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ABSTRACT

The cetacean sighting survey was conducted in the southwestern part of the Sea of Okhotsk in 2022. The vessel is a stern trawl type research vessel with a barrel for observation. The objective of the survey is to obtain information on distribution and abundance of large whales using the normal closing mode. The period of survey was from August 4 to September 4 (32 days) in the southwestern part of the Sea of Okhotsk in coordinates are 44°00N and 50°00N to 142°00E and 150°00E. During the research distance of 1438,03 n.miles by closing mode for large cetaceans in the research area and 590,52 n.miles by passing mode during transit.

Over the entire period of research, the following species of cetaceans were confirmed: common minke whale (7 schools – 8 animals), North Pacific right whale (1-2), humpback whale (1-1), fin whale (24-36), sperm whale (7-7), killer whale (1-6), Baird's beaked whale (5-29), Pacific white-sided dolphin (13-219), Dalli type Dall's porpoise (12-33), truei-type Dall's porpoise (3-8), unidentified type Dall's porpoise (147-545), unidentified dolphin (1-6), unidentified large cetacean (12-13), unidentified small cetacean (2-2).

KEY WORD: SIGHTING SURVEY, SEA OF OKHOTSK, CETACEANS.

INTRODUCTION

Research objectives

The plan of the cetacean sighting survey in the southwestern Sea of Okhotsk in 2022 was submitted at the 68 D session of the IWC/SC meeting (Gushcherov *et al*., 2022). The survey was conducted in the southwestern part of the Sea of Okhotsk by Russian scientists of Pacific branch of «VNIRO» («TINRO») and Russian Research Institute of Fisheries and Oceanography «VNIRO».

The main objective of the survey was to record the information on distribution and abundance of cetaceans based on the IWC standard sighting survey method. Photo identification was tried if North Pacific right whale and killer whales were sighted. Distance and angle estimation training and experiment were conducted.

Research area and cruise track

The 2022 research area in the southwestern part of the Sea of Okhotsk in coordinates to 44°00N - 50°00N and 142°00E -150°00E (Figure 1). The coordinates of waypoints for the pre-determined track line are given in Table 1 (WP1 – WP18). Track line was determined using Distance 7.3 Release 2 (Thomas *et al.* 2010).

By the decision of the captain, way point 10 has been changed (45°3689 N; 148°1799 E).

The line of way points 17 b-18 could not be completed due to lack of time: in the evening on September 01, we reached way point 17 a and, according to the captain's calculation, it was necessary to immediately start a transit to the port of Vladivostok so that the vessel could arrive on time - September 04.

SHORT INFORMATION ON THE CRUISE

Cruise itinerary

	Dates	Activity	Number of days
1	02-03.08.2022	Preparation for the survey, embarking the equipment	2 days
2	04.08.2022	Researchers on board. Vessel departs Vladivostok	1 day
3	04-09.08.2022	Transit to way points 1 of sub-area 12 SW	5 days
4	09.08.2022	Estimated angle and distance estimation training for buoy	1 days
5	10-27.08.2022	Sighting survey in sub-area 12 SW. Estimated angle and distance estimation experiment for buoy	18 days
6	28.08-01.09.2022	Sighting survey in sub-area 11	4 days
7	01-04.09.2022	Transit to the port of Vladivostok	3 days
8	04.09.2022	Arrival at the port of Vladivostok	1 day

Research vessel

The FSBSE «VNIRO» research vessel *ВЛАДИМИР САФОНОВ* (*VLADIMIR SAFONOV*) was used during the survey. It is equipped with a barrel (15,0 m from the sea level) where two observers can conduct searching. On the upper bridge (12,0 m from the sea level), scientists can also observe and record sighting, effort and weather information. The crew consisted of 24 members. Specification and photo of the vessel are shown in Appendix 1 and table 9.

Six scientists from Russia (Pacific branch of «VNIRO» and Russian Research Institute of Fisheries and Oceanography «VNIRO») participated in the cruise. Names and responsibilities are as follows:

1. Pavel S. Gushcherov (Pacific branch of «VNIRO» («TINRO»)) – Cruise leader/Chief Scientist - sighting, photo-ID;
2. Igor A. Naberezhnykh (Pacific branch of «VNIRO» («TINRO»)) – sighting, senior researcher; photo-ID;
3. Vladimir V. Obraztsov (Pacific branch of «VNIRO» («TINRO»)) – sighting;
4. Alexander N. Bashtovoy (Pacific branch of «VNIRO» («TINRO»)) – sighting;
5. Maksim D. Kenin (Pacific branch of «VNIRO» («TINRO»)) – sighting, meteo specialist;
6. Ivan F. Belokobylskiy (Russian Research Institute of Fisheries and Oceanography «VNIRO») – sighting.

Tomio Miyashita (T.M.) advised the scientific group by email communication.

Pre-cruise meeting

Due to the situation in the world caused by the COVID-19 infection, no pre-trip meeting was held this year. However, the readiness of the vessel, crew and scientific group was confirmed by T.M. By email communication with the provision of photo and video materials.

Survey method

In the research area, the normal closing mode was primarily used for large cetaceans and killer whales, but the vessel passed for other small cetaceans. Two scientists conduct searching mainly by naked eye, sometimes using binoculars (15x50 with stabilizer or 7x50) as supplementary measures. Three observer teams with determined members operated in two hours shifts. The survey was conducted for a maximum of 14 hours per day (from 6 a.m. to 20 p.m.) when the weather conditions were suitable for observations: visibility better than 1.5 n.miles and the wind speed less than 15.5 knots (about 7.5 m/s) and Beaufort sea state less than 5. The vessel speed was about 9 knots with slight adjustment to avoid vibration of vessel, and about 10 knots while closing.

During the transit, the normal passing mode survey was conducted.

In general, research effort began from 6 a.m. and ended at 20 p.m. (maximum 14 hours), but considering the time of sunrise and sunset, the period was changed to keep enough brightness. Time-zone was kept the same as that of Vladivostok (GMT +10 hours) throughout the cruise.

