SC/68A/ASI/04

Cruise report of the 2018 IWC-Pacific Ocean Whale and Ecosystem Research (IWC-POWER)

Koji Matsuoka, Jessica Crance, Amy James, Isamu Yoshimura and Hedenori Kasai

INTERNATIONAL WHALING COMMISSION

Cruise report of the 2018 IWC-Pacific Ocean Whale and Ecosystem Research (IWC-POWER)

KOJI MATSUOKA[1], JESSICA CRANCE[2], AMY JAMES [3], ISAMU YOSHIMURA[3] AND HIDENORI KASAI[4]

1: Institute of Cetacean Research, 4-5, Toyomi, Chuo, Tokyo, 104-0055, JAPAN
2: NOAA Fisheries, Alaska Fisheries Science Center, National Marine Mammal Laboratory,7600 Sand Point Way NE, Seattle, WA, 98115, USA
3: IWC-nominated Researcher, The Red House, 135 Station Road, Impington, Cambridge, CB24 9NP, UK.
4: Captain, Kyodo Senpaku Co. LTD., Toyomi 4-5, Chuo-ku Tokyo, 104-0055, JAPAN

Contact e-mail: matsuoka@cetacean.jp

ABSTRACT

IWC-POWER cruises in the North Pacific follow the series of IWC/IDCR-SOWER (Southern Ocean Whale and Ecosystem Research) cruises that were conducted in the Antarctic since 1978. The 9th annual IWC-POWER cruise was conducted between 03 July and 25 September, 2018 in the central Bering Sea. The survey was conducted aboard the Japanese R/V *Yushin-Maru No. 2*. The cruise was organized as a joint project between the IWC and Japan. The cruise plan was endorsed at the 67B IWC/Scientific Committee (IWC/SC) meeting. Researchers from the IWC, the US, and Japan participated in the survey. The cruise had five main objectives: (a) obtain information for in-depth assessments of North Pacific sei, humpback and gray whales in terms of abundance, distribution and stock structure; (b) obtain information on the critically endangered North Pacific right whale population in the eastern Pacific; (c) completion of coverage of the northern range of fin whales following on the IWC-POWER cruises in 2010-12; (d) obtain baseline information on distribution, stock structure and abundance for a poorly known area for several large whale species/populations, including those that were known to have been depleted in the past but whose status is unclear; (e) obtain essential information for the development of the medium-long term international programme in the North Pacific in order to meet the Commission's long-term objectives. At the pre-cruise meeting, the crew of the vessel and international researchers agreed on the procedures and objectives of this survey. The survey was conducted using methods based on the guidelines of the IWC/SC. The acoustic survey was included for the 2nd time to acoustically monitor for the presence of marine mammals, with particular importance for detecting and locating North Pacific right whales. Survey trackline coverage was 75.3 % (planned distance of 2,237.9 n.miles) of the original trackline, with a total of 1,685.5 n.miles in Passing with abeam closing mode (NSP) and Independent Observer passing mode (IO). Additionally, 421.6 n.miles were surveyed during transit between Japan and the research area. During the entire cruise, sightings of: blue (8 schools / 12 individuals), fin (135/199), sei (5/7), common minke (17/17), North Pacific right (3/3), humpback (86/122), gray (27/88), sperm (35/36), Baird's beaked (2/24) and killer (20/136) whales were observed. Fin and humpback whales were the most frequently sighted large whale species. Gray whales were only sighted north of 64°N. A solitary NP right whale was sighted north of 64°N near St. Lawrence Island in the Central Bering Sea. There were no sightings of blue or sei whales in the Bering Sea. Photo-identification data were collected for: 3 North Pacific right, 41 gray, 8 blue, 69 fin, 39 humpback, 33 killer and 4 sperm whales. These data are preliminary, pending further processing and photo-identification confirmation. Two of three right whale sightings were detected and localised using acoustics. A total of 76 biopsy (skin and sometimes blubber) samples were collected from 6 blue, 24 fin, 29 humpback, 7 gray, 3 North Pacific right and 7 killer whales using the Larsen sampling system. A total of 253 sonobuoys were deployed, for a total of almost 700 monitoring hours. Species detected include fin whales, detected on 46.5% of sonobuoys (101 buoys), sperm whales (72 buoys, 33.2%), killer whales (56 buoys, 25.8%), right whales (27 buoys 12.4%), and humpback whales (24 buoys, 11%). Other species detected include gray whales (10 buoys, 4.6%), Baird's beaked whales (1 buoy, 0.5%), probable fish grunts (7 buoys, 3.2%), a double knock sound that we believe is attributed to fish (1 buoy, 0.5%), and possible earthquakes (2 buoys, 1%). The Estimated Angle and Distance Training Exercises and Experiments were completed. A total of 19 objects of marine debris were observed, considerably less than previous cruises. All survey procedures were in accordance with the guidelines set forth and agreed upon by the SC. The 9th annual cruise of this programme was successfully completed and provided important information on cetacean distribution, in particular gray, fin and North Pacific right whales, in an area where limited survey effort had been conducted in recent decades, in a poorly-known and logistically difficult area. These results will contribute to the aforementioned objectives of the IWC/SC.

KEY WORD: GRAY WHALE, NORTH PACIFIC RIGHT WHALE, BLUE WHALE, FIN WHALE, COMMON MINKE WHALE, HUMPBACK WHALE, SURVEY VESSEL, NORTH PACIFIC, BERING SEA, IWC-POWER

1. INTRODUCTION

1.1 Research objectives

The cruise was organised as a joint project between the International Whaling Commission (IWC) and Japan (IWC, 2012a, 2012b, 2013, 2014, 2016a, 2016b, 2017a, 2017b, 2018a, 2018b; Kato *et al*., 2011, Matsuoka *et al*., 2011, 2018). The 2018 cruise plan was discussed at the Tokyo planning meeting in 2017 and endorsed at the 67B IWC/Scientific Committee (IWC/SC) meeting. The cruise had five main objectives: (a) obtain information for in-depth assessments of North Pacific sei, humpback and gray whales in terms of abundance, distribution and stock structure; (b) obtain information on the critically endangered North Pacific right whale population in the eastern Pacific; (c) completion of coverage of the northern range of fin whales following on from the IWC-POWER cruises in 2010-12; (d) obtain baseline information on distribution, stock structure and abundance for a poorly known area for several large whale species/populations, including those that were known to have been depleted in the past but whose status is unclear; (e) obtain essential information for the development of the medium-long term international programme in the North Pacific in order to meet the Commission's long-term objectives (IWC, 2018a).

1.2 Research area, cruise track design and priority of the cruise

The research area was defined as north of 50°N, south of 66°N between 170°E and 165°W, comprised almost entirely of the Exclusive Economic Zone of the United States (US EEZ; Figure 1a). A small portion of the tracklines (291 n.miles) entered the Bering Sea Doughnut Hole, an area of high seas. A randomised start point for survey tracks was used based on the IWC/SC survey guidelines (IWC, 2012c). Every location within the study area had an equal probability of being sampled, as calculated by the software "DISTANCE (Ver. 6.2)" (Thomas *et al*., 2010). The lines were reviewed in the light of the guidelines for good track design included in the Requirements and Guidelines for Surveys under the Revised Management Procedure (IWC, 2012c) and in particular the need to take into account the distribution of priority species and the objectives of the survey, the need to ensure that lines did not follow features that might result in a bias (e.g., by following a coastline where the density of whales decreased with distance from the coast), as well as practical considerations such as time that would need to be spent on transit. Figure 1b shows the cruise track design in the designated research area and Table 1c shows Waypoints (WP) for the pre-determined tracklines. Research hours during the cruise were set at a maximum of 12 hours per day (see section 2.5). Primary search effort was conducted only in acceptable weather conditions, as per guidelines for prior cruises; visibility greater than 2.0 nautical miles (n.miles), wind speed <21 knots and sea state <Beaufort 6.

Following advice from the SC and the Technical Advisory Group (TAG), the 2018 survey alternated modes between Normal Closing Mode (NSP) and Independent Observer Mode (IO) (ca every 50 n.miles).

Two primary observers were in the TOP barrel throughout periods of NSP and IO modes (see section 2.5). Sighting survey procedures are detailed in "Information for Researchers" (Anon. 2018a). For encounters of rare species (e.g., right whales), it was decided that the vessel would approach whales immediately in order to avoid losing the sighting due to a delay in closing.

The priority species for biopsy sampling were North Pacific right (NPRW, highest priority), gray, blue and sei whales, with only the former two encountered during the 2018 cruise. Research time was allocated for biopsy sampling NPRW, gray, fin, humpback and killer whales. The Larsen system was used to collect samples. Medium-priority species included sperm, fin and killer whales. With respect to humpback whales, the priority was to obtain samples from animals encountered north of 60°N since the origin of the animals in this northern portion of the Bering Sea is unclear. In the southern Bering Sea, humpback whales have been sampled in previous years in large numbers; consequently, the species was considered low priority for biopsy in that area, although (as for other large whale species encountered) opportunistic samples were useful. Priority species for photo-ID were North Pacific right, gray and humpback whales, although photos of all other species, including fin and killer whales were obtained opportunistically.

2. SHORT NARRATIVE OF THE CRUISE

2.1 The 2018 cruise itinerary

Date	Event
02 July 2018	Pre-cruise meeting at Shiogama, Japan
03 July	Vessel departed Shiogama
04 July	Started transit survey to the Dutch Harbor (D.H.)
10 July	Passed the dateline at 54-18N (12:26)
13 July	Vessel arrived at D.H., Unalaska Island, Alaska, USA
15 July	Pre-cruise meeting at D.H.
16 July	Vessel left D.H. and started transit survey to the start point of Northern stratum (via NPRW Critical Habitat)
22 July	Vessel started the survey of the Northern stratum.

10 August	Vessel exited US-EEZ (15:22, 56˚23.0'N, 176˚19.5'E) and entered Bering Sea Doughnut Hole (High Sea)
10 August	Vessel finished the Northern stratum and moved to the start point of the Southern stratum
11 August	Vessel entered US-EEZ (08:11, 55˚27.9'N, 178˚00.2'E)
12 August	Vessel started the survey of Southern stratum
16 August	Vessel exited US-EEZ (06:02, 56˚12.3'N, 174˚35.1'E) and entered the Doughnut Hole (High Sea)
21 August	Vessel entered US-EEZ (11:22, 55˚40.7'N, 176˚50.5'E)
02 September	Vessel exited US-EEZ (08:17, 53˚23.9'N, 177˚07.9'W) and entered the Doughnut Hole (High Sea)
03 September	Vessel entered US-EEZ (07:58, 56˚03.9'N, 176˚08.5'W)
06 September	Vessel completed the southern stratum and started transit survey to Dutch Harbor (via NPRW Critical Habitat)
10 September	Vessel completed transit survey
12 September	Vessel arrived D.H., Unalaska Island, Alaska, USA
13 September	Post-cruise meeting at D.H.
15 September	Vessel left D.H. and started the transit survey
23 September	Vessel completed the transit survey
25 September	Vessel arrived Shiogama, Japan

2.2 Research vessel

The R/V *Yushin-Maru No.2* (747GT) was contracted for this cruise. The vessel is a sister ship of the *Yushin-Maru No.3* which was contracted in previous years; from 2011 to 2016. Ship specifications, photo, and the crew list for this cruise are provided in Appendix A.

2.3 Attending scientists and responsibilities

Four international researchers were nominated by the IWC steering group for the POWER programme. Researchers were Koji Matsuoka (The Institute of Cetacean Research, ICR, Cruise Leader), Jessica Crance (US National Oceanic and Atmospheric Administration (NOAA), Alaska Fisheries Science Center (AFSC), USA researcher), Amy James (IWC-nominated researcher, USA), and Isamu Yoshimura (IWC-nominated researcher, Japan). Koji Matsuoka and Isamu Yoshimura were on board from Shiogama to Shiogama and therefore participated in transit surveys, whereas Jessica Crance and Amy James boarded in Dutch Harbor and were not involved in transit surveys.

Koji Matsuoka (Japan) - Cruise Leader /Chief Scientist, sighting, photo-ID
Jessica Crance (USA) – acoustic, biopsy, photo-ID
Amy James (USA) – sighting, photo-ID data management, Marine Debris
Isamu Yoshimura (Japan) – sighting data and biopsy sample managements

2.4 Pre-cruise meeting

On 02 July, a pre-cruise meeting was held at the Tohoku Dock yard at Shiogama, chaired by Kato on behalf of the steering group. Meeting participants were: Kato (chair), Yoshida (National Research Institute of Far Seas Fisheries, NRIFSF), Matsuoka (Cruise Leader), Yoshimura (researcher), Kasai (Captain), Ohura (Chief Engineer), Kuwaoka (Chief Operator), Takamatsu (Chief Officer), Wakatsuki (Bosun) and Sawabe (Quartermaster) and Hosone (Kyodo-Senpaku). The meeting discussed and confirmed priorities and strategies for the cruise based on the IWC Scientific Committee's planning report (IWC, 2018b), and IWC research manual (Anon, 2018a). The pre-cruise meeting report was distributed to the steering group after review by the Convenor. On 03 July, Matsuoka and Yoshimura boarded the YS2 with all of the necessary equipment and departed from the port of Shiogama.

On 15 July, a pre-cruise meeting was held at the Grand Aleutian Hotel in Dutch Harbor, AK, chaired by the Cruise Leader (CL). Meeting participants were: Matsuoka (CL/chair), Crance, James, Yoshimura, Kasai (Captain) and Kuwaoka (Chief Operator). The meeting discussed and confirmed priorities and strategies for the cruise based on the IWC Scientific Committee's planning report (IWC, 2018b), and IWC research manual (Anon, 2018a). The pre-cruise meeting report (Anon, 2018b) was distributed to the steering group after review by the Convenor (Anon, 2018b). On 16 July, all researchers boarded the YS2 with all of the necessary equipment and departed from coastal dock, Dutch Harbor.

2.5 Research hours, survey mode and number of observers on effort

The schedule for research hours was consistent with previous SOWER (Southern Ocean Whale and Ecosystem Research) and POWER cruises. Research effort began 60 minutes after sunrise and ended 60 minutes before sunset, with a maximum 12-hour research day (Maximum 06:00-19:00, including each 30 minutes meal time for lunch or supper, when conducting IO mode, see below). There were occasions when it was beneficial to extend the research day beyond the normal research hours. This decision was made with the mutual agreement of the Captain and Cruise Leader. In such cases, there was an allocation of equivalent time-off on the following day for crew and scientists aboard the vessel. Time-zone changes were made in 60-minute increments, effective from 01:00 hrs. Work schedules adhered to local ship time which ranged between -13.0 hours and +12.0 hours GMT throughout the cruise depending on the ship's

geographic location (Table 1b). Data collected during the cruise and all associated reporting are provided in local ship time, with the exception of acoustic data, which were collected in Alaska Daylight Time (ADT). Relative GMT has been noted for reference in raw data.

Sighting effort was conducted by the bos'un and topmen from the TOP barrel (crow's nest: always two primary observers) and typically, two primary observers (the helmsman and captain) and four secondary observers from the upper bridge (or officer-on-watch, three researchers, and the chief engineer or deputy). Sighting activities aboard the ship were classified into two principal types: On-effort and Off-effort. On-effort activities were times when full search effort was executed and conditions (such as weather and sea state) were within acceptable parameters to conduct research. Off-effort activities were all activities that were not On-effort when no primary observers were in the TOP barrel (e.g. during drifting, Top down (TD) or steaming on the trackline due to bad weather conditions. All sightings recorded during On-effort were classified as Primary sightings. All other sightings were considered to be Secondary sightings.

Following advice from the SC and TAG (IWC, 2018a), the 2018 survey alternated between NSP and IO modes. It was suggested that at least 50% of effort be in IO mode (see 2.6 for expected versus realised survey effort).

Passing with abeam closing mode (NSP): This was in effect Passing Mode. Two topmen were on effort from 06:00-18:00 from the TOP barrel at all times. There was open communication between the upper bridge and the barrel. The observers on the upper bridge communicated with the topmen only to clarify sighting information. The upper bridge observers did not distract the topmen from their normal search procedure unless they were directed to do so by the CL (IWC, 2018a, Anon. 2018a).

