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Research plan for Japan's dedicated cetacean sighting surveys in the North Pacific Ocean in summer 2022

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Research plan for Japan's dedicated cetacean sighting surveys in the North Pacific Ocean in summer 2022

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ABSTRACT

This document outlines the plan for a systematic vessel-based sighting survey in the North Pacific in 2022. The main objective of this survey is to estimate the abundance of large whale species in the North Pacific Ocean for management and conservation purposes. The survey will be conducted using the research vessels *Yushin-Maru (YSI)* and *Kaiyo-Maru No. 7 (KY7)* in August-September 2022, and will cover the area comprised between 35°-44°N, 140°E-153.5°E. For more precise abundance estimation of whales, distance and angle estimation experiments will be conducted. Furthermore, photo-identification experiments on blue, North Pacific right, humpback and killer whales will be collected on an opportunistic basis. Biopsy skin samples of large whale species such as blue, fin, sei, North Pacific right, humpback and killer whales and satellite tagging experiments for fin, sei and common minke whales will be also conducted. Data and samples obtained during these experiments will be used in future studies on distribution, abundance, movement and stock structure of the species involved.

KEYWORDS: LARGE WHALES, SIGHTING SURVEY, NORTH PACIFIC, PHOTO-ID, BIOPSY, SATELLITE TRACKING

INTRODUCTION

In the western North Pacific, dedicated cetacean sighting surveys have been conducted by the Institute of Cetacean Research (ICR) since 1997. The sighting surveys were based on the survey procedures of the International Whaling Commission/Southern Ocean Whale and Ecosystem Research (IWC/SOWER) (Matsuoka *et al.*, 2003) and more recently the IWC/Pacific Ocean Whale and Ecosystem Research (IWC/POWER) (Kato *et al.*, 2010). Based on the collected data, the distribution pattern of large whales such as blue, fin, sei, Bryde's, common minke, humpback, North Pacific right and sperm whales and abundance estimate of those whale species were investigated and reported to the IWC SC (IWC, 2001; 2010; 2016; Hakamada *et al.*, 2017; 2019). The Fisheries Resources Institute (FRI) has also conducted dedicated sighting survey for cetaceans in the North Pacific since the 1980s (Buckland *et al.*, 1992; Miyashita and Kato, 2004; 2005).

Sighting surveys were conducted under the New Scientific Whale Research Program in the western North Pacific (NEWREP-NP) in 2018 and 2019 (Government of Japan, 2017; IWC, 2017).

As in the previous sighting surveys during 2018-2021, the surveys in 2022 are planned considering the following aspects:

- a) The use of the Independent Observer (IO) mode survey to estimate $g(0)$,
- b) The setting of the appropriate survey track in order to avoid double-counting,
- c) The setting of temporal stratification based on information on the migration pattern of each target species/population.

As in previous surveys, the design, protocols, and implementation of the 2022 surveys will follow the 'Requirements and Guidelines for Conducting Surveys and Analyzing Data within the Revised Management Scheme (RMS)' (IWC, 2012). Data collected in this survey will be used for abundance estimates, which is essential for appropriate conservation and management of large whales in the North Pacific.

The objective of this paper is to outline the research plan for dedicated sighting surveys in the North Pacific in summer 2022.

OUTLINE OF THE 2022 RESEARCH PLAN

Research vessels

The sighting surveys will be based on the research vessels *Yushin-Maru (YSI)* and *Kaiyo-Maru No. 7 (KY7)* (Figure 1). These vessels are equipped with a top barrel platform (TOP), IO platform (IOP) and upper bridge. The ICR research data collecting system is set on the vessels. Specifications of the vessels are shown in Table 1.

Research schedule

The sighting surveys will be conducted from August to September. The tentative survey itineraries for *YSI* and *KY7* are shown in Tables 2A and 2B, respectively. The planned numbers of research days are 60 and 50 days for *YSI* and *KY7*, respectively.

Researchers on board and oversight person

Experienced researchers on line transect whale sighting surveys, biopsy sampling, photo-id and satellite tag experiments will be selected in each vessel. Koji Matsuoka (ICR) will be the responsible person for these surveys.