When a sighting was made, the initial sighting information such as estimated distance and angle to the sightings, species and school size etc. was reported to a researcher on the upper bridge for record. The angle was estimated using the angle board in front of each researcher. The effort record was recorded by a researcher on the upper bridge. The hourly weather record was made by a scientist. Sea surface water temperature (SST) was measured from water drawn using a small bucket. Wind information was quoted from the sensor in the bridge.

When a sighted animal seemed to be large cetacean, one of the researchers on the barrel made instructions to the officer in the bridge about speed and/or course change using a transceiver. After the sighting was approached, the species, group size, estimated length, number of calves present and behavior were determined and recorded. All record sheets (sighting, effort and weather) were originally the same forms as those for IWC/POWER cruises.

Species identification

Guidelines of species identification were based on the IWC-POWER methods for classification of identification (Anon., 2014). Whale body, shape of blow, surfacing and other behavioral pattern were potential cues for species identification. Because of not closing to small cetaceans except for killer whales, it was difficult to identify color type of Dall's porpoises when it was observed at a long distance from the vessel and thus the proportion of unidentified type of the species became large.

Also, when identifying cetacean species, we used reference guides and methodological recommendations for registering marine mammals (Бурдин и др., 2009; Мельников, 2001; Гущеров и др., 2021).

School size estimation

Guidelines for school size estimation were also based on the IWC-POWER methods (Anon., 2014). For estimation of school size, a binocular was potentially used. School size was estimated after approaching within 1.0 n.miles for large cetaceans, but for small cetaceans it was estimated when the school was at the closest distance during passing. When it was difficult to determine the school size, especially for small cetaceans, the minimum, the maximum and the best estimate of school size were recorded.

Effort coverage and weather conditions

The overall length of accounting tracks passed in the survey area in normal closing mode with the observations was 1438,03 n. miles (Table 2). In addition, 590,52 n.miles were surveyed during passing mode.

Meteorological observations were made every hour. In total, 447 meteorological observations were carried out during 32 voyage days.

Some statistics on meteorological conditions during the period from August 5 to September 3, 2022 are shown in tables 3 - 6.

The air temperature ranged from 10,1° C to 36,2° C, and the surface water temperature ranged from 4,5° C to 22,6 ° C (Table 3), on average, the air temperature was 17,9°C, and the temperature of the surface water layer was 14,9°C. The minimum water temperature of 4.5°C was recorded on August 11 at 06:00 in the coordinates 49°34'N 144°15'E. In general, the weather during the cruise was favorable for observation. Unsuitable conditions for observation at strong waves (4-7 points) were 29,5% (Table 4).

In the period from August 5 to September 3, of the total number of observations made, good weather conditions (clear, cloudy, slightly cloudy) made up 53,2%, and bad (mainly cloudy, rain, fog) – 46,8% (Table 5).

During the voyage, the South-East (36,2%) and South-West (29,7%) winds were predominant (Table 6).

RESULTS OF SIGHTINGS

Sighting summary

Table 7 shows the summary of sightings recorded in the research area and during transit. The following species of baleen cetaceans were found: North Pacific right whale, humpback whale, common minke whale, fin whale. The

species of toothed cetaceans found: sperm whale, killer whale, Baird's beaked whale, Dall's porpoises, Pacific white-sided dolphin. Due to short observation time of some whales, it was not possible to determine the species affiliation for 21 whales. Sighting positions of species identified were plotted in figures 3 a-q.

Detailed sightings of each species

Common minke whale
During the observations on board the R/V Vladimir Safonov, this whale was encountered everywhere – in research area (3 schools - 4 animals, Figure 3 a) and during transit (4 schools-4 animals, Figure 3 b).

In 2022, it was not marked by large concentrations, most likely due to the fact that this species is rather difficult to observe. In total, 4 whales were counted on tracks and 4 on transit. As a rule, animals were noted one by one.

Fin whale
The fin whale is still a fairly common species in the Sea of Okhotsk in recent years. On the research area, 23 schools - 34 animals were counted (Figure 3 c) and 1 schools-2 animals in transit (Figure 3d). Mostly recorded singly, but sometimes it was possible to meet in pairs and 3 individuals.

Humpback whale
In the current year, the humpback whale met only once at the transit mode (Figure 3 e). Due to the short observation time, photographs could not be taken. The animal was identified by a bushy fountain and a dorsal fin on the hump, as well as a typical caudal fin: a curved posterior edge, uneven, with a large number of teeth of various shapes, the central notch is deep, and the coloration is varied.

North Pacific right whale
In the current season, 1 schools -2 animals, consisting of North Pacific right whales in the research area (Figure 3 f).

Sperm whale
Sperm whales both in the research area (Figure 3 g) and transit mode (Figure 3 h) were always recorded singly, mainly at depths from 1700 to 3300 meters. 3 animals were counted on tracks, 4 animals in transit, mainly in the Kuril waters.

Killer whale
In the current cruise, only one schools of killer whales was registered in the research area (Figure 3 i). By gender, based on the shape and length of the dorsal fin, 2 females, 1 male and 3 young were presumably identified.

Dall's porpoises
As before, as in previous years, Dall's porpoises are the most widely encountered species. In the research area, Dall's porpoises were recorded on accounting lines by subspecies in the following numbers: unidentified type of Dall's porpoise – 484 animals (Figure 3 j), dalli-type of Dall's porpoise – 33 animals (Figure 3 k), truei-type of Dall's porpoise – 8 animals (Figure 3 l). At transit: unidentified type of Dall's porpoise – 61 animals (Figure 3 m).

The Truei and Dalli types of Dall's porpoise was identified in a mixed group of an indeterminate subspecies of the unidentified type of Dall's porpoise as well as individual groups (table 7).

Pacific white-sided dolphin
In 2022, the Pacific white-sided dolphin was observed in research area (Figure 3 n) and in large concentrations at the transit crossing in the Strait of Laperuza (Figure 3 o). A total of 13 schools were noted with a total of 219 animals.

Baird's beaked whale
In the research area Baird's beaked whale was represented by 25 animals (Figure 3 p), and in transit 4 animals (Figure 3 q), sighting in the waters of Primorye.