Independent Observer Mode (IO): This is also in effect Passing Mode. Two topmen were observing from the TOP barrel and two from the IO barrel as recommended by the TAG (IWC, 2018a). Research hours were the same as NSP mode (maximum from 06:00-19:00; with 30 minutes allocated break time for lunch or supper meals). Communications were essentially one-directional, with topmen from the TOP and IO platforms reporting information to the upper bridge in isolation from each other to ensure that no sighting information was exchanged between the TOP and IO barrel observers. The observers on the upper bridge would communicate with the topmen only to clarify sighting information and would not direct the topmen to disrupt their normal search procedure unless directed to do so by the CL.

Immediately after a sighting was detected from the barrel, the topman relayed information to observers on the upper bridge. Details of the estimated distance and angle to the sighting (and when possible, the species and number of animals present) were relayed. After the sighting information was relayed to the upper bridge observers, the topman responsible for the sighting continued his normal searching pattern. Observers on the upper bridge located the sighting made by the topman and decided whether it would be possible to confirm species and conduct a school size count before the sighting passed abeam of the vessel. The topmen gave no further information to the upper bridge unless the whale group resurfaced within their normal searching pattern area. A designated researcher on the upper bridge recorded the species and estimated number of whales in the school when the sighting passed abeam of the vessel; this was in consultation with other upper bridge observers/researchers. When the sighting location was abeam of the vessel, the ship altered course to approach the whale, and speed was increased to 15 knots to hasten the closure. Ship speed was decreased when the group was near, usually within 0.2 to 0.4 n.miles from the initial sighting position. After the sighting was approached, the species, number of animals in the group, estimated length(s), number of calves present, and behaviour were determined and recorded. Following this, other activities would normally be conducted (based on time allowed and at the discretion of the CL), such as photography for natural marking (Photo-ID) studies and biopsy collection experiments. Until the ship resumed full search effort on the trackline, any sightings detected after initial departure from the trackline were classified as secondary sightings (Anon. 2018a).

2.6 Weather conditions and expected versus realised effort

In the research area, sea surface conditions were generally rough. Low-pressure systems resulted in long intervals of poor visibility, rain conditions, and heavy storms. A total of 649.90 n.miles (NSP: 310.55 n.miles, IO: 339.35 n.miles) and 1,035.60 n.miles (NSP: 538.07 n.miles, IO: 497.53 n.miles) of original trackline were surveyed in the northern and southern strata, respectively. In the northern stratum, 65.4 % of the planned trackline distance of 994.0 n.miles was searched, and 83.2 % of the planned trackline distance of 1,243.9 n.miles was searched in the southern stratum. A total of 390.30 n.miles was surveyed during transit surveys in the research area (e.g., transit from Dutch Harbor to the most northern WP and transits between end and start WPs of the western St. Lawrence Island). A comparison of weather conditions among past cruises is shown in Appendix B.

2.7 Management Authority Permits for Cetacean Research Activities and International Export and Import of Cetacean Biopsy Tissue Samples.

All research activities (i.e., the approach of cetaceans for species identification, school size estimates, digital photography, and tissue biopsy samples) that were carried out within the US EEZ were permitted under U.S. National

Marine Fisheries Service (NMFS) Permit no. 20465 (issued to the AFSC), and U.S. Bureau of Oceans and International Environmental and Scientific Affairs Permit no. U2018-002 (issued to the Fisheries Agency of Japan). Researcher Jessica Crance (US, AFSC) was listed as the co-investigator (CI) on the NMFS permit aboard the research vessel.

Cetacean tissue biopsy samples obtained within the US EEZ (i.e., 3 North Pacific right, 17 fin, 24 humpback, 7 gray, 5 killer whale specimens) were legally transported to Southwest Fisheries Science Center (SWFSC/NOAA) after the cruise under Crance's supervision, under the CITES (Convention on International Trade in Endangered Species) U.S. Management Authority (U.S. Fish and Wildlife Service) Permit. Biopsy samples were imported to Japan (the National Research Institute of Far Seas Fisheries (NRIFSF, Yokohama)) under the CITES Japan Management Authority, the Office of Trade Licensing for Wild Animals and Plants, Ministry of Economy, Trade and Industry (METI).

Cetacean research activities conducted on the high seas in international waters (including the Bering Sea Doughnut Hole) by Japanese researchers aboard the YS2 were authorized under permit SUIKAN 30-829 (dated 29 June, 2018) issued by Fisheries Agency, Government of Japan. A summary of research effort in the US EEZ is provided in Appendix C.

2.8 Photo-ID data collection

As appropriate and decided by the CL, research time was allocated to photo-identification and /or video recording of large whales, with the same priority species as for biopsy sampling (section 1.2). Generally, large whales were approached within 15-20 metres. Adults, juveniles, and females accompanied by calves were approached for photo-identification. Photo-ID experiments involved a minimum of one photographer (maximum three) on the bow, with additional photographers in the TOP barrel and IO barrel or upper bridge. The main cameras used were 1) IWC Nikon D7000 (with 70-300 mm lens) from the bow, 2) ICR Canon EOS 7D Mark II (with 100-400 mm lens) from the TOP barrel, and 3) a personally-owned Canon EOS 60D (with 100-400 mm lens) from the IO platform.

The IWC equipment provided was supplemented prior to leaving port in Dutch Harbor. Two 3TB external hard drives were purchased for daily backups. A spare SD card capable of containing 64 gigabytes (GB) of data was also purchased prior leaving Dutch Harbor. There are now 3x 32GB SD cards, and 1x 64 GB to be utilised for photographic data collection. It was found to be more than adequate storage for the 2018 cruise, particularly when combined with daily back up of photographs, allowing for nightly deletions of photos on the cameras' SD cards in preparation for photo-ID data collection the following day.

Images were uploaded to the IWC master photographic database in Adobe Lightroom (LR), backed up, and preliminarily analysed at the close of each survey day. Preliminary photo-analysis involved: linking photographic data to relevant sighting information (i.e., sighting number, school size and species) and biopsy records (i.e., sample number, no sample obtained or no attempt to obtain sample); identifying number of individuals photographed in each sighting; and assessment for photo-identification (Anon, 2018c). Photographic data with associated information saved to the metadata were organised into daily folders and sighting subfolders. Copies of photographic data were submitted to the CL and delivered to the IWC Secretariat shortly after the conclusion of the cruise. Low resolution photo-ID images of individual North Pacific right whales sighted during the cruise were emailed to NOAA's Alaska Fisheries Science Center for near real-time matching.

For the purpose of this report, individuals were considered photo-identified if they were documented with one or more image(s) that met species-specific identification criteria and catalogue-quality standards (section 4.1). These data should be considered preliminary and are subject to change with the further processing of database and catalogue curators.

2.9 Data entry system and analysis

Research data collected during the survey (weather, effort, sighting and distance experiments data) were entered by researchers using the 'onboard data collecting system' (ICR, 2013).

2.10 Acoustic data collection

Passive acoustic monitoring for marine mammals was conducted using sonobuoys. A sonobuoy is a free-floating, expendable, short-term passive acoustic listening device that transmits signals in real time via VHF radio waves to a receiver on a vessel. Each sonobuoy consists of an outer tube (approx. 14 cm in diameter, 110 cm long), and an inner sonobuoy. Total weight of one sonobuoy (including outer tube) is approximately 30-35 lbs; the weight of one crate of 48 sonobuoys is approximately 1,300 lbs. Prior to the start of the survey, the sonobuoys were removed from their crates, brought on board individually, and stored in the lower hold of the vessel. A total of 256 sonobuoys were brought on board prior to the start of the survey. Two types of sonobuoys were used during the survey: one that can be deployed in any depth, and one designed for deep water. The deep water sonobuoys were deployed only in the southern stratum, where water depths were in excess of 1000 m. Two antennas (one omnidirectional and one yagi directional) were installed and tested on the vessel on 14 July 2018 in Dutch Harbor prior to the start of the survey. Sonobuoys were deployed approximately every 2-2.5 hours, or approximately every 20-25 n.miles, from 06:00 to 18:00 (ship time) to

obtain an evenly-sampled cross-survey census of marine mammal vocalizations. Sonobuoys were monitored in real-time by the acoustician, and presence of species-specific call types was noted (Crance *et al*., in review). When drifting due to fog or inclement weather, one buoy could be monitored for the full 8-hour lifespan, or until the vessel transited out of range. At night, one buoy was deployed and monitored for the full 8-hour life span. Those data were post-processed the following day. When in/near the North Pacific right whale critical habitat, buoys were deployed continuously during daylight hours to maximize the potential for detecting a right whale (Crance *et al*., 2018; IWC, 2018a). Handheld radios allowed the acoustic technician to interact with a member of the visual observation team to groundtruth the acoustic detections with the visual sightings. The acoustic technician did not disclose the species detected on the sonobuoys to avoid biasing the visual surveys, with the exception of North Pacific right whales. When right whale vocalizations were detected, multiple sonobuoys were deployed simultaneously to localize on the calling animal and obtain location and distance estimates.

3. SUMMARY OF SIGHTINGS

3.1 Identification of species

Guidelines for species identification were based on the IWC-SOWER and IWC-POWER methods for classification of identification (IWC, 2018a): Positive identification of species was based on multiple cues and usually required clear observation of the whale's body. Occasionally, repeated observations of the shape of the blow, surfacing and other behavioural patterns were sufficient to identify whales; this judgement was made only by the CL or other designated researcher. Identification of species was recorded as 'probable' based on multiple cues, which were nevertheless insufficient to be absolutely confident of identification (recorded as "like"). This usually occurred when blows and surfacing patterns could be confirmed, but the whale's body could not be clearly seen. Details of recording procedures during sightings can be found in 'Information for Researchers' (IWC, 2018a).

3.2 Determination of group size

The following guidelines were used in determining group size: Schools where the number of animals, or an accurate estimated range of the number of animals was determined, were classified as confirmed schools. Data from the confirmed schools can be used to determine a mean school size. Therefore, it is critical that the confirmed schools accurately represent the size of schools in the survey area. Normally, schools believed to be confirmed for school size were approached to within 1 n. mile for large whales and to within 0.3 n.miles for minke whales. Allowing for context-specific differences (i.e., environmental conditions and animal behaviour), every effort was made to be consistent with regard to the maximum time spent on identification of species and confirmation of numbers. Normally, if the sighting was thought to be minke whales, no more than 20 minutes (after closure has been completed) was spent on confirmation; this reduces the potential for confusion with other whale sightings in the vicinity (IWC, 2018a). Counts of individual cetaceans found for each sighting are provided in the Sighting summary (section 3.3). The summary provides best estimates of school sizes in the research area, except when indicated otherwise.

3.3 Sighting summary

Tabulations of cruise itinerary, ship time, trackline WPs, area codes, leg number codes, search effort and sightings recorded in the research area, by species and by survey modes are presented in Tables 1a-1e and 2a. Table 2b summarises all sightings observed throughout the cruise including those recorded during transit to and from the research area. Table 2c shows the identification of duplicate sightings observed during survey in the IO mode. Table 3 shows the sea surface temperature (minimum, maximum and range) for species sighted in the research area and provides quartile analysis for species sighted on multiple occasions. Recorded sea surface temperature (SST) ranged from 5.9 to 12.3°C during sightings observed in the research area (Table 3). Table 4a show the summary of the number of biopsy samples collected by each species. Tables 4b to 4f summarises NPRW, gray, humpback, fin and killer whale sightings, photography and biopsy effort during the cruise. Table 4g shows the summary of photographed sightings with Photo-ID results for individuals and biopsy results for each sighting. Tables 5a to 5e provide sighting-specific details for NPRW, gray, humpback, fin and killer whale sightings respectively, including photo-ID and biopsy information. Table 6 show the summary of all sonobuoy deployments, recording hours, and species detected. Table 7 show the summary of marine debris observations during the cruise.

Figure 1a illustrates the research area and transit course between Japan and the research area. Figure 1b illustrates the pre-determined trackline design and start/end points of tracklines in the research area. Figure 1c illustrates the waypoint number of the original trackline. Figures 2a through 2g illustrate locations of the main species sighted and search effort in the research area. Figure 3 shows the breakdown of research time, in hours by effort code in the research area. Figure 4 shows the location of all sonobuoy deployments and species detected. Figure 5 shows the breakdown of water depth (m) at the sighting position for the main species sighted in the research area. Appendix B compares weather conditions (wind speed / visibility) in the research area among past cruises. Appendix C shows all sonobuoy deployments and

species detected during the entire cruise. Appendix D reports the summary of all research activity in the US-EEZ during the entire cruise.

Transit survey to the Dutch Harbor

The YS2 departed the port of Shiogama on schedule at 09:25 hrs, 03 July 2018 when local ship time was adjusted from +14h to -14h GMT, therefore repeating 03 July. A safety instruction meeting and an emergency abandon ship drill were conducted on 03 July. Transit survey commenced using the passing mode at 06:00 on 04 July under acceptable weather conditions in the High Sea and US-EEZ. Whale biopsy collection training using the Larsen darts system was conducted on 04 July. YS2 passed the dateline on 10 July (05:26) at 54º-18'N. The YS2 completed the transit survey on 12 July and arrived at Crowley Dock at Captains' Bay in Dutch Harbor, Alaska, USA on 13 July.

A total searching distance during the transit survey to the Dutch Harbor between 04 and 12 July was 89.9 n.miles (High Sea: 33.9 n.miles, US-EEZ: 56.0 n.miles).

A total of 4 schools (7 individuals, including mother & calf pair) of blue whales were sighted south-east of the Kamchatka Peninsula (High Sea), and a total of 12 schools (22 individuals) of fin whales were sighted in the US-EEZ (Table 3). Photo-ID photos were collected for 4 individuals (3 blue, 1 fin) and three biopsy samples were collected from blue whales, including from both the mother and calf (Tables 4 and 5). No marine debris was recorded during observations which were restricted to the first 15 minutes of every hour during On-effort, between Shiogama and Dutch Harbor. In addition, humpback, minke, and killer whale, dall's porpoise, and one unidentified large baleen whale were sighted, but no photo-ID photos were collected.

While in Dutch Harbor from 13 to 15 July, all acoustic equipment (sonobuoys, antennas, etc.) from the US researchers were loaded. Two US researchers (Jessica Crance (NOAA, AFSC) and Amy James (Center for Coastal Studies)) boarded the vessel on the morning of 16 July.

The research area

From Dutch Harbor to the research area (16 -21 July)

On 16 July, the YS2 departed Dutch Harbor from coastal dock and started the transit survey to the research area progressing northward on the morning of 17 July through the North Pacific right whale Critical Habitat. On the morning of 17 July, the acoustic omnidirectional antenna was re-tested and replaced with the backup antenna. Shortly thereafter a call similar to the right whale "gunshot call" was detected, and later that evening definitive gunshot calls were detected during the night of 17 July. On 18 July, the YS2 searched the detected calling area and two solitary schools of NP right whales were sighted in the afternoon (approximately 60-63 meter water depth, almost 30 n.miles from the sonobuoy that first detected the calls). On 19 July, the YS2 transited west through the right whale Critical Habitat and continued the transit survey heading northward. The exercise of distance and angle estimation was conducted on 20 July. YS2 continued the transit survey past the eastern side of the St. Lawrence Island and arrived at the starting waypoint in the evening of 21 July.

Generally, a high pressure system resulted in good weather conditions. Air temperature ranged from 6.5˚C to 13.7˚C, and sea temperature ranged between 7.5˚C and 10.1˚C. The water depths along the trackline were shallow (generally 20-90 meters) and the number of observed navigation ships and fishing boats were very few.

The total searching distance was 331.68 n.miles (Passing with abeam closing (NSP) mode). A summary of all sightings is shown in Table 2a. A total of 2 schools (2 individuals) of North Pacific right whales, 13 schools (21 individuals) of fin whales, 23 schools (39 individuals) of humpback whales, and one dalli type Dall's porpoise were sighted. Photo-ID photographs were collected for both North Pacific right whales that were approached close enough to obtain decent-quality images (Tables 4a, 4c-4h), and biopsy samples were collected from both animals (Tables 4b-4h). Low-resolution images of the right whales were sent to AFSC, NOAA to compare with the right whale catalog. Both individuals were unable to be matched to the catalog, indicating possibly new individuals. Confirmation using high-resolution images will occur after the cruise. Two types of marine debris were recorded during observations, which were restricted to the first 15 minutes of every hour (Table 7). Acoustics deployed a total of 38 sonobuoys, all 38 of which were successful deployments (buoy transmitted successfully). Species detected include North Pacific right whales (9 buoys), fin whales (12 buoys), humpback whales (6 buoys), killer whale (9 confirmed, 3 possible), sperm whales (1 buoy), and possible fish grunts (2 buoys). A summary of the acoustic detections is shown in Table 6.