Research area and track line design

The research area will be comprised between 35°-44°N and 140°E-153.5°E, avoiding foreign countries waters (Figure 2). Hereafter, pink and yellow areas in Figure 2 are referred as coastal block (sub-areas 7CN and 7CS) and offshore block (western part of sub-area 8 and sub-areas 7E and 7WR), respectively.

Table 3 shows the waypoints (WP) in the research area. The *KY7* will start the survey at WP701 and will end at WP732 in the northern part (7CN) of coastal block. Then, it will start the survey at WP751 and will end at WP771 in the southern part (7CS). The *YSI* will start the survey at WP801 and will end at WP812 in the offshore block. All vessels will survey in ascending order of WP number.

The planned searching distances are 2,093.0 n.miles for *KY7* and 3,069.6 n.miles for *YSI*. The start points of the track lines will be decided at random using the Distance program ver. 7.3 (Thomas *et al.*, 2010), and the number of lines (width in the longitude) is decided by the research schedule following IWC survey guideline (IWC, 2012).

Survey modes

Sighting activities will be classified into two principal types: ‘On-effort’ and ‘Off-effort’. On-effort means sightings activities conducted under weather and sea state conditions considered acceptable. Off-effort means all activities that are not On-effort. All sightings to be recorded On-effort will be classified as ‘Primary Sightings’. All other sightings will be classified as ‘Secondary Sightings’. Sighting effort will be conducted by the boatswain and topmen from the top barrel (there will be always two primary observers on the top barrel) and the upper bridge where the helmsman, captain or officer on-watch, researchers, and the chief engineer (or second engineer) will be also present (two primary observers and four secondary observers will be always present).

The sighting survey will be conducted using (1) Passing with abeam closing mode (NSP) and (2) Passing with IO mode in order to estimate whale abundance considering estimated $g(0)$. Both survey modes follow the protocol endorsed for the IWC/SOWER surveys (e.g., Matsuoka *et al.*, 2003; IWC, 2008).

Under NSP mode, there will be two primary observers on the TOP. These observers will search for cetaceans by using angle board and binoculars (7x), which include the distance estimate scales. Members of two observer teams on TOP will be fixed and will operate in one or two hours-shifts. There will be open communication between the upper bridge and the TOP. These observers report sighting information to researchers and other observers on the upper bridge for data recording.

Under IO mode, there will be two primary observers on the TOP and two primary observers on the IOP. These observers on TOP and IOP will conduct searching for cetaceans by using angle board and binoculars (7x). Members of the two observer teams on TOP will be fixed and will operate in one or two hours-shifts. There will be no open communication between the IOP and the TOP. The observers on the upper bridge will communicate to the TOP (or IOP) independently, with the topmen required only to clarify information without distracting them from their normal search procedure. These observers report sighting-information to researchers and other observers on the upper bridge for data recording.

Experiments

Distance and angle experiment

Distance and angle measurement experiment consists of the following two steps. Distance and angle measurement training will be conducted at the first stage of the survey. The experiment to evaluate measurement error will be conducted at the last stage of the survey. Observers on each vessel will be required to assess eight sets of angles and distance from TOP, IOP, and upper bridge. All trials will be conducted under

the acceptable weather and sighting conditions.

Photo-id

Photo-identification experiments will be carried out on an opportunistic basis. Protocols for photo-id are similar to those used in the IWC-POWER surveys. Target species will be the blue, North Pacific right, humpback and killer whales. The first three species have high priority.

Biopsy

Biopsy sampling experiments will be carried out large whale species such as blue, fin, sei, North Pacific right, humpback and killer whales on an opportunistic basis using the Larsen system. The first four species have high priority. Protocols for biopsy sampling are similar to those used in the IWC-POWER surveys.

Satellite tagging

Routine telemetry experiments using satellite tag (SPOT6) will be conducted following the same protocols and equipment used during the JASS-A surveys (see also Konishi *et al.*, 2020). The target species for this experiment will be fin, sei and common minke whales.