PHOTO-IDENTIFICATION

This year, photo-ID was applied to two groups of animals encountered - killer whales and North Pacific right whale. In the first case, the animals were encountered at a distance of 3 n.miles and the attempt to approach the animals was very difficult, since their behavior was noted as fast moving, and therefore it was not possible to get close to the killer whales. In the second case, the proximity to the animals was assessed as good and a number of photographs of the North Pacific right whale were taken.

In total, 3 whales have been tentatively identified. The number of photographs taken and individuals identified are also shown in Table 8.

Estimated angle and distance training

Distance and angle estimation training was carried out on August 09th prior to sighting in the research area. Time elapsed – 3 hour 2 min (Appendix 2, Figure 5).

Estimated angle and distance experiment

Experiment was carried out on August 27th. Time elapsed – 3 hours 1 min. The time spent on the training and experiment is given in the table 2.

DISCUSSION

Preliminary analysis based on the past sighting results was summarized as followings (Гущеров и др., 2022).

Joint Russian-Japanese visual surveys of cetaceans have been carried out annually since 2015 and have already covered most of the Sea of Okhotsk.

In the northern, northwestern, western, southwestern, eastern and central parts of the Sea of Okhotsk in 2015-2022 on accounting transects and transit crossings, the following were counted: fin whale (sch/ani) - 122/235, common minke whale - 130/155, North Pacific right whale - 27/40, humpback whale - 18/36, bowhead whale - 3/3, killer whale - 52/209, white whale - 38/400, sperm whale - 13/14, Pacific white-sided dolphin - 20/520, Baird's beaked whale - 9/59, harbour porpoise - 14/34, dalli-type of Dall's porpoise - 186/656, truei-type of Dall's porpoise - 30/98, unidentified type of Dall's porpoise - 1052/3218 (Myasnikov et. all., 2015; Gushcherov et. all., 2016, 2017, 2018, 2019, 2020, 2021; Гущеров и др., 2022).

In addition to animal counts, in accordance with the SC IWC methodology, the reaction of whales to the vessel, the dynamics and compactness of groups and the general characteristics of behavior were also recorded. Analysis of the data showed that the reaction of animals to the vessel was absent in most cases (72,5%), the frequency of other reactions was: indeterminate (10,5%), active avoidance of the vessel at a distance of less than 0,5 miles (3,5%), active avoidance of the vessel over 0,5 mile (5,4%), active attraction when under 0,5 mile (2,3%), active attraction over 0,5 mile (4,3%), sea surface activity (1,4%). In 77,6% of cases no change during entire observation period, in 4,9% and 0,7% of cases, the groups disperses or merged, respectively, the exchange of individuals between schools in 1,8% of cases, in 13,3% of cases, the dynamics of the composition of the group was not determined (Myasnikov et. all., 2015; Gushcherov et. all., 2016, 2017, 2018, 2019, 2020, 2021; Гущеров и др., 2022).

According to the method, the compactness of the group was judged on the basis of the distance expressed in body length between individuals in the group. Whales mostly kept compact at a distance of less than 5 body lengths (45,4% of cases), all animals within 5 BL of another – 16,2%, most animals within 5 BL of another - 8%, Most animals within 5 BL – 7,3%, animals are dispersed – 9,3%, and undetermined compactness was 18,4% of cases. The general behavior was as follows: fast travel (54,2%), slow travel (17,7%), undetermined (13,7%), milling (7,3%), resting (3,5%), feeding (2,5%), social (0,6%) (Myasnikov et. all., 2015; Gushcherov et. all., 2016, 2017, 2018, 2019, 2020, 2021; Гущеров и др., 2022).

Analysis of photos 2015-2022 allowed preliminary identification of 4 species of cetaceans: killer whale - 27 individuals, North Pacific right whale - 14, humpback whale - 8, bowhead whale - 1

CONCLUSIONS

2022 was the eighth year in which a joint Russian-Japanese annual visual survey of cetaceans was conducted on the Vladimir Safonov vessel in the Sea of Okhotsk. During the entire expedition, we noted the following species of cetaceans: common minke whale, North Pacific right whale, humpback whale, fin whale, sperm whale, killer whale, Pacific white-sided dolphin, Baird's beaked whale, Dall's porpoises.

For 8 years of participation (from 2015 - 2022) in expeditions to census cetaceans in the waters of the Sea of Okhotsk in the framework of cooperation with the Japanese Institute, employees of the Laboratory of Marine Mammals of the Pacific Branch of the FGBNU "VNIRO" ("TINRO") have gained the necessary experience to carry out these studies . For all the years of research, it was possible to obtain new information and important scientific information on the abundance and biology of cetaceans. The continuation of these studies will provide additional scientific material on cetaceans and will contribute to the work of the Scientific Committee of the International Whaling Commission.

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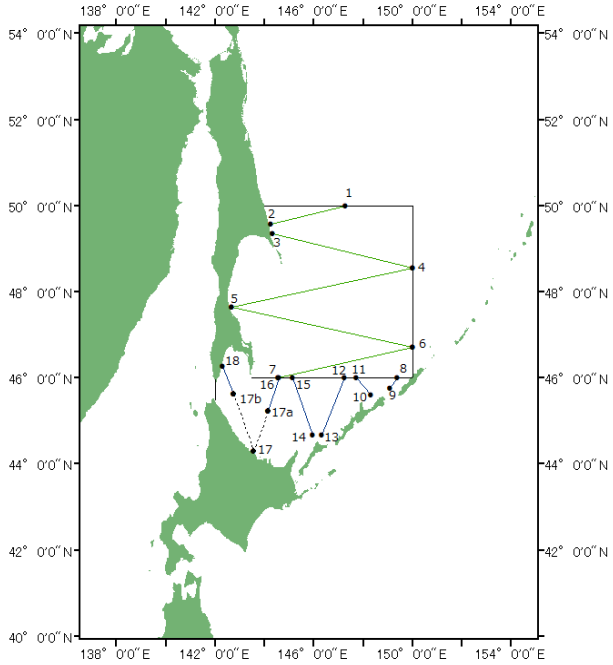

Figure 1 - Pre-determined track line for the 2022 survey in southwestern Sea of Okhotsk. The dotted line portion was cut by force majeure. The numbers indicate the way points