Northern stratum (from 22 July to 10 August)

On the morning of 22 July, the YS2 completed the transit survey and started surveying westward at the starting Waypoint (WP101: 64-23.2N, 168-46.2W) of the northern stratum. The YS2 surveyed westward to the north of St. Lawrence Island and turned southward at the Russian and US border on 25 July. The survey continued southward to St. Lawrence Island, with the vessel transiting around the western side of the island before resuming the survey on the

southern side. Water depths along the trackline were shallow (generally 20-70 meters) and the number of observed navigation ship and fishing boats were very few.

A high density gray whale area was observed on Gambell Shoal near the northwest cape of St. Lawrence Island (from 5 to 15 n.miles off the Cape, water depth: 25-36 m). Several gray whales were feeding (mud trails were seen). A solitary right whale was sighted on the trackline near the southwest cape of St. Lawrence Island (7 n.miles from the coast, 40m depth). Biopsy samples were collected from 7 gray and one N.P. right whale. Biopsy attempts were abandoned for several gray whale sightings due to long dive times.

On 3rd August, the YS2 continued surveying southward in the research area and turned westward to the north of St. Matthew Island (25 n.miles offshore of the island), and turned southward at the Russian and US border. Overall, several large low pressure systems resulted in poor visibility, heavy wind and rain conditions. Water depths along the trackline were shallow (generally 50-155 meters). There were at least 5 Russian fishing boats in the Russian EEZ, and at least 8 fishing boats were concentrated near the track line at 59˚14.1'N, 176˚26.4'W (water depth 140 meters).

A high-density fin whale area was observed along the southernmost trackline in the northern stratum (water depth over 3,000m). A total of 37 schools (59 individuals, including 1 mother and calf pair) of fin, one solitary humpback, common minke, and sperm whale, and 2 schools (7 individuals) of killer whales were sighted in the south-eastern part of the northern stratum.

On 8 August, the YS2 continued surveying south-eastward in the northern stratum research area and turned westward at the eastern boundary. The YS2 completed the northern stratum survey and started to transit to the western starting point of the southern stratum on 10 August.

A total of 649.90 n.miles (NSP: 310.55 n.miles, IO: 339.35 n.miles) of original trackline were surveyed in the northern stratum (65.4 % of the planned trackline distance of 994.0 n.miles was searched). A total of 58.62 n.miles was surveyed during transit surveys in the northern stratum (e.g., transit between end and start WPs near western St. Lawrence Island).

Sightings in the northern stratum consist of: gray (26 schools /85 individuals, fin (40/64 including 1 calf), common minke (11/11), humpback (3/3), N.P. Right (1/1), sperm (1/1) and killer (5/27 including 2 calves) whales. Gray whales were most frequently sighted north of 63ºN (Table 2b). Humpback whales were mainly sighted south of 58ºN. Sighting of whales were very few between 63ºN and 58ºN.

Acoustics deployed a total of 62 sonobuoys, 59 of which were successful deployments (buoy transmitted successfully). Species detected include North Pacific right whales (3 buoys), fin whales (27 buoys), humpback whales (3 confirmed, 4 possible), killer whale (12 confirmed, 1 possible), sperm whales (13 buoys), gray whales (10 buoys), and possible fish grunts (2 buoys). A summary of the acoustic detections is shown in Tables 6a and 6b.

Southern stratum (12 August -6 September)

12-18 August: the YS2 started the southern stratum surveying south-eastward and turned to the north-east approximately 25 n.miles off the western side of Attu Island. The YS2 exited the US-EEZ (56˚12.3'N, 174˚35.1'E) and entered the Bering Sea Doughnut Hole (High Sea) on 16 August. Overall of the western part of the southern stratum, high pressure systems resulted in good visibility conditions. Water depths along the trackline were deep (generally 1,500- 3,500 meters). Air temperature ranged from 9.3˚C to 17.1˚C, and sea temperature ranged between 10.9˚C and 12.6˚C.

In the western part of the southern stratum, there were numerous sightings of humpback whales (a total of 41 schools of 59 individuals), and a high-density area was observed along the northernmost trackline (north of 55N, water depth over 3,000m). In some cases, red colored feces (2 schools/ 2 individuals) and feeding behaviors (9/9) were observed. Other sightings included fin (9 schools / 14 individuals), common minke (3/3), sperm (9/10), killer (6/56) whales and several schools of Dalli type Dall's porpoise.

19-25 August: the YS2 continued surveying south-eastward through the Bering Sea Doughnut Hole (High Sea) and entered the US-EEZ (55˚40.7'N, 176˚50.5'E) on 21 August. Water depths along the trackline were generally very deep (1,100- 3,800 meters), except when crossing Bowers Ridge. Sightings include fin (7 schools / 9 individuals), humpback (10/11), common minke (2/2), Baird's beaked (2/24) whales, and Dalli type Dall's porpoise (6/20).

26 August–1st September: the YS2 continued surveying south-eastward in the southern stratum and turned to the north-east approximately 8 n.miles off the eastern side of Amchitka Is. Water depths along the trackline were generally deep, but became shallow near Amchitka Is. (235- 3,700 meters). Sightings include fin (17 schools / 22 individuals), sperm (16/16), killer (3/5) whales, and dalli type Dall's porpoise (24/143).

2 – 6 September: the YS2 completed the original trackline of the southern stratum on 6 September. Overall during the week, low pressure systems resulted in short intervals of poor visibility condition. Air temperature ranged from 8.2˚C

to 15.6˚C, and sea temperature ranged between 9.1˚C and 10.6˚C. Total sightings included fin (34 schools / 42 individuals), humpback (7/7) and killer (4/22) whales. Photo-ID photographs were collected for fin (9 schools/ 11 individuals) and humpback whales (1/1).

On 3 September, a probable right whale upcall was detected at 11:18 ship time. Because the sonobuoy on which it was detected was deployed in omni mode (to detect high frequency species while in the deep basin) rather than Difar mode, no directional information was obtained. A second sonobuoy was immediately deployed in Difar mode to obtain directional information, but another upcall was not detected until almost 14:00 ship time. From 14:00 to 15:00, several more upsweeps were detected, all with a bearing of 300° relative to the sonobuoy. At 15:00, after completing a biopsy experiment, the ship changed course, first heading west approximately 3 miles to deploy a second buoy (to localize on the position), then heading northwest at approximately 300° in the direction of the detected upcalls. A possible location of the call was obtained at 16:55, and the ship changed course to head approximately 360° in the direction of the position. Unfortunately, due to increasing sea states and the presence of many fin whales, the calling right whale was not visually sighted. No more upcalls were detected after 17:00. The ship continued to search for the right whale until 18:00, when we had to cease visual operations due to fading daylight and inclement weather. The ship remained in the area overnight and continued to monitor acoustically, but no more right whale calls were detected, and at 6:00 the following morning, the vessel left the area to return to the trackline. No gunshot calls were detected during the encounter.

Sightings in the southern stratum consist of: fin (67 schools /87 individuals), common minke (2/2), humpback (21/21), sperm (25/26) and Baird's Beaked (2/24) whales. Fin and humpback whales were the most frequently sighted large whale species.

Acoustics deployed a total of 110 sonobuoys, 83 of which were successful deployments. Species detected include North Pacific right whales (2 buoys), fin whales (41 buoys), humpback whales (9 confirmed, 2 possible), killer whales (26 confirmed, 4 possible), sperm whales (57 buoys), Baird's beaked whales (1 buoy), and possible earthquakes (2 buoys). A summary of the acoustic detections is shown in Tables 6a and 6b.

From southern stratum to Dutch Harbor (6-12 September)

On 6 September, YS2 completed the southern stratum survey and started the transit survey to the Dutch Harbor (via North Pacific right whale (NPRW) Critical Habitat). From 8 to 10 September, the YS2 conducted a dedicated search for NPRW in the critical habitat. The area surveyed (mainly northeastern portion of habitat) was chosen based on a high density of sightings in previous years.

On the afternoon of 7 September, the YS2 reached the western edge of the right whale Critical Habitat. Although gunshot calls were detected, localization positions were inconsistent, and the animal was never visually sighted. The YS2 continued surveying throughout the Critical Habitat from 8 to 10 September, but no right whales were sighted. Only a handful of right whale calls were detected on 8 September, but the few gunshots detected were very faint, from a very distant calling animal. As a result, no good localizations occurred, so the YS2 remained on trackline. No gunshots were detected on 9 or 10 September, despite continuous acoustic monitoring. Gunshots were detected on the last sonobuoy deployment on 11 September, when the YS2 was transiting to Dutch Harbor.

The lack of acoustic detections and sightings were highly unusual, given the high number of detections that occur every year in September in this area. A total of 204.73 n.miles were surveyed by the Passing Mode (NSP). Sightings in the area consist of: humpback (7 schools /7 individual) whales.

Acoustics deployed a total of 43 sonobuoys, 39 of which were successful deployments. Species detected include North Pacific right whales (13 confirmed, 3 possible buoys), fin whales (18 buoys), humpback whales (7 confirmed, 2 possible), killer whales (8 buoys), and possible fish grunts (4 buoys). A summary of the acoustic detections is shown in Tables 6a and 6b.

On 10 September, YS2 completed surveys in the Bering Sea and arrived at Dutch Harbor on 12 September on schedule. Two US researchers, Crance and James disembarked at Dutch Harbor, and Japanese researchers Matsuoka and Yoshimura remained onboard for the completion of the transit back to Japan.

Transit survey to Shiogama

The YS2 arrived at Dutch Harbor (D.H.) on 12 September. In the port of D.H., we completed works including refueling, off board of the two US researchers, unloading acoustic equipment, shipping biopsy samples which collected in the USEEZ to the SWFSC. YS2 departed at D.H. (13:00, 15 September). YS2 started the transit survey to Japan under heavy storm conditions during 17 to 20 September (maximum wind speed was 42 knots and height of swell was over 5 meters). The YS2 passed the dateline at 2:33 on 18 September (at 53°-29.5'N), and left US-EEZ (22:51, 19 September at 50°-46.9'N, 168°-07.3'E) and completed the transit survey on 23 September. Total sightings included blue (4 schools / 5 individuals), fin (3/5), sei (5/7), sperm (9/9) and killer (1/25) whales

during 100.4 n.miles searching. These whales were photographed, and biopsy samples were collected from 3 blue, 2 fin and 1 killer whales, respectively. Most whales were sighted south-east of the Kamchatka Peninsula (High Sea). YS2 arrive at Shiogama port on 25 September on schedule.

Detailed sightings by each species during the 2018 cruise are as follows:

North Pacific right whale (*Eubalaena japonica*)

A total of 3 schools (3 individuals) of eastern North Pacific right whales (NPRW) were sighted during this cruise. Two animals were sighted in the right whale critical habitat on 18 July during the transit from Dutch Harbor to the research area. One animal was sighted south of St. Lawrence Island on 26 July in the northern stratum, far north of the critical habitat (Table 2a; Figure 2a). All individuals were photographed and photo-identified, and biopsy samples were obtained from all three individuals. All whales were sighted in shallow water, with depth between 40 and 63 meters (Figure 5). Sea temperatures ranged from 8.9˚C to 9.7˚C (Table 3). Preliminary results are given in Table 4b and sightings are summarized in Table 5a. Details of each sighting are as follows:

The first two schools were detected by acoustics in the NPRW Critical Habitat during transit from Dutch Harbor to the northern stratum. On 17 July, a call similar to the right whale "gunshot call" was detected, and later that evening definitive gunshot calls were detected during the night of 17 July. On 18 July, the YS2 searched the detected calling area and two solitary schools of NP right whales were sighted (sighting numbers 022 and 023) in the afternoon (approximately 60-63 m water depth), almost 30 n.miles from the sonobuoy that first detected the calls. Estimated lengths were 13.6 m and 12.3 m, respectively. Time taken to visually sight the animal after initial acoustic detection was approximately 7 hours. There were many other baleen whales in close proximity (humpback and fin whales), that were assumed to be feeding, based on short dive and surfacing times. Large, dense flocks of birds were also feeding in the area. Weather conditions were suitable for photo-ID and biopsy attempts. Photo-ID images were collected for both whales, of which one was matched to whale 25 in the MML right whale catalogue (Sighing 022; Tables 4c and 5a). The second animal (sighting 023) was confirmed a new animal. Both whales were successfully biopsied (S/No 18081004 and 18081005), and biopsy results reveal that both animals are males. Divots on both whales (indicative of previous satellite tag placement) were not documented. In general, whales were maintaining a consistent direction of travel during long dives. Feeding and red feces were observed by one whale and there were large numbers of shearwaters feeding in surface waters surrounding the whales. Acoustic data were collected from these individuals, including gunshot song, which is hypothesized to be produced exclusively by males as a reproductive display (Crance *et al.*, in review).

On 26 July (sighting number 018), a solitary right whale (estimated length 13.1m) was sighted by visual observations on the trackline near the southwest cape of St. Lawrence Island (7 n.miles from the coast, 40 m depth). Weather conditions were suitable for photo-ID and biopsy attempts. Photo-ID images were collected for the whale, which were compared to the MML catalogue; this animal was confirmed newly documented (Tables 4c and 5a). A biopsy sample was collected from the whale (S/No 18081014), and results indicate this is a male. No divots were documented on the whale. Feeding was not observed, although there were large numbers of shearwaters feeding in surface waters surrounding the whale, and head nodding was observed, indicating the whale may have been sub-surface feeding. No right whale acoustic detections occurred prior to the sighting despite consistent monitoring, although one solitary gunshot call was detected four days prior, on the northwest cape of St. Lawrence Island, likely from the sighted animal. This animal was re-sighted on 18 August by a Russian charter organization actively feeding with humpbacks in Pengkingney Fjord near the Bering Strait (64.85 º N, 172.95 º W), 106 n.miles away from the sighting location (Clapham, pers. comm.). This results in an average swimming speed of 0.18 knts over 24 days. Further details will be reported in the near future.

Blue whale (*Balaenoptera musculus*)

This species was sighted only during the transit survey between Japan and Dutch Harbor in the Western North Pacific in July and September (8 schools / 12 individuals). A total of 4 schools (7 individuals, including a mother & calf pair) of blue whales were sighted south-east of Kamchatka Peninsula between 45º-18'N, 157º-13'E and 48º-26'N, 161º-35'E (High Sea) in July, and a total of 4 schools (5 individuals) of blue whales were sighted south of Kamchatka Peninsula between 48º-26'N, 161º-03'E and 46º-04'N, 157º-51'E (High Sea). Sea surface temperatures of the sighting positions were between 5.8ºC and 7.5ºC in July, and 11.6ºC and 12.1ºC in September. Photo-ID photos and biopsy samples were successfully collected from 6 individuals, including a mother and calf pair.

Fin whale (*Balaenoptera physalus*)

Fin whales were the most frequently encountered baleen whale species in the research area, especially south of 58ºN. Sightings were widely distributed in the southern part of the northern stratum and the whole southern stratum. A high-

density fin whale area was observed along the southernmost trackline in the northern stratum (water depth over 3,000m) (Figure 2b). A total of 132 schools (194 individuals) of fin whales were observed in the research area including 3 mother and calf pairs. A total of 19 schools and 22 individuals of "Like fin" were recorded; these looked like fin whale blows but could not be approached (Table 2a). Most fin whales were sighted in deep water of depths over 1,000 meters (Figure 5). Sea temperatures ranged from 4.4˚C to 12.4˚C (25th to 75th Quartile: 9.5˚C - 9.9˚C) (Table 3). Biopsy samples were obtained from 22 fin whales. A total of 76 individuals from 55 schools were photographed; of these, 69 were photo-identified. Individuals have not been inter-matched to check for duplicates (Table 4g).