The study of satellite tagging will be also conducted in order to obtain information on dive time of large whales using the satellite-linked Time-depth-Recorder (TDR) tags (SPLASH10). The target species for this experiment will be the fin, sei and common minke whales. The data of mean dive-time and diving behaviour of the animal are key results for abundance estimate considering availability bias.

Data and samples obtained during the photo-id, biopsy and satellite tracking experiments will be used in future studies on distribution, abundance, movement and stock structure of the species involved.

DATA STORAGE

The researcher will input data collected (weather, effort, sighting and from experiments data) to the computer on board during the survey as was done for the previous surveys conducted by ICR (e.g., IWC-SOWER, JARPAII/JARPNII). These data will be stored at the ICR and provided to the IWC secretariat by Japan on a volunteer basis.

Scientists at the ICR will analyze the sighting data collected using the methods developed and modified by previous studies such as a design-based abundance estimation using line transect data assuming $g(0)=1$. Abundance estimation considering $g(0)$ estimate and model-based abundance estimation (e.g., Hakamada *et al.*, 2009; Matsuoka *et al.*, 2011; Okamura and Kitakado, 2004; Murase *et al.*, 2016) will be also conducted, if possible. Collaboration work will be conducted for abundance estimation of cetaceans in the surveyed area.

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Table 1. Specification of the research vessels participating in the 2022 sighting surveys.

	<i>Yushin-Maru</i>	<i>Kaiyo-Maru No. 7</i>
Call sign	JLZS	JECL
Length overall [m]	69.61	60.02
Molded breadth [m]	10.4	10.6
Gross tonnage [GT]	724	649
Top barrel height [m]	19.5	17.5
IO platform height [m]	13.5	12.7
Upper bridge height [m]	11.5	9.6
Bow height [m]	6.5	4.5
Engine power [PS/kW]	5,280/3,900	2,100/1,544

Table 2A. Tentative itinerary of the *YSI* in the 2022 sighting survey.

Date	Event
2-Aug	<i>YSI</i> departs Shiogama, Japan
4-August	<i>YSI</i> arrives at the starting point in the offshore block
28-September	<i>YSI</i> completes the offshore block and moves to Shiogama
30-September	<i>YSI</i> arrives Shiogama, Japan

Table 2B. Tentative itinerary of the *KY7* in the 2022 sighting survey.

Date	Event
3-August	<i>KY7</i> departs Shiogama, Japan
5-August	<i>KY7</i> arrives at the starting point in the coastal area
19-September	<i>KY7</i> completes the coastal area and move to Shiogama
21-September	<i>KY7</i> arrives Shiogama, Japan

Table 3. Waypoint (WP) in each survey block during the sighting survey in 2022. Asterisks (*) indicate that sighting survey will not be conducted between the WP and next WP.

Waypoint for northern part of coastal block surveyed by the KY7

WP	Lat			Lon		
701	42°	52.3'	N	145°	55.7'	E
702	43°	17.6'	N	145°	36.5'	E *
703	43°	16.6'	N	145°	35.7'	E
704	42°	9.7'	N	145°	38.6'	E *
705	42°	9.5'	N	145°	38.2'	E
706	43°	0.9'	N	145°	1.5'	E *
707	42°	59.0'	N	144°	54.2'	E
708	41°	52.7'	N	144°	59.7'	E *
709	41°	52.6'	N	144°	59.4'	E
710	42°	59.7'	N	144°	15.0'	E *
711	42°	59.1'	N	144°	11.2'	E
712	41°	35.7'	N	144°	20.9'	E *
713	41°	35.6'	N	144°	20.7'	E
714	42°	41.3'	N	143°	39.8'	E *
715	42°	33.9'	N	143°	31.5'	E
716	41°	18.6'	N	143°	42.0'	E
717	42°	1.1'	N	143°	16.9'	E *
718	42°	7.7'	N	142°	52.6'	E
719	41°	1.4'	N	143°	3.2'	E
720	42°	22.0'	N	142°	17.6'	E *
721	42°	28.0'	N	142°	5.6'	E
722	41°	0.0'	N	142°	18.9'	E
723	42°	33.9'	N	141°	24.7'	E *
724	42°	32.2'	N	141°	21.2'	E
725	41°	0.0'	N	141°	34.0'	E
726	41°	15.1'	N	141°	25.2'	E *
727	41°	21.6'	N	141°	21.4'	E
728	41°	46.6'	N	141°	6.6'	E *
729	41°	53.5'	N	141°	2.5'	E
730	42°	34.7'	N	140°	38.0'	E *
731	42°	34.1'	N	140°	36.4'	E
732	42°	10.5'	N	140°	27.5'	E