Table 1 – Coordinates of the way points in region of Okhotsk Sea in 2022 cruise by «Vladimir Safonov»

Number of way point	**Coordinates**	
	longitude	**latitude**
1	50°00,00’	147°16,80’
2	49°34,62’	144°15,59’
3	49°20,68’	144°20,37’
4	48°33,11’	150°00,00’
5	47°38,28’	142°40,66’
6	46°43,37’	150°00,00’
7	46°00,00’	144°34,22’
8	46°00,00’	149°24,00’
9	45°45,00’	149°05,00’
10*	45°36,89’	148°17,99’
11	46°00,00’	147°44,35’
12	46°00,00’	147°15,47’
13	44°40,54’	146°20,27’
14	44°40,05’	145°57,63’
15	46°00,00’	145°08,48’
16	46°00,00’	144°34,95’
17 a	45°14,00’	144°09,00’
17 b	45°37,00’	142°45,00’
18	46°15,59’	142°19,41’

Note: * The coordinate of the way point has been changed by the decision of the captain

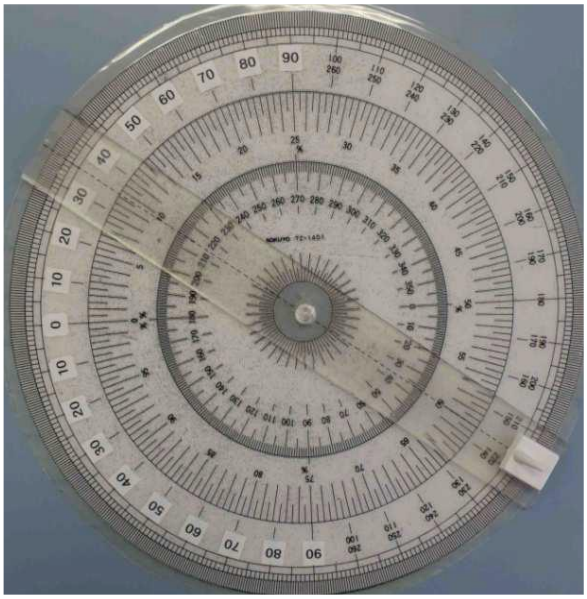

Figure 2 - Angle board to support the angle estimation

Table 2 - Summary of search effort of in 2022 cruise by «Vladimir Safonov»

Area	Start	End	Normal Closing mode		Normal Passing mode		Estimated angle and distance estimation training/ experiment
	Data/ Time	Data/ Time	Time	Distance (nmi)	Time	Distance (nmi)	
Vladivostok to research area	04-Aug. 15:00	09-Aug. 18:00	-	-	22:10	197,83	-
Research area	10-Aug. 05:30	01-Sep. 07:40	200:10	1438,03	11:15	128,19	Training 3:02
Research area to Vladivostok	01- Sep. 07:40	03-Sep. 19:06	-	-	29:30	264,50	Experiment 3:01
Total	-	-	200:10	1438,03	62:55	590,52	6:03

Table 3 - Air and SST temperatures during to 2022/8/5 – 9/3

Item	Air temperature	SST
Maximum	36,2	22,6
Minimum	10,1	4,5
Average	17,9	14,9

Table 4 - Observation of the sea state during to 2022/8/5 – 9/3

Sea state	0	1	2	3	4	5	6	7	Total
Observation	0	12	141	156	102	30	6	0	447
%	0	2,6	31,8	34,8	22,8	6,7	1,3	0	100

Table 5 - Observation of weather condition during to 2022/8/5 – 9/3

Weather	Clear	Slightly cloudy	Cloudy	Mainly cloudy	Rain	Fog	Total
Observation	37	88	112	97	29	84	447
%	8,2	19,8	25,2	21,7	6,4	18,7	100

Table 6 - Observation of wind speed and direction during to 2022/8/5 – 9/3

Wind speed (knots)					**Wind direction**				
	NE	E	SE	S	SW	W	NW	Total	%
breeze								3	0,6
1-3	2	4	6	2	1			15	3,3
4-6	6	4	36	16	37		7	99	22,1
7-10	26	5	63	28	66		5	193	43,1
11-16	2		27	12	24		13	78	17,4
17-21	1		18		3		1	23	5,1
22-27			7		1		7	15	3,3
28-35			5	2	1	1	1	10	2,2
Total	37	13	162	60	133	1	34	447	100
Total, %	8,2	2,9	36,2	13,4	29,7	0,2	7,6	100	

Table 7 - Number of sighting during to Okhotsk Sea sighting survey in 2022

Species	**Sub-area 12 SW**				**Sub area 11**				**Transit**				**Total**			
	Primary		Secondary		Primary		Secondary		Primary		Secondary		Primary		Secondary	
	Sch.	Ani.	Sch.	Ani.	Sch.	Ani.	Sch.	Ani.	Sch.	Ani.	Sch.	Ani.	Sch.	Ani.	Sch.	Ani.
Dall's porpoise (unidentified type)	90	338	0	0	36	146	0	0	6	20	15	41	132	504	15	41
Dall's porpoise (dalli-type)*	10	25	0	0	2	8	0	0	0	0	0	0	12	33	0	0
Dall's porpoise (truei-type)*	3	8	0	0	0	0	0	0	0	0	0	0	3	8	0	0
Pacific white-sided dolphin	0	0	0	0	1	12	0	0	12	207	0	0	13	219	0	0
Killer whale	1	6	0	0	0	0	0	0	0	0	0	0	1	6	0	0
Common minke whale	2	2	1	2	0	0	0	0	3	3	1	1	5	5	2	3
North pacific right whale	1	2	0	0	0	0	0	0	0	0	0	0	1	2	0	0
Humpback whale	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1
Sperm whale	2	2	0	0	1	1	0	0	0	0	4	4	3	3	4	4
Fin whale	21	30	0	0	2	4	0	0	0	0	1	2	23	34	1	2
Baird's beaked whale	4	25	0	0	0	0	0	0	1	4	0	0	5	29	0	0
Unidentified dolphin	0	0	0	0	0	0	0	0	1	6	0	0	1	6	0	0
Unidentified large cetacean	8	9	0	0	2	2	0	0	1	1	1	1	11	12	1	1
Unidentified small cetacean	2	2	0	0	0	0	0	0	0	0	0	0	2	2	0	0

Note: *met as separate schools, including as mixed size groups with unidentified type Dall's porpoise:
3 Sch – 6 Ani - Dall's porpoise (dalli-type) as mixed size groups with unidentified type Dall's porpoise;
4 Sch – 4 Ani - Dall's porpoise (truei-type) as mixed size groups with unidentified type Dall's porpoise;
other animals are marked in separate schools.