Humpback whale (*Megaptera novaeangliae*)

Humpback whales were the second most frequently encountered baleen whale species in the research area, primarily in the southern stratum. Few sightings occurred in the northern stratum (Figure 2d). A high-density area was observed in the western side of the southern stratum along the northern trackline (north of 55ºN, water depth over 3,000m; Figure 2d). A total of 80 schools (115 individuals) were observed in the research area, including one mother-calf pair. In some cases, red colored feces (3 schools/ 3 individuals) and feeding behaviors (10/10) were observed (Table 4e). Sea temperatures ranged from 7.0˚C to 13.1˚C (25th to 75th Quartile: 9.6˚C -11.8˚C) (Table 3). Biopsy samples were obtained from 29 humpback whales (Table 4b). A total of 54 individuals from 39 schools (combined school size of 56) were photographed. Of these, 39 individuals were photo-identified (Table 4c).

Gray whale (*Eschrichtius robustus*)

Gray whales were the third most frequently encountered baleen whale species in the research area and sightings ranged from 63ºN to 65ºN, north of the St. Lawrence Is. in the northern stratum. A high density gray whale area was observed on Gambell Shoal near the northwest cape of St. Lawrence Island (from 5 to 15 n.miles off the Cape, water depth: 20-36 m). Several gray whales were feeding (mud trails were seen; Figure 2e). A total of 27 schools (87 individuals) were seen in the northern stratum. No mother and calf pairs were seen. All whales were sighted in shallow water depths between 24 and 63 meters (Figure 5). Sea temperatures ranged from 5.8˚C to 9.4˚C. Biopsy samples were obtained from 7 gray whales; however, some biopsy attempts were abandoned due to long dive times (Table 4b). A total of 49 individuals from 13 schools (combined school size of 61) were photographed; of these, 44 individuals were photo-identified and 41 were unique individuals (Tables 4c and 4g).

Common minke whale (*Balaenoptera acutorostrata*)

Common minke whales were widely distributed in the northern and southern strata, between 53ºN and 65ºN with some areas of high concentrations around St. Lawrence Island (Figure 2c). A total of 17 schools (17 individuals) were observed. Approximately 50% of sightings occurred in shallow waters (depth between 31 and 200 meters); the rest were in deep water (over 1,000 meters; Figure 5). Sea temperature at sighting locations ranged from 5.6˚C to 12.1˚C (25th to 75th Quartile: 8.2˚C -10.2˚C; Table 3). Because of the difficulty in seeing their blow and small body, observations of this species were more difficult than in Antarctic waters. Common minke whale blows are very small and are difficult to spot in rough sea surface conditions (e.g., wind speed over 12 knots). During this survey, sea states averaged 4-5 on the Beaufort scale, which is assumed to be too rough for sighting common minke whales. A total of 4 individuals from 4 schools were photographed, 2 of which were photo-identified.

Sperm whale (*Physeter macrocephalus*)

Sperm whales were mainly sighted in the southern stratum where the water depth was over 1,000 meters (Figures 2f and 5). A total of 35 schools (36 individuals) were sighted (Table 2a). Sperm whales were recorded in waters with SST ranging from 3.9˚C to 11.7˚C (25th to 75th Quartile: 8.3˚C -11.5˚C; Table 3). Three individuals were photographed and no biopsy samples were collected.

Killer whale *(Orcinus Orca)*

Killer whales were sighted in both northern and southern strata (Figure 2g). A total of 20 schools (136 individuals, including 7 calves) were sighted (Table 2a). Killer whales were sighted in waters with SST ranging from 4.3˚C to 11.2˚C (25th to 75th Quartile: 9.2˚C -11.5˚C; Table 3). Biopsy samples were obtained from 6 individual killer whales (Table 4a). A total of 39 individuals from 8 schools were photographed; of these, 33 were photo-identified (Tables 4a and 4h). Biopsy samples were collected from 7 individuals. Individuals have not been inter-matched to check for duplicates and two schools will need further analysis.

Baird's beaked whale (*Berardius bairdii*)

Baird's beaked whales were sighted in the southern stratum in deep water (water depths over 1,000 m). A total of 2 schools (24 individuals) were sighted. Both Baird's beaked whale sightings were in waters with a SST of 10.6˚C. A

total of 1 school (17 individuals) was close enough for photo-documentation, of which 7 are estimated to be photographed. Further photo-identification analysis should be conducted for individuals. Acoustic recordings were made shortly after leaving this group; detections include clicks, whistles, and buzzes. The acoustic encounter lasted over an hour.

3.4 Resighting During IO Mode

Resight data were recorded for a total of 200 sightings during IO Mode. Table 2c shows the identification of duplicate sightings observed during survey in IO mode. Duplicate status was based on the number of sightings made by the Independent Observer Platform (IOP) that also were observed by the Topmen in the Standard TOP Barrel. For fin whales, there were 97 school sightings made by TOP or IOP and 45 schools made by IOP. A breakdown of the numbers of the 45 schools include 34 for "Definite duplicate" and 11 for "Not duplicate". For humpback whales, there were 26 school sightings made by TOP or IOP and 12 schools made by IOP. A breakdown of the numbers of the 26 include 12 for "Definite duplicate" and 2 for "Not duplicate". During this cruise, long diving behaviours were often observed for fin whales, and visibility was not always good in the research area. Further, in a high-density area, sometimes several fin or humpback whales were not sighted from the TOP Barrel. These may have resulted in lower numbers of duplicates for these species.

4. PHOTOGRAPHIC DATABASE

Ten different photo-ID species were photographed during the 2018 IWC-POWER cruise. A total of 126 schools were approached close enough to obtain photo-identification images. Of those, 197 were photo-identified within schools; not all have been inter-matched to check for duplicates (see 4.1). Photo-ID species encountered included: blue (7 schools approached / 8 photo-ID'd), Fin (55 / 69), humpback (40 / 39), gray (13 / 41), North Pacific right (3 / 3), killer (8 / at least 33) and sperm (4 / 4) whales (Table 4a). Baird's beaked whales (17 individuals) and Dall's (24) porpoises were also photographed but not analysed for unique individuals.

Images collected during the cruise were uploaded to the IWC master photographic database in Adobe Lightroom (LR). Preliminary coding was completed for all cetacean images (10,187), including the allocation of species name, sighting number, school size and biopsy effort. Full coding involved analysing each image in LR for various health, behaviour and unique identification parameters, which were written to the image metadata as keywords. Star ratings were allocated for image quality and colours were assigned for photo-identification purposes. This thorough image-by-image analysis was conducted for all sightings up to and including 15 August, as well as all gray whale images (2,162) and of NPRW (870 images), humpback (3,679) and the majority of fin (some of 2,459) whale images. Photographs of low priority species and carcasses were marked to be fully coded at a later date, time permitting. This included the majority of killer whale, around half of minke whale and all porpoise photographs. Images of non-cetaceans were archived.

4.1 Individual Identification

Sighting rates were high for five photo-ID species encountered during the 2018 POWER survey: NPRW, gray, fin, humpback and killer whales. Images of photo-ID species were reviewed at the end of each survey day to confirm number of unique individuals per sighting. Individuals were reviewed for images that documented identification features and met catalogue-quality criteria, e.g., perpendicular angle for dorsal fins. Primary ID features were species-specific: ventral flukes for humpbacks; left or right head for right whales; laterals (left or right) or flukes (dorsal or ventral) for gray whales; dorsal fin or right head blazed chevron for fin whales; and dorsal fin or saddle patch for killer whales. Individuals that had one or more image(s) of a Primary ID feature that adhered to catalogue-quality criteria, were considered photo-identified for the purpose of this report (Tables 4a, c-g). Secondary ID features were useful for photo-identification but not sufficient alone (e.g. humpback whale dorsal fins or scars anywhere on the body).

The IWC LR database is not a photo-identification catalogue but is designed to categorise images for contribution to various research interests, including photo-identification. During the 2018 POWER cruise, the best primary ID feature image(s) and the best secondary feature image(s) of individuals were coded 'Photo-identification' in LR. If no images of primary features met the criteria, the individual was not considered photo-identified for the purpose of this report, and no images were coded 'Photo-identification' in LR, not even excellent-quality secondaries.

The logic: species-specific catalogues are based on primary ID features; therefore, even if a secondary feature (e.g., scar) is well documented making the whale easy to match, this whale could potentially never be matched to catalogue primaries that do not show the distinct mark (or to images of the whale prior to acquiring the scar). All images 'useful for photo-identification' are labelled green in LR, regardless of whether the whale is photo-identified or not.

Photo-identification results are **preliminary** and subject to change after further processing by catalogue curators. Individuals that were documented to catalogue-quality standards were provisionally identified, including: 3 right (all unique individuals), 44 gray (41 unique), 39 humpback (all unique individuals, including one mother-calf pair), 66 fin

(not yet inter-matched for duplicates, including three mother-calf pairs), 2 minke, and 22 killer whales (not yet inter-matched for duplicates, including 3 calves) (Tables 4a, 4c-h). Images will be made available for incorporation into respective catalogues.

5. BIOPSY SAMPLING

Biopsy samples were collected for 70 individual whales: 3 North Pacific right, 3 blue, 22 fin, 29 humpback, 7 gray, and 6 killer whales (Table 4b). Every biopsy encounter was documented photographically. All biopsy samples were catalogued and stored in cryo-vials frozen at a temperature of -30ºC on the vessel. These samples will be used for molecular genetics analyses. All biopsy samples collected in the US EEZ were sent to SWFSC post cruise after arrival at Dutch Harbor, Alaska, USA under the responsibility of the CL and US researcher, Crance. So that replicate genetic analyses can take place for the biopsy collection (i.e., an IWC study to take place at the SWFSC genetics laboratory in the USA and a separate, concurrent study to be conducted by the Japanese Fisheries Agency at the NRIFSF laboratory), all individual biopsies were cut in half on board. This provided two equivalent biological samples for separate analysis at the respective laboratories noted above. Samples for Japan will be sent to the NRIFSF laboratory as soon as possible from SWFSC under the responsibility of the SWFSC genetic scientist. A summary of the number of individuals biopsied during this cruise is shown in Table 4b. These biopsy skin samples will enable genetic studies on stock structure to be conducted and samples of blubber will be analysed for contaminants, hormones and fatty acids.

5.1 Biopsy data management

As in past years, biopsy darts were numbered and color-coded and each biopsy shooter used either red or black labelled darts. This allowed us to track which whale was sampled. At the commencement of each biopsy sampling encounter, effort code “BX” was recorded, and after a sample was collected, effort code “EX” was recorded by the researcher on the upper bridge. The time of each biopsy hit was captured photographically, and the exact biopsy time of each biopsy hit was written on the foil wrap for each sample before it was taken to the biopsy lab.

5.2 Biopsy efficiency

Biopsy duration times were evaluated to examine biopsy efficiency (Table 4a). Biopsy success rate when approaching NPRW for sampling was very high compared to other species during this cruise. Success rates for each species were 100% (n=3) for NPRW, 50% (n=14) for gray, 48.0% (n=50) for fin, 75% (n=8) for blue, 74.4% (n=39) for humpback and 70.0% (n=10) for killer whales. The main cause of low success rates of fin whales was short surfacing instead of fast swimming. Median time of biopsy effort duration from setup to sample retrieval when sampling each species was 52 minutes for NPRW, 17.5 minutes for gray, 35 min for blue, 27.0 minutes for fin, 25.0 minutes for humpback and 10 minutes for killer whales. Biopsy sampling was attempted as often as time permitted under acceptable environmental conditions.

6. VIDEO-RECORDING

A digital video camera recorder, Sony FDR-AX60, 4K Handycam was used to conduct opportunistic video recording. 19 separate video clips (9schools) were recorded for a total time of 00:25:00, including 00:01:24 of fin whale surfacing and biopsy events, 00:14:46 of NP right whale surfacing and biopsy events, 00:07:56 of humpback whale surfacing and biopsy events and 00:00:54 of killer whale surfacing events.

7. ACOUSTIC DATA COLLECTION

A total of 253 sonobuoys were deployed during the cruise (Appendix C). Of these, 217 deployed and transmitted successfully for an overall success rate of 85.8% (Table 6a). Overall success rate was lower than the previous year for two reasons. 1. The deep water sonobuoys were of an older manufacture year (2004-2005) and had a success rate of only 60.5%; and 2. During the last two weeks of the survey, on multiple occasions, a sonobuoy that was transmitting a strong signal would suddenly lose the audio signals, even though the sonobuoy was still transmitting. This happened on buoys of different manufacturing years, and when programmed with different settings; no pattern was detected regarding the failures. It is thought that this was an internal sonobuoy problem, as there was no indication that it was a result of interference from other signals or ship instrumentation.

A total of almost 700 hours of acoustic monitoring occurred during the survey (Table 6b). The location of sonobuoy deployments and species detected are shown in Figure 4. The most common species detected were fin whales, detected on 46.5% of sonobuoys (101 buoys), followed by sperm whales (72 buoys, 33.2%), killer whales (56 buoys, 25.8%), right whales (27 buoys, 12.4%), and humpback whales (24 buoys, 11%). Other species detected include gray whales

(10 buoys, 4.6%), Baird's beaked whales (1 buoy, 0.5%), probable fish grunts (7 buoys, 3.2%), a double knock sound that we believe is attributed to fish (1 buoy, 0.5%), and possible earthquakes (2 buoys, 1%).

Fin whales were the most commonly detected species, and were widely detected throughout both the northern and southern stratum. Sperm whales were the second most commonly detected species, and were only detected in the southern stratum, where water depths were in excess of 1000 m. Killer whales were the third most commonly detected species, and were detected throughout both the northern and southern stratum. Humpback whales were detected more commonly in the northern stratum; similarly, gray whales were only detected in the northern stratum. NP right whales were mainly detected within or near the critical habitat, with two exceptions. One right whale gunshot call was detected four days before the sighting of a NP right whale near St. Lawrence Island (section 3.3), and a few gunshot calls were detected after the sighting. Additionally, right whale upcalls were detected on 3 September in the southern stratum in deep water (>1000 m), almost 300 n.miles west of the critical habitat. No gunshot calls were detected, and the animal was not visually sighted. Baird's beaked whales were acoustically detected on 23 August, shortly after their sighting in the southern stratum. This encounter included clicks, whistles, and buzzes, and lasted over an hour. Generally, acoustic detections aligned nicely with visual sightings, with the exception of sperm whales. Sperm whales are more easily detected acoustically than visually, due to extremely long dive times and their highly vocal nature.

Of the 3 total right whale sightings, 2 were localized using sonobuoys. Maximum detection distance for right whales was approximately 40 n.miles. In-air reception range averaged 16 nm for the yagi antenna (maximum 18 nm), and 11 nm (maximum 13 nm) for the omni antenna. In addition to spatial distribution data of all marine mammals, valuable acoustic data on gunshot song production by NPRW were collected during this survey. These data contribute to an ongoing study on NP right whale song production. A manuscript detailing song production, and including data collected during the 2017 POWER cruise and long-term acoustic recorders was submitted by Crance in December 2018 (Crance *et al*., in review).

8. OTHER EXPERIMENTS

8.1 Estimated Angle and Distance Training Exercise

The Estimated Angle and Distance Training Exercises were conducted on the afternoon of 20 July for a total duration of 3 hours 28 minutes. During the exercise, observers familiarised themselves with distance estimates from the top barrel and upper bridge. Following advice from the SC and the TAG, the 2018 survey adopted several improvements for this experiment (IWC, 2017a). The improvements were: (1) use of relatively inexpensive GPS technology (a durable waterproof model) on the buoy to improve detectability (a) at greater distances and (b) in more realistic sea/weather conditions than may be possible using the present radar system; (2) use of two buoys which can (a) reduce the potential lack of independence while using only one buoy with the correct experimental protocols and (b) allow increased efficiency which will assist when having a greater distance range and when including researchers as well as the crew in the experiment using the recommended buoy (to simulate a whale's body rather than the blow).

8.2 Estimated Angle and Distance Experiment

The Estimated Angle and Distance Experiments were conducted on 08 August for 5 hours 18 minutes whilst in the research area. A total of 84 trials were conducted for each platform (top and IO barrels and upper bridge). Both of the estimated Angle and Distance Training Exercises and Estimated Angle and Distance Experiments were performed using the improved protocol (IWC, 2017b). Details of the results will be analysed and reported to the TAG after the conclusion of the cruise.

8.3 Marine debris observations

During this cruise as in past years, data on floating marine debris were collected to document the type and extent of marine debris present in the North Pacific. As agreed during the pre-cruise meeting in Shiogama and Dutch Harbor, systematic data collection of marine debris was limited to the first 15 minutes of each hour, as time permitted (not to interfere with marine mammal observations). In addition, opportunistic marine debris data were recorded and photographed if items were particularly large and/or could potentially lead to large whale entanglements. For all recorded marine debris items, observers recorded angle, distance and time of initial sighting, IWC code and a description. Photographs of items were archived and will be available to those interested in these data.

