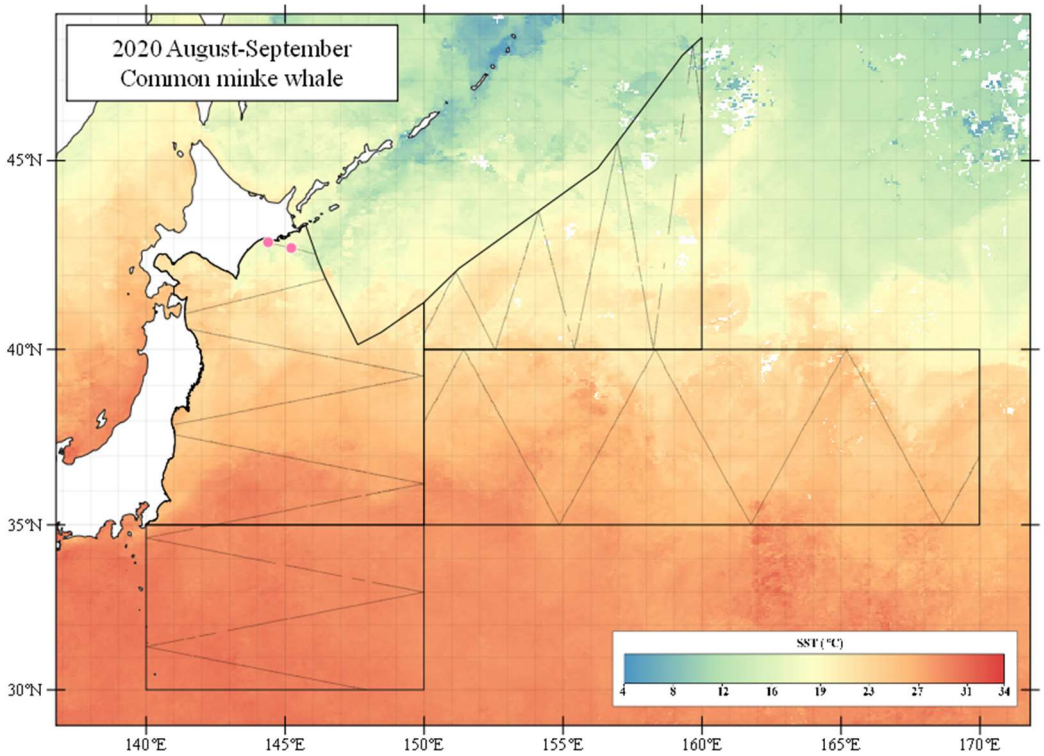



Figure 2e. The sighting locations of common minke whales and sea surface temperature in the middle date of survey period (August-September). The average sea surface temperature of western North Pacific between 12 August, and 12 September (original data: Ocean color web, from https://oceancolor.gsfc.nasa.gov/).