25.08.22, Common minke whale, photo by P.S. Gushcherov

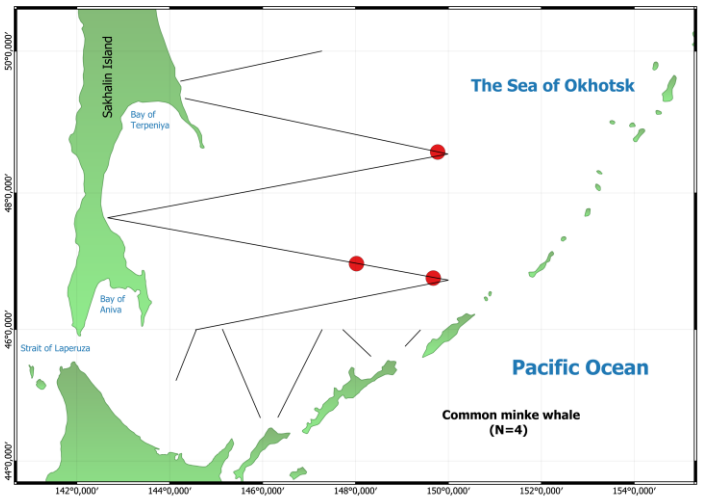

Figure 3 a - Sighting positions of common minke whale schools in research area. Red circle show the sighting position

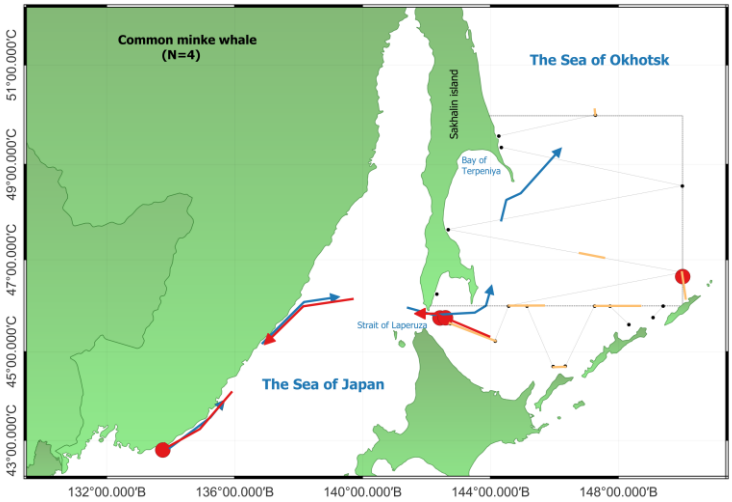

Figure 3 b - Sighting positions of common minke whale schools in transit. The blue line indicates the route of movement to the research area, the red line - back, and the orange line - transit within the research area and between track of way points

14.08.22, fin whale, photo by P.S. Gushcherov

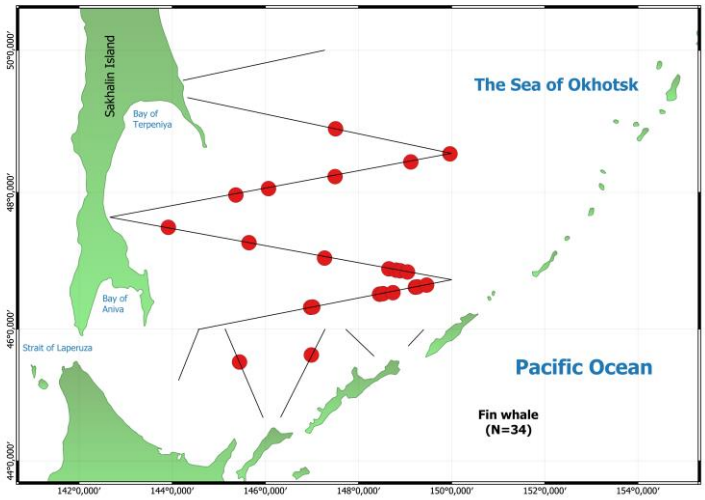

Figure 3 c - Sighting positions of fin whale schools in research area. Red circle show the sighting position

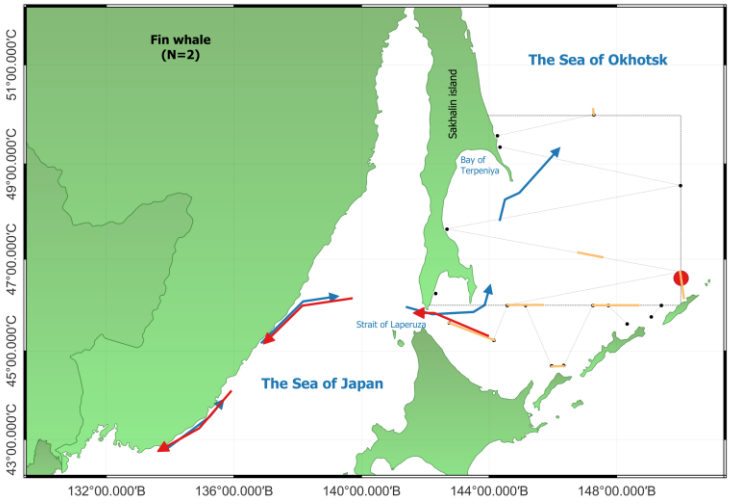

Figure 3 d - Sighting positions of fin whale schools in transit. The blue line indicates the route of movement to the research area, the red line - back, and the orange line - transit within the research area and between track of way points