Marine debris were very few and sparsely distributed during this cruise compared to previous years (Matsuoka *et al.,* 2013, 2014). A total of 19 marine debris objects were observed. 11 items were recorded "on effort" (i.e., during the first 15 minutes of each hour) and 8 items were recorded during "off effort" (Table 5). A total of 17 objects were recorded in the US EEZ.

9. TECHNICAL MATTERS OF DATA AND RECOMMENDATIONS

9.1 Photographic data collection

Previously it has been recommended that VHF marine radios be purchased for use by photographers. On the 2018 cruise, photographers used radios on loan from NOAA. During photo-ID experiments of killer whales with large school sizes that were dispersed, radio communications were particularly useful. It was possible to coordinate between researchers on separate platforms in order to maximise the number of individuals that were photographed, rather than have three isolated photographers all focusing on the closest animal. It is **recommended** that VHF radios are available for future cruises.

9.2 Photographic database processing in Lightroom (LR)

Images collected during the cruise were uploaded to LR and preliminarily coded. By processing images directly in LR, post-cruise processing time is greatly reduced. Furthermore, it allows for real-time photo-analysis summaries and expedites image access/sharing. It is **recommended** that researchers on future cruises continue LR processing. It is recommended that guidance documents specific for photo-processing during the cruise and the IWC LR Photographic Database Manual are kept up-to-date and that hard and electronic copies are made available on future cruises. A new IWC-POWER laptop with fast processor, high resolution wide screen and ample memory and drive storage was available on the 2018 cruise for digital photography processing. This was a welcomed upgrade and considerably improved the efficiency of photographic data processing. It is **recommended** that LR is installed on the IWC-POWER laptop with an up-to-date catalogue prior to the 2019 POWER cruise.

9.3 Camera equipment

IWC Nikon D7000 (with 70-300 mm lens) is one of two primary DSLR cameras used during the 2018 POWER cruise. GPS locations are recorded in the metadata of each picture by operating the DSLR with an externally mounted Nikon GPS (GP-1A) unit connected by an external ten-pin (GP1-CA90) cable. It has been noted in previous years that there can be difficulty with GPS connection, no consistent problems were discovered during the cruise. The camera also has two Nikon lithium ion batteries (EN-EL15) batteries, manufactured in 2012 and 2013, respectively. After a full charge, short battery life was noticed with both batteries, though the 2012 battery was noticeably worse, sometimes lasting only 2.5 hours of non-constant use. The solution during the cruise was to utilise electrical outlets in the YS2 bridge while using the other battery for backup. However, a full charge could not always be fully obtained before the back-up battery also ran out of charge. As is the case with other rechargeable lithium ion batteries, capacity is likely to continue to decrease with age. It is recommended that 1-2 new batteries are available for future use of the IWC Nikon D7000.

9.4 Photographic storage and backing up

Noted in the IWC's photographic database manual (Anon, 2018c), photographs and related data are to be backed up to an external hard drive disk to prevent loss of data. Two new 3TB hard drives were purchased in Dutch Harbor prior to leaving dock. It is recommended these drives remain available for 2019 POWER Cruise.

A spare SD card capable of containing 64 gigabytes (GB) of data was also purchased prior leaving Dutch Harbor. There now are 2x 32GB SD cards, and 1x 64 GB to be utilised for photographic data collection. It was found to be more than adequate storage for the 2018 cruise, particularly when combined with daily back up of photographs, allowing for nightly deletions of photos on the cameras' SD cards in preparation for photo-ID data collection the following day.

10. CONCLUSIONS

The 9th annual IWC-POWER cruise was successfully conducted using the Japanese R/V *Yushin-Maru No.2* under approved international status. Dutch Harbor was used for shipping, refuelling and boarding international researchers. The inclusion of acoustic data collection was successfully conducted and detected numerous marine mammal species, in addition to localizing on 2 of the 3 North Pacific right whale sightings. All equipment and survey methods were consistent with previous IWC international cetacean sighting surveys. Sighting procedures were in accordance with guidelines agreed upon by the SC (IWC, 2012c). Survey objectives, methods and procedures were discussed and agreed upon by the Captain, officers, crew and international researchers prior to survey operations. Throughout the cruise, all participants worked collaboratively to meet overall research objectives. Data collected, including sighting records, photographic, video data, acoustic and biopsy samples have been submitted to the IWC secretariat by the cruise leader and confirmed on 5 December 2018. The 9th cruise of this programme provides critical information on the distribution, abundance and stock structure of baleen whale species, in particular gray and North Pacific right whales, in a poorly-known and logistically difficult area. Additional information on other cetacean species, in particular fin, humpback and sperm whales, found to be widely distributed in the southern part of the research area will contribute to an improved understanding of species/population movements in areas of the North Pacific where there has been little to no survey effort in recent decades. These results contribute to the objectives of the IWC/SC.

ACKNOWLEDGEMENTS

We acknowledge the Governments of the US and Japan (Fisheries Agency of Japan) for their assistance in the research permit and funding for this cruise and also Greg Donovan and Secretariat of the IWC for their support and funding for this cruise. We also acknowledge the steering group of this cruise (Hidehiro Kato, John Bannister, Robert Brownell, Phillip Clapham, Paul Ensor, Hyun Woo Kim, Tomio Miyashita, Hiroto Murase, Luis Pastene, Paul Wade, Allex Zervini and Kirill A. Zharikov), the Technical advisory group of this cruise (Debra Palka, Toshihide Kitakado, Sharon Hedley, Mark Bravington, and Natalie Kelly) and the staff of the Institute of Cetacean Research (Tokyo) and Kyodo Senpaku Co. LTD., for their arrangements and support for this cruise, especially in acquiring an international license of the vessel. We also thank the crew of the R/V *Yushin-Maru No.2* for their hard work and dedication. Alaskan fisheries Science Center provided acoustic equipment and port arrangement at Dutch Harbor. Thank you to Amy Kennedy (NOAA/NMFS/AFSC/MML) for matching the North Pacific right whale images to the MML catalog. Hideyoshi Yoshida, the National Research Institute of Far Seas Fisheries (NRIFSF, Yokohama) arranged biopsy CITES permit issues and loaned materials for biopsy processing and storage. We thank Jessica Taylor for her assistance in quick response times to giving guidance on processing photographic data. We also thank Theresa Yost (Naval Operational Logistics Support Center), Jeffrey Leonhard, Todd Mequet, Edward Rainey, and Edgar Brown (Naval Surface Warfare Center, Crane Division), and Anurag Kumar and Dr. Robert Gisiner (Living Marine Resources Program Manager, NAVFAC EXWC) for providing sonobuoys.

REFERENCE

Anon. 2018a. 2018 IWC/POWER Cruise, Information for Researchers. 55pp. Available from the IWC Secretariat.

Anon. 2018b. Report of the pre-cruise meeting for the 2018 IWC-POWER Cruise. 6pp. Available from the IWC Secretariat.

Anon. 2018c. IWC's IDCR/SOWER and POWER cruise Photographic Database Manual. 21pp. Available from the IWC Secretariat.

Crance, J.L., Berchok, C.L., Wright, D.L., Brewer, A.M. and Woodrich, D.F. Song production by the eastern North Pacific right whale, *Eubalaena japonica. J. Acoust. Soc. Amer.*, in review.

Crance, J.L., Matsuoka, K., Taylor, J.K. and Clapham, P.J. 2018. POWERful cruise results: Finding the world's rarest whale. Poster presentation at Alaska Marine Science Symposium. 22-26 January, 2018.

Institute of Cetacean Research, 2013. The Outline of the ICR Accurate information System (ICRAS). 13pp. Available from the IWC Secretariat.

IWC. 2012a. Report of the Intersessional Meeting on the North Pacific Survey Programme. Tokyo 27-28 September 2009. *J. Cetacean Res. Manage.* (Suppl.) 12:413-420.

IWC. 2012b. Report of the Workshop on Planning for an IWC Co-ordinated North Pacific Research Programme. Tokyo 28 September -1st October 2010. *J. Cetacean Res. Manage.* (Suppl.) 13:371-391.

IWC. 2012c. Requirements and Guidelines for Conducting Surveys and Analysing Data within the Revised Management Scheme. *J. Cetacean Res. Manage*. 13 (Suppl.):507-18

IWC. 2013. Report of the Technical Advisory Group (TAG) meeting on the short and medium term objectives and plans for the IWC-POWER cruises. Tokyo 26-28 September 2011. *J. Cetacean Res. Manage.* (Suppl.) 14:341-356.

IWC. 2014. Report of the Planning Meeting for the 2013 IWC-POWER Cruise. Tokyo 25-26 October 2012. *J. Cetacean Res. Manage.* (*Suppl.*) 15:425-435.

IWC. 2016a. Report of the meeting of the IWC-POWER Technical Advisory Group (TAG). *J. Cetacean Res. Manage.* (*Suppl.*) 17:443-458. 16pp.

IWC. 2016b. Report of the Planning Meeting for the 2014 IWC-POWER Cruise in the North Pacific, *J. Cetacean Res. Manage.* (Suppl.) 17:459-470. 12pp.

IWC. 2017a. Report of the meeting of the IWC-POWER Technical Advisory Group (TAG). *J. Cetacean Res. Manage.* (Suppl.) 18:461-475.

IWC. 2017b. Report of the Planning Meeting for the 2016 IWC-POWER Cruise in the North Pacific, *J. Cetacean Res. Manage.* (Suppl.) 18:477-488.

IWC. 2018a. Report of the Planning Meeting for the 2017 IWC-POWER Cruise in the North Pacific with Initial Discussions for the 2018 and 2019 cruises. *J. Cetacean Res. Manage.* (Suppl.) 19:493-506.

IWC. 2018b. Report of the Planning Meeting for the 2018 and 2019 IWC-POWER Cruises in the North Pacific, SC/67B/Rep04.27pp. (unpublished).

Kato, H., An, Y.R, Bravington, M., Brownell, B., Clapham, P., Donovan, G., Ensor, P., Matsuoka, K., Miyashita, Murase, and Walløe. 2011. Research plan for the 2012 IWC / Japan Joint Cetacean Sighting Survey Cruise in the North Pacific. SC/63/O7. 12pp.

Matsuoka, K, Hakala, S., Kim, H.W., Aki, M. and Shinyasiki, Y., 2011. 2010 IWC/Japan Joint Cetacean Sighting Survey Cruise in the North Pacific. Paper SC/63/O5 presented to the 63rd IWC Scientific Committee, June 2011 (unpublished). 40pp.

Matsuoka, K., Taylor, J.,Yoshimura, I., Crance, J., and Kasai, H., 2018. Cruise report of the 2017 IWC-Pacific Ocean Whale and Ecosystem Research (IWC-POWER). Paper SC/67B/ASI/12 presented to the 67b-th IWC Scientific Committee, May 2018 (unpublished). 47pp.

NOAA, 2016. Critical habitat for the North Pacific Right Whale. United States Coast Pilot (USCP) No.9. Pacific and Arctic Coasts Alaska: Cape Spencer to Beaufort Sea. 34th Edition. Pp 96-100.

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

TABLES AND FIGURES

Table 1a. The 2018 cruise itinerary. Area code and no. of trackline were used for the effort record for this cruise.

Date (GMT) y/m/d	Time (GMT)	Date (SMT) y/m/d	Time (SMT)	Area code	Ttack Line	Leg No	Position		Remark
2018/7/3	0:00	2018/7/3	9:00	-	-	-	-	-	Departed Shiogama Japan
2018/7/3	16:00	2018/7/4	1:00	-	-	-	39° 16.8′N	145° 12.8′E	Adjusted ship's Time, repeated date of 3rd July
2018/7/3	20:00	2018/7/3	6:00	1	1	001	39° 36.7′N	146° 17.5′E	Started transit survey to Dutch Harbor (D.H.)
2018/7/8	5:07	2018/7/7	18:07	1	1	001	51° 18.5′N	165° 40.5′E	Russian EEZ in
2018/7/8	11:09	2018/7/8	0:19	11	1	001	51° 57.1′N	167° 05.5′E	US EEZ in, Russian EEZ out
2018/7/10	12:26	2018/7/10	2:26	11	1	001	54° 18.0′N	180° 00.0′	Crossed the meridian of 180° (Date Line)
2018/7/13	2:00	2018/7/12	18:00	11	1	001	54° 11.6′N	166° 23.9′W	Finished transit survey
2018/7/13	15:40	2018/7/13	7:40	-	-	-	-	-	Arrived D.H.
2018/7/16	21:00	2018/7/16	13:00	74	1	821	53° 52.9′N	166° 32.4′W	Departed D.H. and started transit survey from D.H. to Northern Stratum (R.A)
2018/7/22	3:00	2018/7/21	18:00	74	1	821	64° 12.1′N	168° 42.2′W	Finished transit survey from D.H. to Northern Stratum (R.A)
2018/7/22	19:38	2018/7/22	10:38	72	1	101	64° 23.3′N	168° 46.0′W	Started Northern stratum (R.A)
2018/8/11	3:22	2018/8/10	15:22	72	1	119	56° 23.0′N	176° 19.5′W	US EEZ out, Bering Sea-Doughnut Hole (High Sea) in
2018/8/11	6:30	2018/8/10	18:30	72	1	119	56° 32.7′N	177° 03.5′W	Finished Northern Stratum (R.A)
2018/8/11	20:11	2018/8/11	8:11	73	1	825	55° 27.9′N	178° 00.2′E	US EEZ in
2018/8/12	19:00	2018/8/12	6:00	73	1	201	53° 36.0′N	170° 10.2′E	Started Southern Stratum (R.A)
2018/8/16	19:02	2018/8/16	6:02	73	1	206	56° 12.3′N	174° 35.1′E	US EEZ out, Bering Sea-Doughnut Hole (High Sea) in
2018/8/22	0:22	2018/8/21	11:22	73	1	209	55° 40.7′N	176° 50.5′E	US EEZ in
2018/9/2	20:17	2018/9/2	8:17	73	1	219	55° 23.9′N	177° 07.9′W	US EEZ out, Bering Sea-Doughnut Hole (High Sea) in
2018/9/3	19:58	2018/9/3	7:58	73	1	221	56° 03.9′N	176° 08.5′W	US EEZ in
2018/9/7	4:56	2018/9/6	16:56	73	1	224	53° 46.2′N	174° 07.1′W	Finished Southern Stratum (R.A)
2018/9/7	4:56	2018/9/6	16:56	75	1	829	53° 46.2′N	174° 07.1′W	Started transit survey from Southern Stratum to D.H.
2018/9/12	2:00	2018//9/11	18:00	75	1	829	54° 45.8′N	165° 57.0′W	Finished transit survey from Southern Stratum to D.H.
2018/9/12	18:35	2018/9/12	10:35	-	-	-	-	-	Arrived D.H.
2018/9/15	21:00	2018/9/15	13:00	-	-	-	-	-	Departed D.H.
2018/9/16	9:00	2018/9/16	1:00	-	-	-	53° 54.2′N	170° 21.8′W	Adjusted ship's Time, skipped date of 16th Sep.
2018/9/16	18:10	2018/9/17	9:10	12	1	002	53° 46.6′N	173° 38.0′W	Started transit survey from D.H. to Shiogama.
2018/9/17	12:33	2018/9/18	2:33	12	1	002	53° 29.5′N	180° 00.0′	Crossed the meridian of 180° (Date Line)
2018/9/19	9:51	2018/9/19	22:51	2	1	002	50° 46.9′N	168° 07.3′E	US-EEZ out
2018/9/23	3:00	2018/9/23	12:00	2	1	2	40° 05.3′N	147° 47.1′E	Finished Transit
2018/9/25	0:00	2018/9/25	9:00	-	-	-	-	-	Arrived Shiogama Japan

Table 1b. Summary of the “Ship's Time Adjustment” Schedule during 2018 Cruise. JST: Japan time.