Waypoint for southern part of coastal block surveyed by the KY7

WP	Lat			Lon		
751	41°	0.0'	N	142°	57.0'	E
752	40°	59.1'	N	143°	0.2'	E
753	40°	35.5'	N	141°	28.6'	E *
754	40°	26.8'	N	141°	41.5'	E
755	40°	5.6'	N	143°	13.6'	E
756	39°	50.1'	N	141°	59.0'	E *
757	39°	25.1'	N	142°	2.3'	E
758	39°	11.3'	N	143°	2.5'	E
759	38°	54.0'	N	141°	39.3'	E *
760	38°	34.9'	N	141°	29.6'	E
761	38°	16.4'	N	142°	48.5'	E
762	37°	52.6'	N	140°	56.3'	E *
763	37°	43.1'	N	141°	0.9'	E
764	37°	20.7'	N	142°	34.5'	E
765	37°	0.0'	N	140°	59.1'	E *
766	36°	47.5'	N	140°	45.4'	E
767	36°	24.3'	N	142°	20.6'	E
768	36°	1.8'	N	140°	38.7'	E *
769	35°	46.5'	N	140°	49.2'	E

770	35°	27.2'	N	142°	6.6'	E
771	35°	0.0'	N	140°	11.8'	E

Waypoint for offshore block surveyed by the *YSI*

WP		Lat			Lon	
801	37°	45.7'	N	153°	30.0'	E
802	35°	0.0'	N	153°	3.4'	E
803	42°	28.6'	N	151°	47.3'	E *
804	42°	20.3'	N	151°	31.6'	E
805	35°	0.0'	N	150°	17.0'	E
806	40°	53.2'	N	149°	14.7'	E *
807	40°	28.6'	N	148°	28.3'	E
808	35°	0.0'	N	147°	30.5'	E
809	42°	22.2'	N	146°	7.3'	E
810	35°	0.0'	N	144°	44.1'	E
811	41°	9.2'	N	143°	20.8'	E
812	40°	21.5'	N	143°	9.7'	E

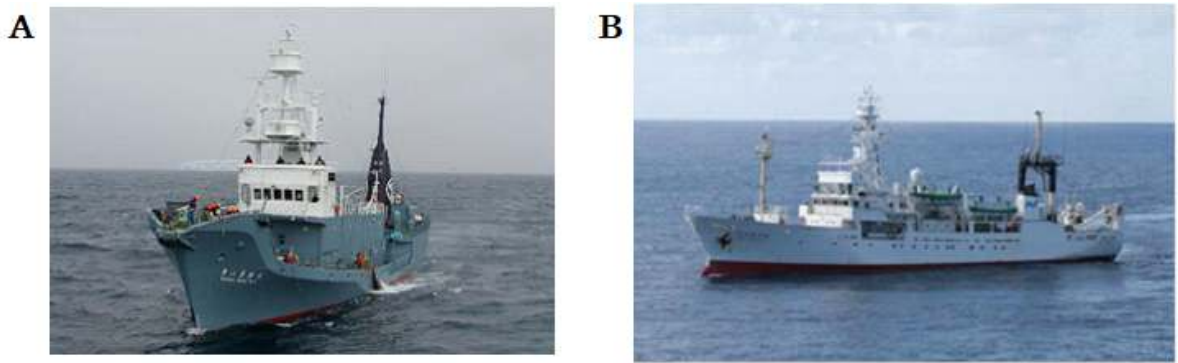


Figure 1. Research vessels participating in the dedicated sighting surveys in 2022: A) *Yushin-Maru*, B) *Kaiyo-Maru No. 7*.