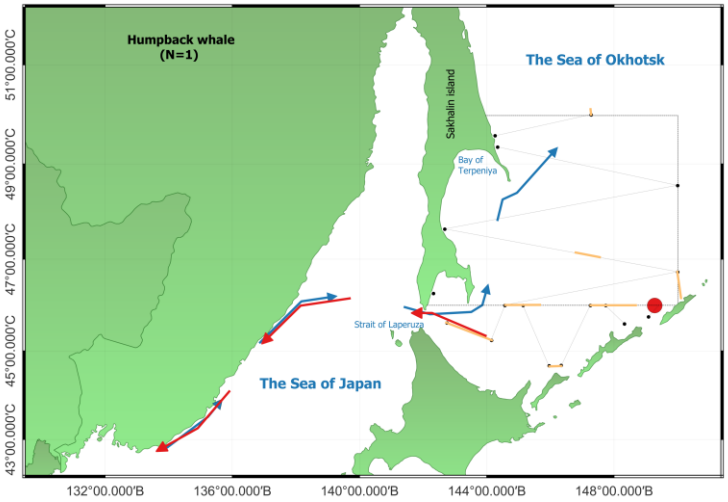

Figure 3 e - Sighting positions of humpback whale schools in transit. The blue line indicates the route of movement to the research area, the red line - back, and the orange line - transit within the research area and between track of way points

12.08.22, North Pacific right whale jump, photo by P.S. Gushcherov

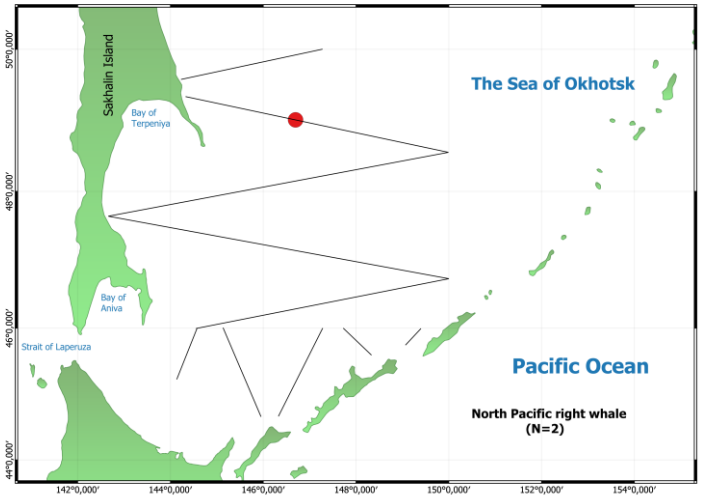

Figure 3 f - Sighting positions of North Pacific right whale schools in research area. Red circle show the sighting position

25.08.22, sperm whale, photo by P.S. Gushcherov

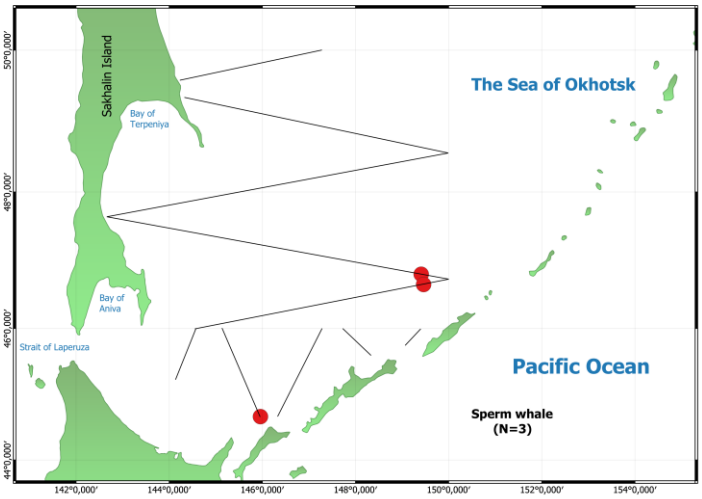

Figure 3 g - Sighting positions of sperm whale schools in research area. Red circle show the sighting position

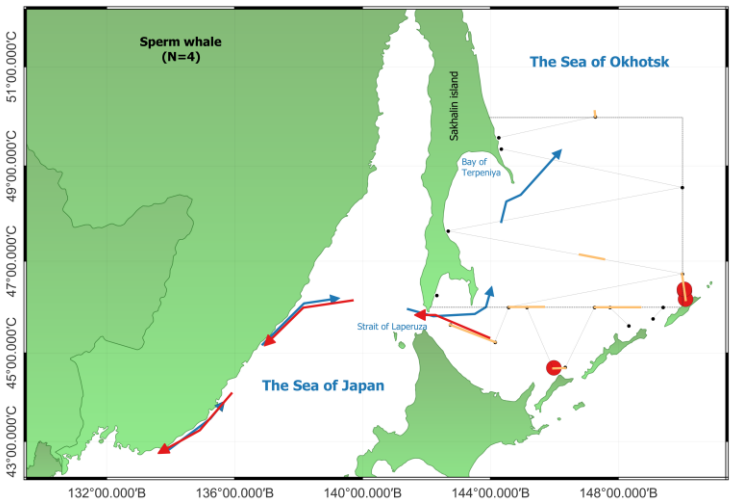

Figure 3 h - Sighting positions of sperm whale schools in transit. The blue line indicates the route of movement to the research area, the red line - back, and the orange line - transit within the research area and between track of way points

13.08.22, killer whale, photo by P.S. Gushcherov

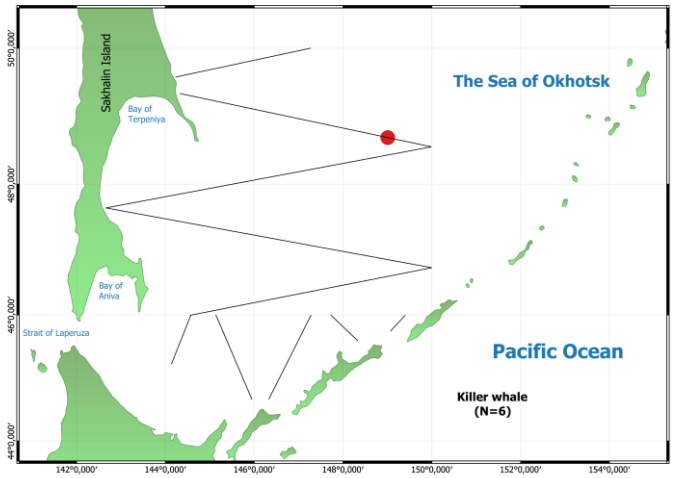

Figure 3 i - Sighting positions of killer whale schools in research area. Red circle show the sighting position