Date	Ah'd/Ab'k	Balance	Ship's time	Remarks
2018/7/3	-	GMT+9.0h	JST	Depart Japan
2018/7/3	Ah'd 60min	GMT-14.0h	JST-23.0h	Repeated date of 3rd July
2018/7/4	Ah'd 60min	GMT-13.0h	JST-22.0h	Transit to Dutch Harbor (D.H.)
2018/7/5	Ah'd 60min	GMT-12.0h	JST-21.0h	-
2018/7/7	Ah'd 60min	GMT-11.0h	JST-20.0h	-
2018/7/9	Ah'd 60min	GMT-10.0h	JST-19.0h	-
2018/7/11	Ah'd 60min	GMT-9.0h	JST-18.0h	-
2018/7/12	Ah'd 60min	GMT-8.0h	JST-17.0h	-
2018/7/17	Ab'k 60min	GMT-9.0h	JST-18.0h	Transit from D.H to WP101
2018/7/24	Ab'k 60min	GMT-10.0h	JST-19.0h	-
2018/7/30	Ab'k 60min	GMT-11.0h	JST-20.0h	-
2018/8/7	Ab'k 60min	GMT-12.0h	JST-21.0h	-
2018/8/12	Ab'k 60min	GMT-13.0h	JST-22.0h	-
2018/8/26	Ah'd 60min	GMT-12.0h	JST-21.0h	-
2018/9/7	Ah'd 60min	GMT-11.0h	JST-20.0h	-
2018/9/9	Ah'd 60min	GMT-10.0h	JST-19.0h	-
2018/9/10	Ah'd 60min	GMT-9.0h	JST-18.0h	-
2018/9/11	Ah'd 60min	GMT-8.0h	JST-17.0h	-
2018/9/16	Ab'k 60min	GMT+15.0h	JST+6.0h	Skipped date of 16thSeptember
2018/9/18	Ab'k 60min	GMT+14.0h	JST+5.0h	
2018/9/19	Ab'k 60min	GMT+13.0h	JST+4.0h	-
2018/9/20	Ab'k 60min	GMT+12.0h	JST+3.0h	-
2018/9/21	Ab'k 60min	GMT+11.0h	JST+2.0h	-
2018/9/22	Ab'k 60min	GMT+10.0h	JST+1.0h	-
2018/9/23	Ab'k 60min	GMT+9.0h	JST	
2018/9/25	-	GMT+9.0h	JST	Arrived Japan (Shiogama)

Table 1c. Way Points (WP) and each survey mode in the research area. The planned original cruise track line distance in the research area was 2,237.9 n.miles (Northern stratum: 994.0 n.miles, Southern stratum: 1,243.9 n.miles, respectively). Original trackline, see Figure1c.

Northern Stratum (WP No. from 101 to 120)					
WP	Latitude	Longitude	Co.	Distance	Mode
101	64°23.2'N	168°46.2'W	265°	38.4	NSP
102	64°19.8'N	170°14.3'W	265°	38.4	IO
103	64°16.4'N	171°42.3'W	169°	30.0	NSP
104	63°24.1'N	171°18.7'W	169°	45.4	IO
105	62°31.7'N	170°55.7'W	169°	53.4	NSP
106	61°39.4'N	170°33.5'W	169°	53.5	IO
107	60°47.0'N	170°11.8'W	277°	56.1	NSP
108	60°54.1'N	172°06.0'W	277°	56.2	IO
109	61°01.2'N	174°00.6'W	277°	56.1	NSP
110	61°08.3'N	175°55.4'W	277°	56.1	IO
111	61°15.4'N	177°50.6'W	-	-	-
112	61°15.3'N	177°50.5'W	156°	60.6	NSP
113	60°20.1'N	176°59.8'W	156°	60.7	IO
114	59°24.7'N	176°10.4'W	156°	60.6	NSP
115	58°29.5'N	175°22.5'W	156°	60.6	IO
116	57°34.2'N	174°35.7'W	156°	60.6	NSP
117	56°39.0'N	173°50.2'W	156°	60.6	IO
118	55°43.7'N	173°05.7'W	290°	73.3	NSP
119	56°08.7'N	175°08.5'W	290°	73.4	IO
120	56°33.6'N	177°12.7'W	-	-	-

Southern Stratum (WP No. from 201 to 225)					
WP	Latitude	Longitude	Co.	Distance	Mode
201	53°36.0'N	170°10.2'E	127°	28.7	NSP
202	53°18.6'N	170°48.4'E	127°	28.6	IO
203	53°01.2'N	171°26.3'E	-	-	-
204	52°59.2'N	171°45.7'E	027°	73.8	NSP
205	54°05.0'N	172°42.0'E	027°	73.8	IO
206	55°10.8'N	173°39.8'E	027°	73.8	NSP
207	56°16.5'N	174°39.2'E	027°	73.8	IO
208	57°22.2'N	175°40.3'E	159°	64.8	NSP
209	56°21.7'N	176°22.6'E	159°	64.8	IO
210	55°21.2'N	177°03.7'E	159°	64.8	NSP
211	54°20.6'N	177°43.9'E	159°	64.8	IO
212	53°20.1'N	178°23.0'E	159°	64.9	NSP
213	52°19.5'N	179°01.3'E	159°	64.8	IO
214	51°18.9'N	179°38.7'E	-	-	-
215	51°18.9'N	179°39.5'E	025°	55.2	NSP
216	52°08.9'N	179°42.7'W	025°	55.2	IO
217	52°58.9'N	179°04.2'W	025°	55.2	NSP
218	53°48.8'N	178°24.9'W	025°	55.2	IO
219	54°38.8'N	177°44.9'W	025°	55.3	NSP
220	55°28.9'N	177°03.9'W	025°	55.2	IO
221	56°18.8'N	176°22.2'W	153°	42.8	NSP
222	55°40.7'N	175°47.6'W	153°	42.8	IO
223	55°02.5'N	175°13.5'W	153°	42.8	NSP
224	54°24.4'N	174°40.0'W	153°	42.8	IO
225	53°46.2'N	174°07.0'W	-	-	-

Table 1d. List of area code and leg number code used for the effort record during 2018 cruise.

Area Code	Definition
1	Transit survey from Shiogama to Dutch Harbor (D.H.) (High Sea)
11	Transit survey from Shiogama to D.H. (US-EEZ)
72	Northern Stratum of Research area (original track line WP101-WP120)
73	Southern Stratum of Research area (original track line WP201-WP225)
74	Transit survey from D.H. to Northern stratum, Leg 821-828
75	Transit survey from Southern stratum to D.H., Leg 829
12	Transit survey from Dutch Harbor to Shiogama (US EEZ)
2	Transit survey from Dutch Harbor to Shiogama (High Sea)

Leg.No	Definition
821	Transit survey from Dutch Harbor to Northern stratum (WP101)
101-119	Northern stratum (original track line)
201-224	Southern stratum (original track line)
822	Off-effort steaming from Leg 102 to Leg103
823	Transit survey to avoid St.Lawrence Is.
824	Off-effort steaming from Leg 110 to Leg 112
825	Off-effort steaming from WP 120 to WP 201
826	Off-effort steaming from WP 203 to WP 204
827	Off-effort steaming from Leg 208 to Leg 209
828	Off-effort steaming from WP214 to WP215
829	Transit survey from Southern stratum (WP225) to D.H.

Table 1e. Summary of the searching effort (time and distance) and experimental time (hours) by each survey with the area code conducted during 2018 Cruise.

Area	Area Code	Leg No.	Start	End	NSP		IO		NSP+IO		Photo-ID, Biopsy	Estimated angle and distance training / experiment
		Start	Date	Date	Time	Dist.	Time	Dist.	Time	Dist.	Time	Time
		End	Time	Time		(n.m.)		(n.m.)		(n.m.)		
Shiogama to Dutch Harbor (D.H.)	1	001	3-Jul.	7-Jul.	3:15:06	33.87	0:00:00	0.00	3:15:06	33.87	1:23:05	0:00:00
	High Sea	-	6:00	18:00								
Shiogama to D.H.	11	001	8-Jul.	12-Jul.	5:31:59	56.00	0:00:00	0.00	5:31:59	56.00	0:00:00	0:00:00
	US-EEZ	-	6:35	18:00								
D.H. to R.A (Leg 821)	74	821	16-Jul.	22-Jul.	27:43:22	331.68	0:00:00	0.00	27:43:22	331.68	2:08:07	3:27:36
	US-EEZ		13:00	10:38								
Northern stratum (Leg 101-119)	72	101	22-Jul.	10-Aug.	26:35:24	310.55	27:24:09	322.21	53:59:33	632.76	12:16:24	5:18:18
	US-EEZ	119	10:38	15:22								
Northern stratum (Leg 823)	72	823	26-Jul.	26-Jul.	4:56:05	58.62	0:00:00	0.00	4:56:05	58.62	0:00:00	0:00:00
	US-EEZ	-	11:39	17:21								
Northern stratum (Leg 119)	72	119	10-Aug.	10-Aug.	0:00:00	0.00	1:25:29	17.14	1:25:29	17.14	0:00:00	0:00:00
	High Sea	-	15:22	18:30								
Southern stratum (Leg 825)	73	825	11-Aug.	11-Aug.	0:00:00	0.00	0:00:00	0.00	0:00:00	0.00	0:00:00	0:00:00
	High Sea	-	6:00	8:11								
Southern stratum (Leg 825)	73	825	11-Aug.	11-Aug.	0:00:00	0.00	0:00:00	0.00	0:00:00	0.00	0:00:00	0:00:00
	US-EEZ	-	8:11	18:00								
Southern stratum (Leg 201- 206)	73	201	12-Aug.	16-Aug.	12:00:35	143.88	7:34:09	90.58	19:34:44	234.46	9:05:30	0:00:00
	US-EEZ	206	6:00	6:02								
Southern stratum (Leg 206- 209)	73	206	16-Aug.	21-Aug.	4:55:10	57.83	8:35:18	101.39	13:30:28	159.22	5:35:55	0:00:00
	High Sea	209	6:02	11:22								
Southern stratum (Leg 209- 219)	73	209	21-Aug.	2-Sep.	22:11:55	265.20	18:44:41	224.05	40:56:36	489.25	14:06:02	0:00:00
	US-EEZ	219	11:22	8:17								
Southern stratum (Leg 219- 221)	73	219	2-Sep.	3-Sep.	1:31:55	18.28	2:34:18	30.97	4:06:13	49.25	4:09:56	0:00:00
	High Sea	221	8:17	7:58								
Southern stratum (Leg 221- 224)	73	221	3-Sep.	6-Sep.	4:23:21	52.88	4:12:00	50.54	8:35:21	103.42	1:32:17	0:00:00
	US-EEZ	224	7:58	16:56								
R.A to D.H. (Leg 829)	75	829	6-Sep.	11-Sep.	17:03:52	204.73	0:00:00	0.00	17:03:52	204.73	1:26:01	0:00:00
	US-EEZ	-	16:56	18:00								
D.H. to Shiogama	12	002	17-Sep.	19-Sep.	0:00:00	0.00	0:00:00	0.00	0:00:00	0.00	0:00:00	0:00:00
	US-EEZ	-	9:10	18:00								
D.H. to Shiogama	2	002	20-Sep.	23-Sep.	8:25:32	100.41	0:00:00	0.00	8:25:32	100.41	4:24:46	0:00:00
	High Sea	-	7:40	12:00								
Total			3-Jul.	23-Sep.	138:34:16	1,633.93	70:30:04	836.88	209:04:20	2,470.81	56:08:03	8:45:54
			6:00	12:00								

Table 2a. Number of sightings for all species observed in the research area (Original trackline and transit tracklines) by effort mode. NSP: Normal Passing with abeam closing Mode; IO: Independent Observer Mode (IO), OE: Top down (TD) and drifting (DR). Numbers of Individuals includes the number of calves.

Species	NSP			IO			OE			Total		
	Sch.	Ind.	Calf	Sch.	Ind.	Calf	Sch.	Ind.	Calf	Sch.	Ind.	Calf
Fin whale	50	79	0	67	88	3	3	5	0	120	172	3
Like fin	7	7	0	11	13	0	0	0	0	18	20	0
Common minke whale	10	10	0	5	5	0	1	1	0	16	16	0
Like minke	1	1	0	1	1	0	0	0	0	2	2	0
Humpback whale	68	99	1	16	21	0	1	1	0	85	121	1
Like humpback	3	3	0	0	0	0	0	0	0	3	3	0
North pacific right whale	2	2	0	1	1	0	0	0	0	3	3	0
Gray whale	24	83	0	2	3	0	1	2	0	27	88	0
Like gray	1	4	0	0	0	0	0	0	0	1	4	0
Sperm whale	4	4	0	22	23	0	0	0	0	26	27	0
Like sperm	0	0	0	1	1	0	0	0	0	1	1	0
Baird's beaked whale	2	24	0	0	0	0	0	0	0	2	24	0
Killer whale	4	36	2	13	69	2	1	5	0	18	110	4
Habour porpoise	1	2	0	0	0	0	0	0	0	1	2	0
Dalli type Dall's porpoise	30	104	4	28	154	6	0	0	0	58	258	10
Unid. type Dall's porpoise	2	4	0	4	11	0	0	0	0	6	15	0
Unid. large baleen whale	1	4	0	1	1	0	0	0	0	2	5	0
Unid. dolphin	1	3	0	0	0	0	0	0	0	1	3	0
Unid. cetacean	1	1	0	3	3	0	0	0	0	4	4	0

Table 2b. Number of sightings for all species observed during the entire 2018 cruise. Numbers of Individuals includes number of calves.

Species	Transit to Dutch Harbor (D.H.), (High-Sea, area code 1)			Transit to D.H. (US EEZ, area code 11)			Transit from D.H. to Northern stratum (US EEZ, area code 74, leg 821)			Northen Stratum (US EEZ, area code 72)			Northen Stratum (High Sea (Bering Sea Doughnut Hole), area code 72)			Southern stratum (US EEZ, area codes 73)			Southern stratum (High Sea (Bering Sea Doughnut Hole), area codes 73)			Transit from Southern stratum to D.H. (US EEZ, area codes 75)			Transit to Shiogama (US EEZ, area code 12)			Transit to Shiogama (High Sea, area code 2)			Total		
	Sch.	Ind.	Calf	Sch.	Ind.	Calf	Sch.	Ind.	Calf	Sch.	Ind.	Calf	Sch.	Ind.	Calf	Sch.	Ind.	Calf	Sch.	Ind.	Calf	Sch.	Ind.	Calf	Sch.	Ind.	Calf	Sch.	Ind.	Calf	Sch.	Ind.	Calf
Blue whale	4	7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	5	0	8	12	1
Fin whale	0	0	0	12	22	0	13	21	0	33	55	0	7	9	1	44	55	2	23	32	0	0	0	0	0	0	0	3	5	0	135	199	3
Like fin	0	0	0	1	2	0	2	2	0	6	8	0	2	2	0	5	5	0	2	2	0	1	1	0	0	0	0	0	0	0	19	22	0
Sei whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	7	0	5	7	0
Like sei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	2	2	0
Common minke whale	1	1	0	0	0	0	0	0	0	11	11	0	0	0	0	2	2	0	3	3	0	0	0	0	0	0	0	0	0	0	17	17	0
Like minke	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0
Humpback whale	1	1	0	0	0	0	23	39	0	3	3	0	0	0	0	38	58	1	14	14	0	7	7	0	0	0	0	0	0	0	86	122	1
Like humpback	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	1	1	0	0	0	0	0	0	0	0	0	0	3	3	0
North Pacific Right whale	0	0	0	0	0	0	2	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0
Gray whale	0	0	0	0	0	0	1	2	0	26	86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27	88	0
Like gray	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0
Sperm whale	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	25	26	0	0	0	0	0	0	0	0	0	0	9	9	0	35	36	0
Like sperm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
Baird's beaked whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	24	0	0	0	0	0	0	0	0	0	0	0	0	0	2	24	0
Killer whale	1	1	0	0	0	0	0	0	0	5	27	2	0	0	0	12	80	2	1	3	0	0	0	0	0	0	0	1	25	3	20	136	7
Harbour porpoise	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0
Dalli type Dall's porpoise	0	0	0	0	0	0	1	3	0	6	19	0	0	0	0	41	199	7	9	34	3	1	3	0	0	0	0	1	8	0	59	266	10
Unid.type Dall's porpoise	0	0	0	2	3	0	1	2	0	2	5	0	0	0	0	3	8	0	0	0	0	0	0	0	0	0	0	0	0	0	8	18	0
Unid. large baleen whale	1	1	0	0	0	0	0	0	0	1	4	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	6	0
Unid. small cetacean	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unid. dolphin	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0
Unid. cetacean	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	0
Total	**8**	**11**	**1**	**15**	**27**	**0**	**43**	**71**	**0**	**101**	**232**	**2**	**9**	**11**	**1**	**179**	**464**	**12**	**53**	**89**	**3**	**9**	**11**	**0**	**0**	**0**	**0**	**25**	**61**	**3**	**442**	**977**	**22**

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

Species	Number of all schools sighted made by TOP & IOP	Number of schools made by IOP	Duplicate Status			
			D	P	R	N
Fin whale	97	45	34	0	0	11
Like fin	12	7	2	0	0	5
Humpback whale	26	12	10	0	0	2
Common minke whale	4	1	0	0	0	1
North Pacific right whale	1	0	0	0	0	0
Gray whale	4	2	2	0	0	0
Sperm whale	35	20	14	0	0	6
Killer whale	21	10	9	0	0	1

Table 3. Minimum, maximum and range of sea surface temperatures in degrees Celsius for each species sighted during the research area (original trackline). Also noted are the number of sightings for each species. Range of 25th to 75th quartiles are presented for our most frequently encountered cetaceans.