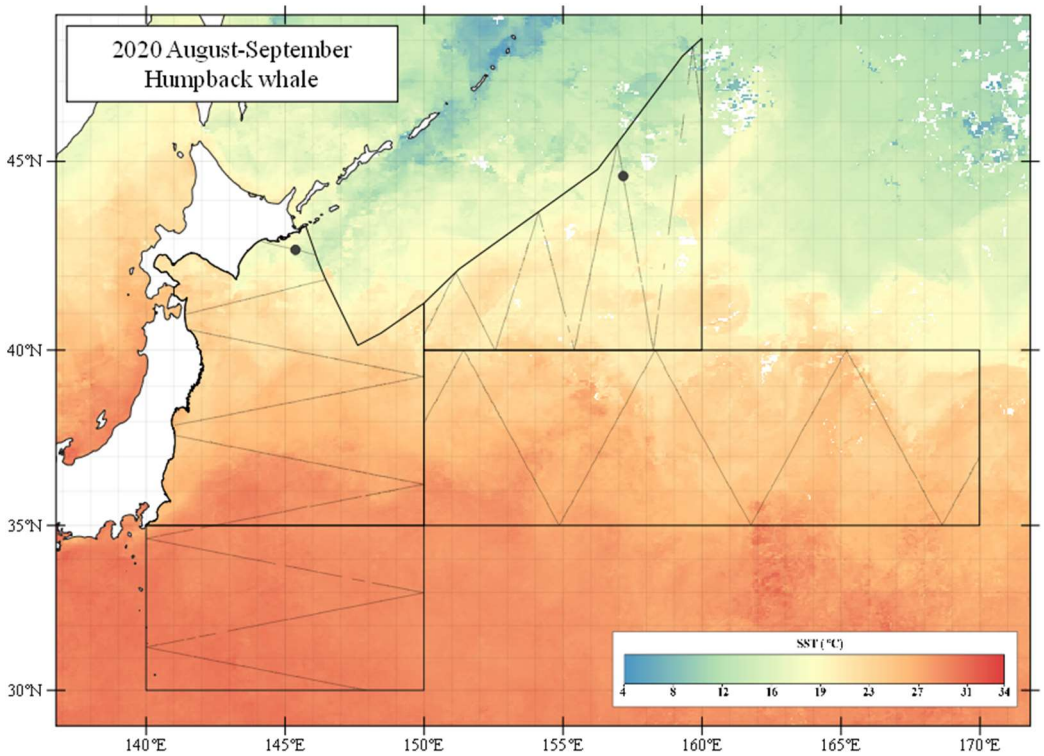
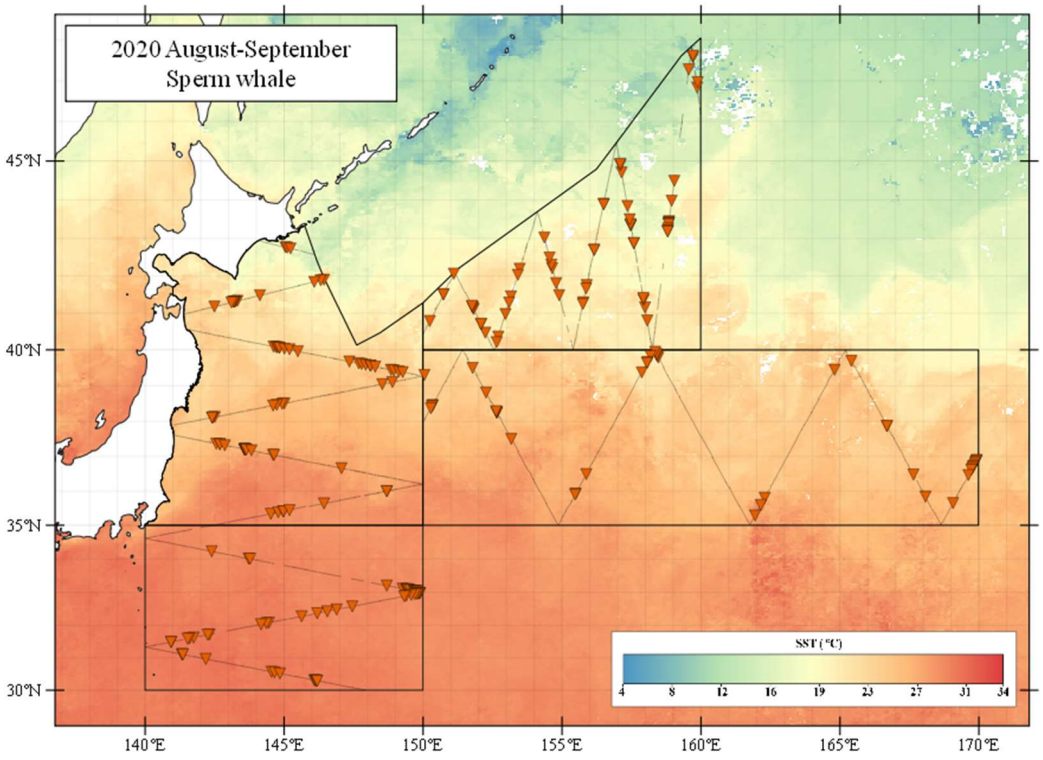



Figure 2f. The sighting locations of humpback whales and sea surface temperature in the middle date of survey period (August-September). The average sea surface temperature of western North Pacific between 12 August, and 12 September (original data: Ocean color web, from https://oceancolor.gsfc.nasa.gov/).

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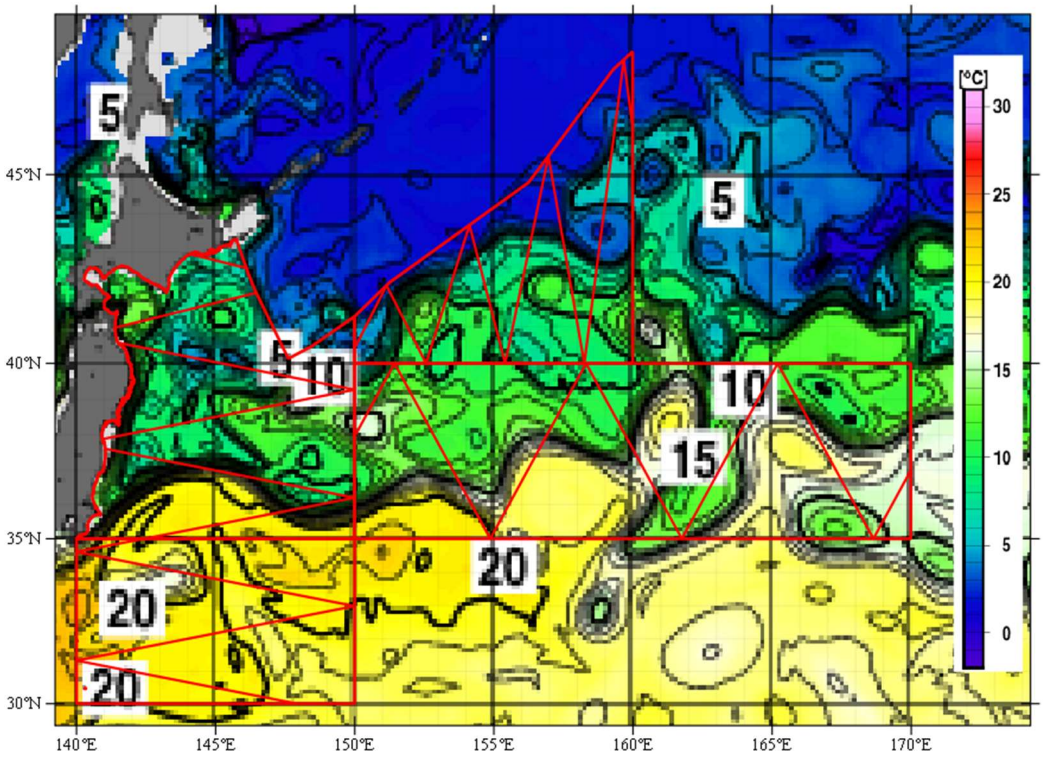