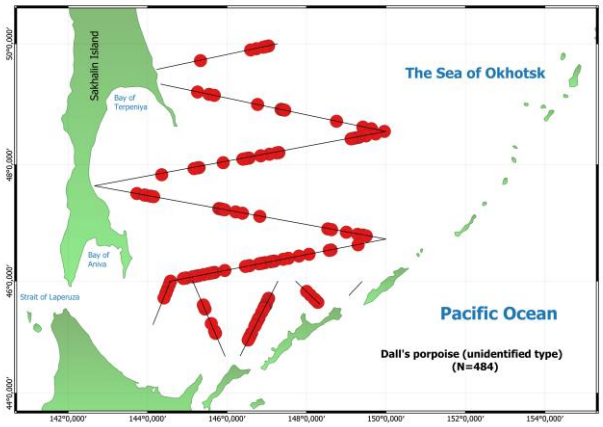

Figure 3 j - Sighting positions of Dall's porpoise (unidentified type) schools in research area. Red circle show the sighting position

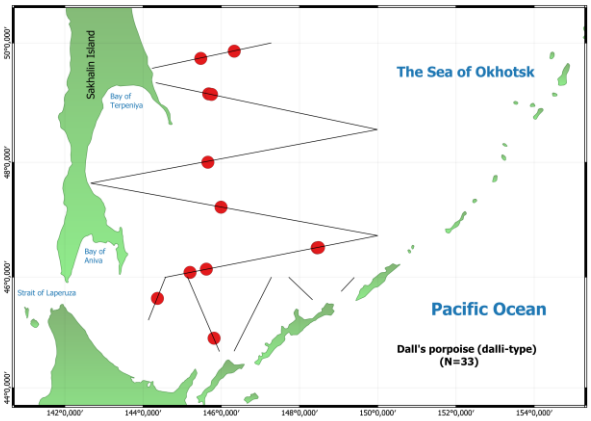

Figure 3 k - Sighting positions of Dall's porpoise (dalli-type) schools in research area. Red circle show the sighting position

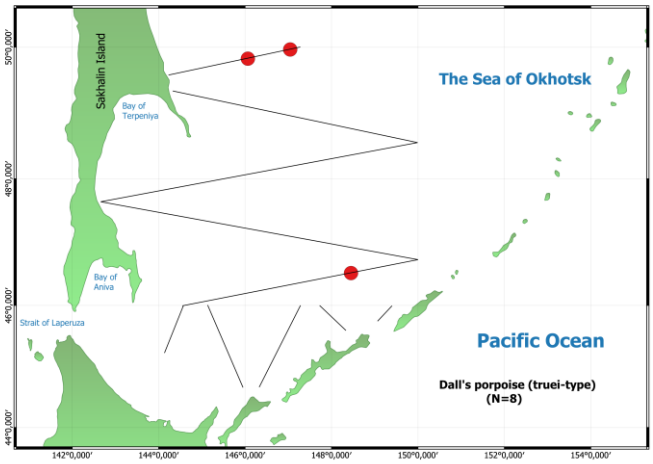

Figure 3 l - Sighting positions of Dall's porpoise (truei-type) schools in research area. Red circle show the sighting position

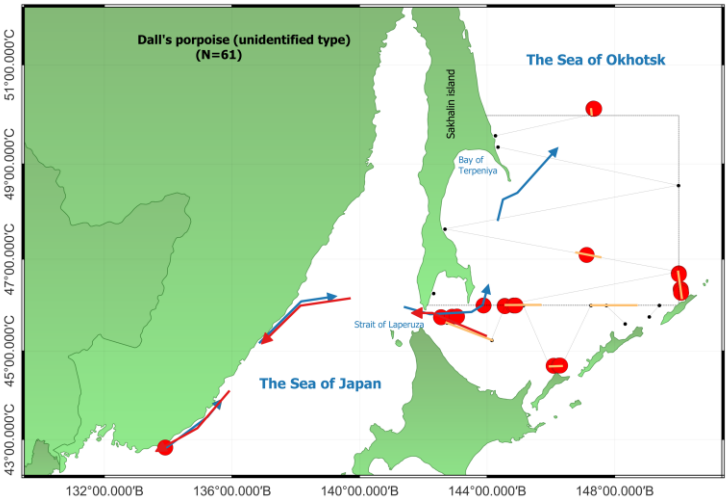

Figure 3 m - Sighting positions of Dall's porpoise (unidentified type) schools in transit. The blue line indicates the route of movement to the research area, the red line - back, and the orange line - transit within the research area and between track of way points

01.09.22, Pacific white-sided dolphin jump, photo by P.S. Gushcherov

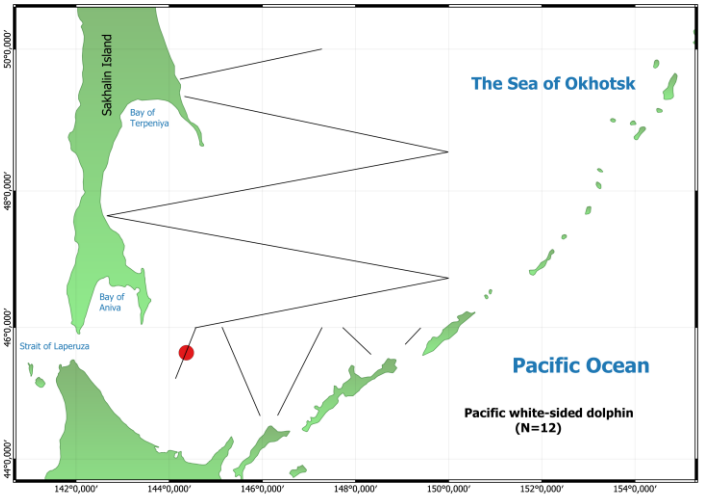

Figure 3 n - Sighting positions of Pacific white-sided dolphin schools in research area. Red circle show the sighting position