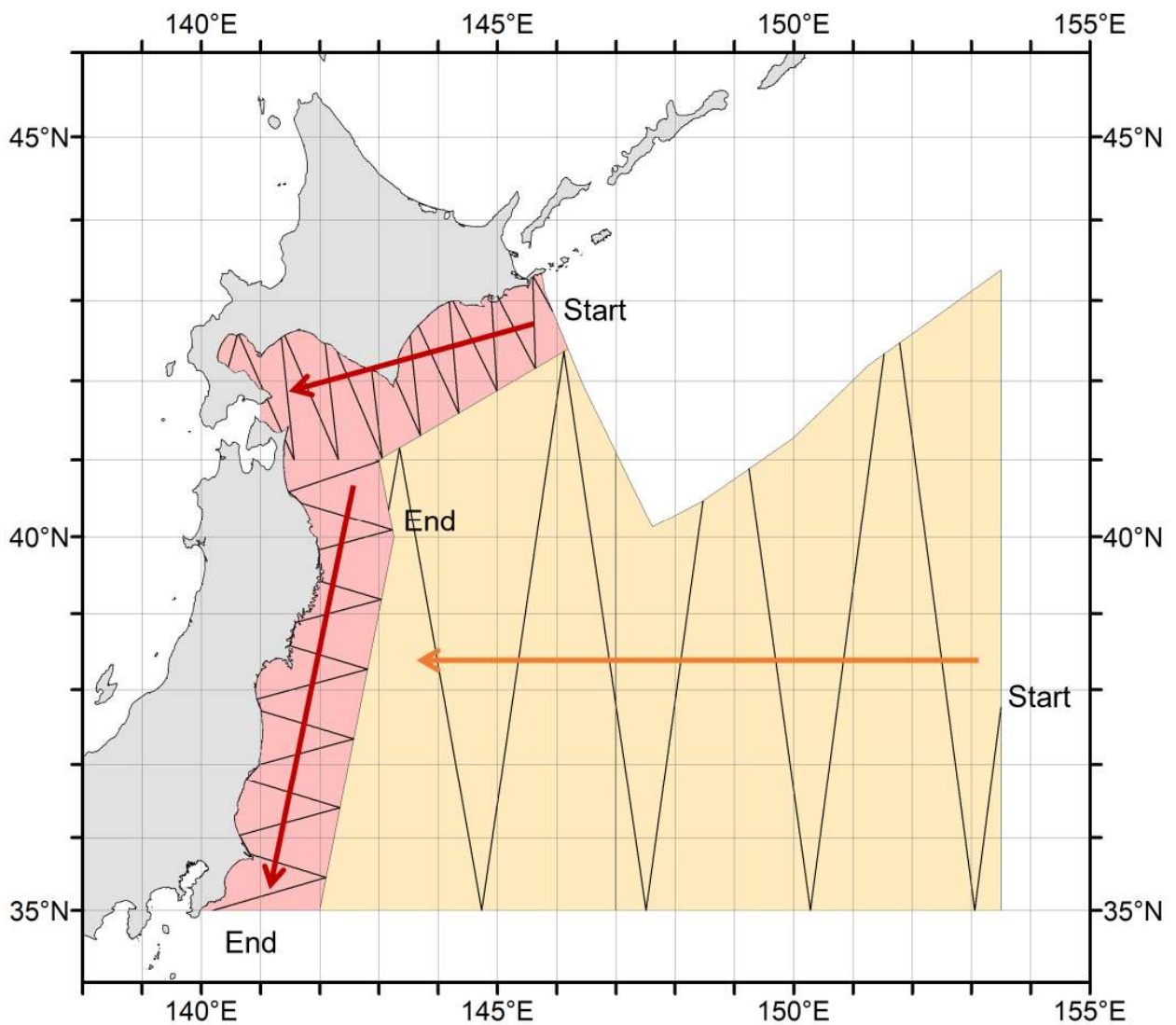


Figure 2. Research areas (yellow is the offshore block to be covered by *YSI*; pink is the coastal block to be covered mainly by *KY7*), and pre-determined track lines (zigzag lines) of the 2022 sighting survey from August to September. Orange and red arrows indicates survey direction of *YSI* and *KY7*, respectively.