Figure 3. The water temperature at a depth 100m of the western North Pacific in August, 2020 (Modified from the Japan Meteorological Agency website, on 9 March, 2020, https://www.jma.go.jp/jma/index.html). The red lines indicate the survey blocks and track line.

## Appendix A. Ship specifications of Yushin-Maru, Yushin-Maru No.3 and Kaiyo-Maru No.7.

Ship photos: Left: *Yushin-Maru*, Midlle: *Yushin-Maru No.3*, Right: *Kaiyo-Maru No.7*



Ship specifications:

| | *Yushin-Maru* | *Yushin-Maru No.3* | *Kaiyo-Maru No.7* |
|---|---|---|---|
| Call sign | JLZS | 7JCH | JECL |
| Length overall [m] | 69.61 | 69.61 | 60.02 |
| Gross tonnage (GT) | 724 | 742 | 649 |
| TOP barrel height [m] | 19.5 | 19.5 | 17.5 |
| IO barrel height [m] | 13.5 | 13.5 | 12.7 |
| Upper bridge height [m] | 11.5 | 11.5 | 9.6 |
| Bow height [m] | 6.5 | 6.5 | 4.5 |
| Engine power [PS / kW] | 5280/3900 | 5280/3900 | 2100 / 1544 |

## Appendix B. Oversight for the 2020 Japanese dedicated sighting survey in the western North Pacific

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The plan of late summer surveys were presented to the 2020 IWC/SC meeting (Hakamada *et al*., 2020) and endorsed by the Scientific Committee (IWC, 2020). On behalf of the IWC Scientific Committee, I carried out the oversight work during the 2020 Japanese dedicated sighting survey in the western North Pacific. This is a brief report of the oversight activities conducted on that survey.

### Preparatory work and pre-cruise meeting

The first pre-cruise meetings carried out at Tokyo from 22 to 25 June. The second pre-cruise meetings carried out at Ishinomaki on 27 July and at Hachinohe on 3 August. 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 sightings and experiments. The planned sighting procedure was in order with that agreed by the Scientific Committee. The research vessels *Yushin-Maru, Yushin-Maru No.3* and *Kaiyo-Maru No.7* were engaged for this survey.

The research area was set between 30°N and 48°N and between 140°E and 170°E. The survey was conducted between 31 July and 24 September. The vessels were assigned to cover pre-determined transects in these areas by the passing with abeam closing mode (NSP) and the independent observer mode (IO). Two experienced researchers were assigned to work onboard each vessel.

### Oversight method and period

The research activities of the vessels were oversight by e-mail communication and by examining the daily report prepared by each researcher on board. In some instances, Inmarsat satellite telephone calls were made for further clarification of the activities, procedure and sightings made. Further, geographical positions and weather information of each vessel were tracked each other per day. Oversight activities were carried between 31 July and 24 September.

### Brief narrative of the oversight vessel

The *YS1* and *YS3* departed Japan on 31 July and started the survey in each survey block on 4 or 6 August. The *KY7* departed Japan on 5 August and started the survey in the survey block on 7 August. The *YS1, YS3* and *KY7* surveyed in the sub-area 7, 8 and a part of sub-areas 2, 9 used in the past for common minke whale's RMP Implementation by the IWC. The *YS1* and *YS3* left the research area on 19 September and arrived at their port on 24 September. The *KY7* left the research area on 11 September and arrived at the port on 18 September.

### Post-cruise meeting

I participated in a post-cruise meetings held on 24 September at Ishinomaki, 18 September at Kurihama, respectively. Survey organizers, researchers and the Captain also 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 block and track lines were improved to cover each block 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 2020 Japanese dedicated sighting survey in the western North Pacific.

### Reference

IWC. 2012. Requirements and Guidelines for Conducting Surveys and Analysing Data within the Revised Management Scheme. *J. Cetacean Res. Manage. (Suppl2.)* 11:507-18.

IWC. 2020 Report of the Scientific Committee. 131pp. Virtual Meetings, 2020. [Paper available at the IWC Office].

Hakamada, T., Takahashi, M., Matsuoka, K. and Miyashita, T. 2020. Outline of the research plan for Japan's dedicated cetacean sighting surveys in the western North Pacific Ocean in summer 2020. SC/68B/ASI/14. 7pp. [Paper available at the IWC Office].