Species	Number of sightings	Minimum SST	Maximum SST	Temperature range	25th to 75th Quartile
Fin whale	120	8.0	12.4	4.4	9.5-9.9
Common minke whale	16	6.4	12.0	5.6	8.2-10.2
Humpback whale	78	6.1	13.1	7.0	9.6-11.8
North Pacific right whale	3	8.9	9.7	0.8	9.3-9.7
Gray whale	27	5.8	9.4	3.6	7.1-8.5
Sperm whale	26	7.8	11.7	3.9	8.3-11.5
Baird's beaked whale	2	10.6	10.6	0.0	10.6-10.6
Killer whale	18	7.9	12.2	4.3	9.2-11.5
Dalli type Dall's porpoise	57	7.1	12.7	5.6	9.4-10.7

Table 4a. Summary of the number of Photo-ID'd individuals by each species.

Photo-ID	Blue	Fin	Humpback	N.P Right	Gray	Killer	Sperm	Total
Transit from Japan to Dutch Harbor (D.H.) (High Sea, area code 1)	3	0	0	0	0	0	0	3
Transit from Japan to D.H. (All US-EEZ, area code 11)	0	1	0	0	0	0	0	1
Transit from D.H. to Northern Stratum (All US-EEZ, area code 74)	0	0	2	2	0	0	0	4
Northern Stratum (US-EEZ, area code 72)	0	23	2	1	41	1	1	69
Northern Stratum (High Sea, area code 72)	0	1	0	0	0	0	0	1
Southern Stratum (US-EEZ, area code 73)	0	26	27	0	0	12	2	67
Southern Stratum (High Sea, area code 73)	0	15	6	0	0	3	0	24
Transit from Southern Stratum to D.H. (All US-EEZ, area code 75)	0	0	2	0	0	0	0	2
Transit from D.H. to Japan (All US-EEZ, area code 12)	0	0	0	0	0	0	0	0
Transit from D.H. to Japan (High Sea, area code 2)	5	3	0	0	0	17	1	26
Sub-total (US-EEZ)	**0**	**50**	**33**	**3**	**41**	**13**	**3**	**143**
Sub-total (High Sea)	**8**	**19**	**6**	**0**	**0**	**20**	**1**	**54**
Total	**8**	**69**	**39**	**3**	**41**	**33**	**4**	**197**

Table 4b. Summary of the number of biopsy samples collected by each species.

Biopsy samples	Blue*	Fin**	Humpback	N.P Right	Gray	Killer	Total
Transit from Japan to Dutch Harbor (High Sea, area code 1)	3	0	0	0	0	0	3
Transit from Dutch Harbor to Northern Stratum (All US-EEZ, area code 74)	0	0	0	2	0	0	2
Northern Stratum (US-EEZ, area code 72)	0	9	2	1	7	4	23
Northern Stratum (High Sea, area code 72)	0	0	0	0	0	0	0
Southern Stratum (US-EEZ, area code 73)	0	8	22	0	0	1	31
Southern Stratum (High Sea, area code 73)	0	5	5	0	0	1	11
Transit from Southern Stratum to Dutch Harbor (All US-EEZ, area code 75)	0	0	0	0	0	0	0
Transit from Dutch Harbor to Japan (High Sea, area code 2)	3	2	0	0	0	1	6
Sub-total (US-EEZ)	**0**	**17**	**24**	**3**	**7**	**5**	**56**
Sub-total (High Sea)	**6**	**7**	**5**	**0**	**0**	**2**	**20**
Total	**6**	**24**	**29**	**3**	**7**	**7**	**76**

Blue* Including one mother and calf pair.

Fin** Including one mother and calf pair (sampled at Southern Stratum of US-EEZ).

Table 4c. Summary of North Pacific right whale sightings, photography and biopsy effort during the cruise.

N.P. right	Total Sightings		Ind.	Sch. Photo-graphed	Ind. Photo-graphed	Ind. Photo-ID'd
	Sch.	ind.	Biopsy			
Transit from Shiogama to Dutch Harbor (High Sea)	0	0	0	0	0	0
Transit from Shiogama to D.H. (US-EEZ)	0	0	0	0	0	0
Transit from D.H to northern stratum (All US-EEZ)	2	2	2	2	2	2
Northern stratum (US-EEZ)	1	1	1	1	1	1
Northern stratum (High Sea)	0	0	0	0	0	0
Southern stratum (US-EEZ)	0	0	0	0	0	0
Southern stratum (High Sea)	0	0	0	0	0	0
Transit from southern stratum to D.H (All US-EEZ)	0	0	0	0	0	0
Transit from D.H to Shiogama (US-EEZ)	0	0	0	0	0	0
Transit from D.H. to Shiogama (High Sea)	0	0	0	0	0	0
Total	**3**	**3**	**3**	**3**	**3**	**3**

Table 4d. Summary of gray whale sightings, photography (unique individuals) and biopsy effort during the cruise.

Gray whale	Total Sightings		Ind.	Sch. Photo-graphed	Ind. Photo-graphed	Ind. Photo-ID'd
	Sch.	ind.	Biopsy			
Transit from Shiogama to Dutch Harbor (High Sea)	0	0	0	0	0	0
Transit from Shiogama to D.H. (US-EEZ)	0	0	0	0	0	0
Transit from D.H to northern stratum (All US-EEZ)	1	2	0	0	0	0
Northern stratum (US-EEZ)	26	86	7	13	49	41
Northern stratum (High Sea)	0	0	0	0	0	0
Southern stratum (US-EEZ)	0	0	0	0	0	0
Southern stratum (High Sea)	0	0	0	0	0	0
Transit from southern stratum to D.H (All US-EEZ)	0	0	0	0	0	0
Transit from D.H to Shiogama (US-EEZ)	0	0	0	0	0	0
Transit from D.H. to Shiogama (High Sea)	0	0	0	0	0	0
Total	**27**	**88**	**7**	**13**	**49**	**41**

Table 4e. Summary of humpback whale sightings, photography and biopsy effort during the cruise (see table 5c for detailed sighting summary). *Includes one mother/calf pair

Humpback whale	Total Sightings		Ind.	Sch. Photo-graphed	Ind. Photo-graphed	Ind. Photo-ID'd
	Sch.	ind.	Biopsy			
Transit from Shiogama to Dutch Harbor (High Sea)	1	1	0	0	0	0
Transit from Shiogama to D.H. (US-EEZ)	0	0	0	0	0	0
Transit from D.H to northern stratum (All US-EEZ)	23	39	0	4	6	2
Northern stratum (US-EEZ)	3	3	2	2	2	2
Northern stratum (High Sea)	0	0	0	0	0	0
Southern stratum (US-EEZ)	38	58	22	26	38	27
Southern stratum (High Sea)	14	14	5	6	6	6
Transit from southern stratum to D.H (All US-EEZ)	7	7	0	2	2	2
Transit from D.H to Shiogama (US-EEZ)	0	0	0	0	0	0
Transit from D.H. to Shiogama (High Sea)	0	0	0	0	0	0
Total	**86**	**122**	**29**	**40**	**54**	**39**

Table 4f. Summary of blue whale sightings, photography and biopsy effort during the cruise.

Blue whale	Total Sightings		Ind.	Sch. Photo-graphed	Ind. Photo-graphed	Ind. Photo-ID'd
	Sch.	ind.	Biopsy			
Transit from Shiogama to Dutch Harbor (High Sea)	4	7	3	3	3	3
Transit from Shiogama to D.H. (US-EEZ)	0	0	0	0	0	0
Transit from D.H to northern stratum (All US-EEZ)	0	0	0	0	0	0
Northern stratum (US-EEZ)	0	0	0	0	0	0
Northern stratum (High Sea)	0	0	0	0	0	0
Southern stratum (US-EEZ)	0	0	0	0	0	0
Southern stratum (High Sea)	0	0	0	0	0	0
Transit from southern stratum to D.H (All US-EEZ)	0	0	0	0	0	0
Transit from D.H to Shiogama (US-EEZ)	0	0	0	0	0	0
Transit from D.H. to Shiogama (High Sea)	4	5	3	4	5	5
Total	**8**	**12**	**6**	**7**	**8**	**8**

Table 4g. Summary of fin whale sightings, photography and biopsy effort during the cruise

Fin whale	Total Sightings		Ind.	Sch. Photo-graphed	Ind. Photo-graphed	Ind. Photo-ID'd
	Sch.	ind.	Biopsy			
Transit from Shiogama to Dutch Harbor (High Sea)	0	0	0	0	0	0
Transit from Shiogama to D.H. (US-EEZ)	12	22	0	1	1	1
Transit from D.H to northern stratum (All US-EEZ)	13	21	0	1	1	0
Northern stratum (US-EEZ)	33	55	9	17	26	23
Northern stratum (High Sea)	7	9	0	1	3	1
Southern stratum (US-EEZ)	44	55	8	22	27	26
Southern stratum (High Sea)	23	32	5	11	15	15
Transit from southern stratum to D.H (All US-EEZ)	0	0	0	0	0	0
Transit from D.H to Shiogama (US-EEZ)	0	0	0	0	0	0
Transit from D.H. to Shiogama (High Sea)	3	5	2	2	3	3
Total	**135**	**199**	**24**	**55**	**76**	**69**

Table 4h. Summary of killer whale sightings, photography and biopsy effort during the cruise.

Killer whale	Total Sightings		Ind.	Sch. Photo-graphed	Ind. Photo-graphed	Ind. Photo-ID'd
	Sch.	ind.	Biopsy			
Transit from Shiogama to Dutch Harbor (High Sea)	1	1	0	0	0	0
Transit from Shiogama to D.H. (US-EEZ)	0	0	0	0	0	0
Transit from D.H to northern stratum (All US-EEZ)	0	0	0	0	0	0
Northern stratum (US-EEZ)	5	27	4	2	1	1
Northern stratum (High Sea)	0	0	0	0	0	0
Southern stratum (US-EEZ)	12	80	1	4	15	12
Southern stratum (High Sea)	1	3	1	1	3	3
Transit from southern stratum to D.H (All US-EEZ)	0	0	0	0	0	0
Transit from D.H to Shiogama (US-EEZ)	0	0	0	0	0	0
Transit from D.H. to Shiogama (High Sea)	1	25	1	1	20	17
Total	**20**	**136**	**7**	**8**	**39**	**33**

Table 4i. Summary of Photographed Sightings with Photo-ID results for Individuals, and Biopsy results for Sightings. Primary ID features are main, species-specific identification characteristics. Secondary ID features, and features in brackets, are useful but not enough alone for identification. Body part codes: FL = Flukes, LD = Left dorsal fin, RD = Right dorsal fin, LL = Left lateral, RL = Right lateral, HD = Head, DM = Distinctive marking, OT = Other (e.g., ped = peduncle, PBH = post blowhole callosity). View direction codes: D = Dorsal, V = Ventral, L = Left, R = Right. Body part codes always precede view direction codes. ID Form No = natural marking datasheet form number. BY Form No = Biopsy datasheet form number. S/No = Biopsy sample number is concatenated: Year (18) | Species code (e.g., Gray whale 01) | Boat code (1) | Serial number (consecutive number for all samples throughout the cruise starting at 001). If S/No is N/A no biopsy attempt was made. If S/No is 'No Sample' a biopsy attempt was made; i.e., shooters were on standby, but no sample was collected (shots may or may not have been fired). Biopsy sampling encounter duration was calculated using effort code "BX" (on standby with equipment) and "EX" (darts collected time).

Survey Date (D/M/Y)	Sighting Number	Species	School Size	Photographed	Photo Identified	Letters of ID'd	Results of Primary ID features	Results of Secondary ID features	Biopsied	Letter of Biopsied	ID Form Number	BY Form Number	S/No	Encounter Duration (min)	Photo-ID Notes e.g. Behavs, Assocs, Reaction to dart, Unusual
06/07/2018	001	Blue whale	2	1	1	A	LD,RD,HD	DM: Diatom	1	B	ID001	BY001	18061001	45	Diatoms on the back
06/07/2018	005	Blue whale	2	2	2	A	LD,RD,HD	DM: DF damage	2	A, B	ID002	BY002	18061002(A) + 18061003(B)	38	Mother (A), Lack of dorsal fin, Estimated body length: 27.3 meters.
						B	LD,RD,HD	N/A							Calf (B), 13.1 meters
10/07/2018	004	Fin whale	3	1	1	A	RD	HDR, OT: Chevron Blaze	0	N/A	ID003	N/A	N/A	0	Red feces, Whale letter A: 17.2m
18/07/2018	022	NP right whale	1	1	1	A	HDL (HDR)	OT: PBH	1	A	ID004	BY003	18081004	86	Matched to MML 25, sex determined to be male. Red feces, Feeding (filtering water from closed mouth after dives). Water depth: 63m, video taken.
18/07/2018	023	NP right whale	1	1	1	A	HDR, HD	OT: PBH, upturned FL	1	A	ID005	BY004	18081005	43	Confirmed new animal, sex determined to be male. Water depth: 60m, video taken.
18/07/2018	025	Fin Whale	1	1	0	N/A	N/A	N/A	0	N/A	N/A	N/A	N/A		Secondary sighting during sight#023
19/07/2018	001	Humpback whale	1	1	0	A	N/A	LD	0	N/A	ID006	N/A	N/A	0	Opportunistic photos. Fluke up, Water depth: 50 m. White on dorsal.
19/07/2018	003	Humpback whale	4	3	1	A	N/A	LD	0	N/A	ID007	N/A	N/A	0	Red feces from whale B. Opportunistic photos. Water depth: 58 m.
						B	N/A	LD							
						C	FLV	LD							
19/07/2018	010	Humpback whale	1	1	1	A	FLV	(FLD)	0	N/A	ID008	N/A	N/A	0	Opportunistic photos Fluke slapping Water depth: 61 m.
21/07/2018	002	Humpback whale	2	1	0	A	N/A	(RD)	0	N/A	ID009	N/A	N/A	0	Opportunistic photos. Water depth: 35 m.
22/07/2018	002	Gray whale	2	1	1	A	RL	N/A	0	N/A	ID010	N/A	N/A	0	Feeding, mud expelled from mouth at surface Defecation, brown feces (unphoto'd) Photo for 12.1m (Whale letter A) Water depth: 41m
22/07/2018	003	Gray whale	2	2	2	A	LL, RL, FLD, FLV	N/A	2	A,B	ID011	BY005	18011006(A) + 18011007(B)	59	Feeding: mud expelled from mouth of animal A on surfacing A and B not associated. A: 12.7m B:12.3m Water depth: 42m
						B	RL, FLD, FLV	OT: ped L							