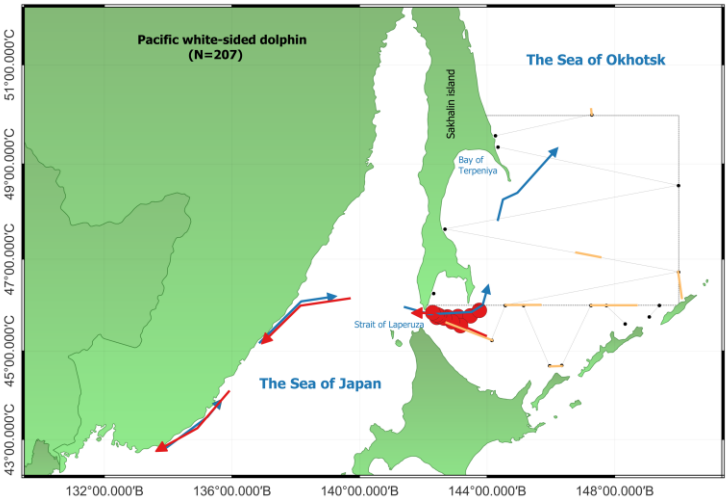

Figure 3 o - Sighting positions of Pacific white-sided dolphin schools in transit. The blue line indicates the route of movement to the research area, the red line - back, and the orange line - transit within the research area and between track of way points

19.08.22, schools of Baird's beaked whale's, photo by P.S. Gushcherov

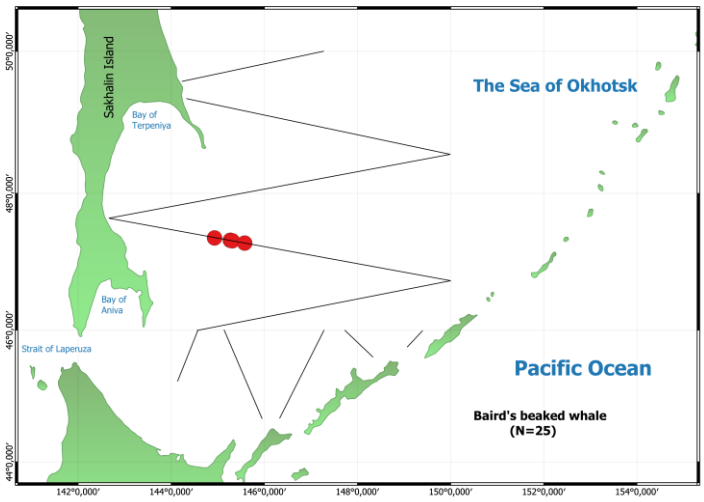

Figure 3 p - Sighting positions of Baird's beaked whale schools in research area. Red circle show the sighting position

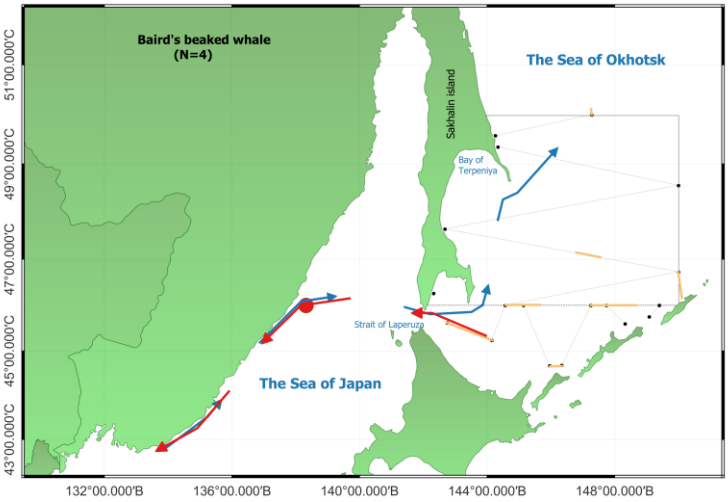

Figure 3 q - Sighting positions of Baird's beaked whale schools in transit. The blue line indicates the route of movement to the research area, the red line - back, and the orange line - transit within the research area and between track of way points

Table 8 - Number of photo-identified animals during the 2022 survey

Date	Species	Number of photos	Number of identified individuals
12.08.2022	North Pacific Right whale	104	2
25.08.2022	Killer whale	7	1

Appendix 1

R/V ВЛАДИМИР САФОНОВ (VLADIMIR SAFONOV)

Table 9 - Specification of the research vessel ВЛАДИМИР САФОНОВ (VLADIMIR SAFONOV)

Length overall	[m] 48.12
Molded breadth	[m] 10.50
Gross tonnage	(GT) 462.0
Barrel height	[m] 15.0
Upper bridge height	[m] 12.0
Engine power	[kW] 970

Appendix 2

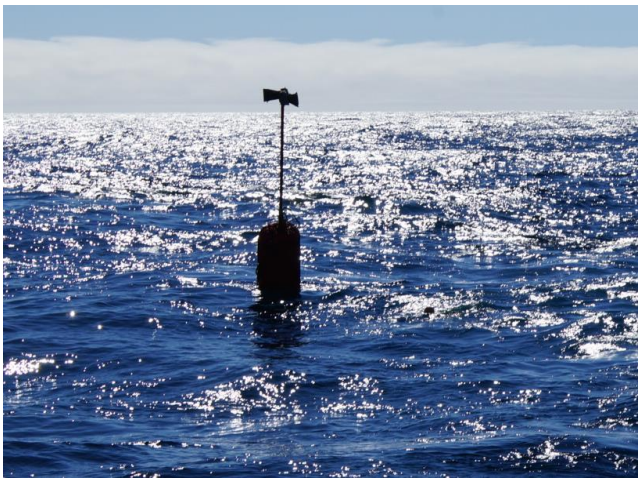

Figure 5 - Radar reflecting buoy for estimated angle and distance training and experiment