Survey Date (D/M/Y)	Sighting Number	Species	School Size	Photographed	Photo Identified	Letters of IDd	Results of Primary ID features	Results of Secondary ID features	Biopsied	Letter of Biopsied	ID Form Number	BY Form Number	S/No	Encounter Duration (min)	Photo-ID Notes e.g. Behavs, Assocs, Reaction to dart, Unusual
22/07/2018	005	Humpback whale	1	1	1	A	(FLV)	LD, RD, FLD	1	A	ID012	BY006	18071008	28	2 broken darts Low fluking dives, fluke breach A:12.1m, Water depth: 42m
24/07/2018	001	Gray whale	2	2	2	A	RL,LL,FLV, FLD	HDL	0	N/A	ID013	BY007	No sample	67	A & B associated, Protrusions near shoulders on both animals No chance to shoot Water depth: 38m
						B	RL,LL,FLV, FLD	HDl, HDR							
24/07/2018	003	Gray whale	1	1	1	A	FLV	DM: missing FL tip	1	N/A	ID014	BY008	18011009	24	Mud in water when animal surfaces 12.7m Water depth: 39m
25/07/2018	002	Gray whale	2	1	1	A	RL,FLV, FLD, (LL)	N/A	0	A	ID015	BY009	No Sample	35	No chance to shoot. A was not associated with nearby animal (Unphoto'd) Water depth: 50m Breach.
25/07/2018	008	Gray whale	5	4	4	A	LL	(FLD), DM: Ped rake marks	0	N/A	ID016	N/A	N/A	0	Coordinated surfacings between animals A-D.
						B	LL	N/A							
						C	LL	(FLD)							
						D	LL	N/A							
25/07/2018	006	Gray whale	15	12	10	A	RL,FLV (FLD)	HDR, DM: white, missing FL tips	0	N/A	ID017	N/A	N/A	0	Feeding. Mud observed. Video taken. Feeding aggregation: no consistent associations observed. Schools approached #008, #006, #007 Water depth: 36m
						B	RL (FLV, FLD)	DM:white scar FL TE							
						C	RL, (FLD)	DM: scar RL							
						E	LL, (RL)	N/A							
						G	LL, (FLD, FLV)	HDL, OT: ped L							
						H	RL, (FLD, FLV)	DM: Scars on Ped R							
						I	FLV	(FLD)							
						J	RL, FLD, FLV	HDR, DM: RLthree patches							
						K	RL (FLD, FLV)	DM: TE Rake							
						L	RL	N/A							
25/07/2018	007	Gray whale	7	4	4	A	RL, LL, FLD, FLV	DM: Ped R line scar	1	A	ID018	BY010	18011010	22	Feeding Coordinated surfacings between animals A-D 11.6m, Water depth: 36m
						B	RL	N/A							
						C	RL	DM: body scars							
						D	RL, FLD, FLV	N/A							
25/07/2017	011	Gray whale	5	5	5	A	FLD, FLV, LL, RL	HDL	2	A, B	ID019	BY011	18011011(A) + 18011012(B)	32	A:12.8m, Associated with B and C Matched to animal A on 26/07/2018 sight#001 and 003 Water depth: 29m

Survey Date (D/M/Y)	Sighting Number	Species	School Size	Photographed	Photo Identified	Letters of IDd	Results of Primary ID features	Results of Secondary ID features	Biopsied	Letter of Biopsied	ID Form Number	BY Form Number	S/No	Encounter Duration (min)	Photo-ID Notes e.g. Behavs, Assocs, Reaction to dart, Unusual
						B	RL, FLV	N/A							Associated with A and C B:12.2m
						C	FLV, LL, FLD	N/A							Associated with A and B
						D	LL, FLV, FLD	N/A							Feeding Not associated with other animals in school
						E	FLD	N/A							Not associated with other animals in school
26/07/2018	001	Gray whale	6	6	5	A	FLD, FLV		1	D	ID020	BY012	18011013 (D)	30	Animal A: Matched to animal A 7/25/18 sight#011 Animal A: duplicate in PA to A in sight#003 (26/07/18) Associated with Animal B D:11.6m, Water depth: 24m
						B	(LL) FLD, FLV								Associated with Animal A B is a duplicate in PA to Animal B sightno#003(26/07/18)
						C	LL, (RL)	DM: divot RL							Singleton Unusual divot/serious injury on RL
						D	LL, RL	DM: scar on LL							Singleton
						E	RL	N/A							Associated with F
						F	N/A	N/A							Associated with E
26/07/2018	002	Gray whale	2	1	1	A	FLD, (FLV)	DM: FL nick	0	N/A	ID021	N/A	N/A	0	Water depth: 27m
26/07/2018	003	Gray whale	2	2	2*	A	RL, FLD, FLV	(FLD)	0	N/A	ID022	BY013	No Sample	30	Animal A Matched to Animal A 25/07/18 sight#011 Duplicate in PA to Animal A in sight#001(26/07/18) Associated with B A: 12.2m Water depth: 27m
						B	RL, FLV	(FLD)							Animal B is a duplicate in PA is Animal B in sight#001(26/07/18) Associated with A B:10.7m
26/07/2018	012	Gray whale	11	10	7	A	LL	N/A	0	N/A	ID023	N/A	N/A	0	Feeding aggregation – all individuals feeding No stable associations observed Opportunistic sighting Many seabirds, Water depth: 26m
						B	FLV	N/A							
						C	RL	HDR							
						D	RL	DM: body scar							
						E	(FLV)	N/A							
						F	LL	N/A							
						G	(RL)	N/A							
						H	(RL)	N/A							
						I	(RL, FLD), FLV	OT: ped R							
						J	FLV	N/A							
26/07/2018	018	NP. right whale	1	1	1	A	HDL, HDR, HD	DM: FLD + FLV rake marks	0	N/A	ID024	BY014	18081014	52	Confirmed new animal, sex determined to be male. Head nodding observed on some surfacings, possible subsurface feeding 6 minutes dive-time. Rake marks on right fluke tip. Sloughy on left lip, back peds. 13.1 m, Water depth: 40m. Re-sighted 24 days later in Pengkingney Fjord feeding with humpbacks.

Survey Date (D/M/Y)	Sighting Number	Species	School Size	Photographed	Photo Identified	Letters of IDd	Results of Primary ID features	Results of Secondary ID features	Biopsied	Letter of Biopsied	ID Form Number	BY Form Number	S/No	Encounter Duration (min)	Photo-ID Notes e.g. Behavs, Assocs, Reaction to dart, Unusual
27/07/2018	003	Common minke whale	1	1	0	A	N/A	N/A	0	N/A	ID025	N/A	N/A	0	6.8m Water depth: 48m
27/07/2018	004	Killer whale	12	8	6	A	LD	OT: Eye patch L+R	3	A, B, C	ID026	BY015	18271015(A) 18271016(B) 18271017 (C)	21	A: 6.3m B:5.8m C: 8.1m (Large male) Breaching, Pec. Slap, Tail slap. Water depth: 46m Further photo analysis is required
						B	LD, (RD)	DM: 5 rake marks LD							
						C	LD, RD	OT: Eye patch, DMl 4 rake marks, LD							
						D	{LD)	DM: Dorsal nick							
						E	LD	DM: LD rake mark							
						F	LD	DM: Rake marks on ped near saddle							
						G	LD	N/A							
						H	LD	DM: Rasping marks in saddle patch							
01/08/2018	004	Fin whale	1	1	1	A	RD	RL, HDR, (HDL)	0	A	ID027	BY016	No Sample	28	Feeding, filtering water from mouth upon surfacing, ventral pleats slightly expanded
01/08/2018	002	Fin whale	3	3	3	A	LD	LL, OT: Diatom patterning	1	A	ID028	BY017	18051018	32	Animals A-C associated
						B	LD, RD	DM: pockmarks							
						C	LD, (RD)	LL, DM: dorsal nick, parasitic cover							
05/08/2018	003	Fin whale	3	1	1	A	RD	HDR, RL DM: diatom, DM: pockmarks	0	N/A	ID029	N/A	N/A	0	Opportunistic photos Not associated with other whales in school Near many seabirds
06/08/2018	001	Fin whale	1	1	1	A	RD	HDR, RL	1	A	ID030	BY018	18051019	11	Biopsy dart sampled splashguard No reaction to dart
06/08/2018	003	Fin whale	1	1	1	A	LD	HDL, LL, DM: HDL nick	1	A	ID031	BY019	18051020	27	Unusual: Nick on left mandible
06/08/2018	006	Fin whale	3	2	2	A	RD	DM: RD nicks	0	N/A	ID032	BY020	No Sample	13	Coordinated surfacings with Whale B. Suspected feeding.
						B	RD	HDR, RL DM: RD nick, hole							Coordinated surfacings with Whale A. Feeding.
06/08/2018	010	Humpback whale	1	1	1	A	FLV	FLD, RD (LD), DM: scar on LD, RD, DM:scar on Ped V	1	A	ID033	BY021	18071021	66	Trumpeted during each close approach made by vessel. Water depth: Over 1,000 m.
06/082018	011	Fin whale	4	3	3	A	LD	DM: LD nick	0	N/A	ID034	N/A	N/A	0	Opportunistic photos All four animals in school associated
						B	LD	DM: RD hole, DM: pockmarks							
						C	RD	RL, DM: RD nick							

07/08/2018	001	Fin whale	2	2	2	A	RD, LD	HDR, RL, HDL, LL	1	A	ID035	BY022	18051022 (A)	27	Coordinated surfacings with whale B
						B	(LD), RD	HDL, LL, RL, DM: dorsal fin nick							Biopsy attempt of whale B was unsuccessful, no sample, Coordinated surfacings with whale A
07/08/2018	002	Fin whale	5	1	0	A	N/A	N/A	2	A, B	ID036	BY023	18051023 (A) 18051024 (B)	8	Biopsies of animals A and B taken simultaneously, no photographs of animal A All five animals associated together
						B	(LD)	HDL, LL							Biopsies of animals A and B taken simultaneously All five animals associated together
07/08/2018	004	Fin whale	4	2	2	A	RD	RL	0	N/A	ID037	N/A	N/A	0	A+B associated Opportunistic photos
						B	RD	(RL)							
07/08/2018	005	Fin whale	4	2	1	A	LD	DM: LD nick	0	N/A	ID038	N/A	N/A	0	A+B associated Opportunistic photos
						B	(LD)	N/A							
07/08/2018	011	Fin whale	1	1	0	A	(RD, LD)	LL, RL	0	A	ID039	BY024	No Sample	12	Thin Fast movement
07/08/2018	012	Killer whale	1	1	1	A	LD	DM: LD nicks	1	A	ID040	BY025	18271025	3	Large male, 5.7 m.
07/08/2018	014	Fin whale	1	1	1	A	LD, RD	HD, RL, DM: dorsal fin holes(2)	1	A	ID041	BY026	18051026	31	
07/08/2018	015	Sperm whale	1	1	0	A	N/A	(RD)	0	N/A	ID042	N/A	N/A	0	Large male,
08/08/2018	003	Fin whale	1	1	1	A	LD	HDL, LL	1	A	ID043	BY027	18051027	31	
08/08/2018	008	Fin whale	2	2	2	A	LD	LL, DM: dorsal fin nick	1	A	ID044	BY028	18051028_A	15	A+B associated
						B	LD (RD)	LL, DM: dorsal fin nick							
08/08/2018	009	Fin whale	1	1	1	A	LD, RD	N/A	0	N/A	ID045	BY029	No Sample	35	Feeding
10/08/2018	012	Fin whale	2	2	1	A	RD	RL, DM: RD Rake marks	0	N/A	ID046	N/A	N/A	0	A+B associated Opportunistic photos
						B	N/A	N/A							
10/08/2018	033	Fin whale	3	3	2	A	LD	N/A	0	N/A	ID047	N/A	N/A	0	Mum/calf pair associated with other animal C Opportunistic photos
						B	LD	N/A							
						C	N/A	N/A							
12/08/2018	002	Killer whale	15	8	5	A	LD, RD	OT: Eye patch L	0	A	ID048	BY030	No Sample	30	At least 4 or 5 large male animals. 3 sub-groups. A: Large male, jagged dorsal fin. B: Large male C: Yearling D: xx E: xx F: Large male Further photo analysis needed
						B	LD,	DM: Dorsal							
						C	LD	DM: Ped Rakes							
						D	LD	N/A							
						E	(LD)	N/A							
						F	(LD)	DM: Wavy Dorsal							
						G	LD	DM: LD rake							
						-	-	-							
12/08/2018	016	Killer whale	5	5	5	A	RD, LD	OT: eyepatch R	1	A	ID049	BY031	18271029	12	Mixed school with sight# 017 Broken dart with Biopsy of whale A

						B	RD, (LD)	OT: Eyepatch L							Whale A had reaction to dart; shuddered and small tail slash before submerging.
						C	RD, LD	DM: LL body scar, OT: open saddle R							Further photo analysis is needed.
						D	RD	N/A							
						E	RD	N/A							
12/08/2018	017	Humpback whale	5	5	1	A	N/A	RD, DM: RL divots	2	A, B	ID050	BY032	18071030 (A), 18071031 (B)	29	Mixed school with sight# 016 Feeding aggregations, no stable associations observed (between animals nor between multi-species)
						B	FLV	RD, LD							
						C	N/A	(RD)							One low fluke up dive sequence with partial FLV showing (black), unsure which individual it belongs to.
						D	N/A	RD, DM: RD scar							
						E	N/A	RD, DM: RD damage							
12/08/2018	020	Sperm whale	1	1	0	A	N/A	LD, LL, (RD)	0	N/A	ID051	N/A	N/A	0	Opportunistically photo'd Secondary sighting during sight #016 and 017
13/08/2018	005	Humpback whale	1	1	1	A	FLV	RD, LD, HD, FLD	1	A	ID052	BY033	18071032	37	Feeding at depth. Open mouth at surface. Black fluke- ventral. 13.6 m
13/08/2018	009	Humpback whale	1	1	1	A	FLV	RD, (LD)	1	A	ID053	BY034	18071033	49	Only low fluking dives. Feeding. 13.3m
14/08/2018	003	Humpback whale	2	2	2	A	FLV	LD, FLD	2	A,B	ID054	BY035	18071034(A) 18071035(B)	22	13.6 m, Associated with whale B (Coordinated surfacings), broken dart.
						B	FLV	RD, LD, FLD, OT: Pecs							14.2 m, Associated with Whale A (coordinated surfacings), Pec slapping
14/08/2018	004	Humpback whale	1	1	1	A	FLV	RD, LD, (FLD)	0	A	ID055	BY036	No sample	59	Trumpet, Black fluke. 12.3 m
14/08/2018	005	Humpback whale	1	1	1	A	FLV	RD, LD, (FLD)	1	A	ID056	BY037	18071036	52	Barnacles on dorsal fin. Black & white Fluke ventral. 13.7m.
14/08/2018	006	Humpback whale	1	1	1	A	FLV	RD, LD, FLD	1	A	ID057	BY038	18071037	16	Feeding, video taken, fluke up. 12.2m
14/08/2018	007	Humpback whale	1	1	1	A	FLV	LD, (RD, FLD), OT: Pec	0	A	ID058	BY039	No sample	52	Pec Slapping, low fluking dives Fluke up. Diatoms. 13.6m
14/08/2018	009	Humpback whale	1	1	1	A	FLV	(RD)	0	N/A	ID059	N/A	N/A	0	Opportunistic photos. White fluke-ventral. 12.1m
14/08/2018	011	Humpback whale	2	2	1	A	FLV	RD, LD, (FLD)	0	A	ID060	BY040	No sample	18	13.3 m: Mother Reaction to dart: fluke flick
						B	(FLV)	RD, LD, FLV,DM: RL body scar							8.6 m, Calf
14/08/2018	012	Humpback whale	1	1	1	A	FLV	LD, RD, HDR, FLD	1	A	ID061	BY041	18071038	4	Feeding, 13.7 m. Secondary sighting during sight#011 Black fluke-ventral
14/08/2018	0014	Humpback whale	2	2	1	A	FLV	LD, FLD	0	N/A	ID062	BY042	No sample	13	A: 15.7 m, Both animal, parasite cover: heavy barnacle load Suspected feeding.
						B	N/A	LD, FLD							B: 11.2 m.
14/08/2018	015	Humpback whale	4	4	4	A	FLV	RD, FLD DM: RD scar	2	A,B	ID063	BY043	18071039 (A) 18071040 (B)	35	A: 12.4 m, Associated with Whale C

						B	FLV	LD, RD, FLD, DM: hole in FL							B: 13.8 m, Associated with Whale D
						C	FLV	RD, FLD, (LD), DM: RD scar							Associated with Whale A
						D	FLV	RD, FLD, (LD), DM: RD scar							Associated with Whale B
15/08/2018	003	Humpback Whale	1	1	0	A	N/A	RD, DM: dorsal fin nick, DM: scars on rostrum	1	A	ID064	BY044	18071041	6	13.1 m, Singleton, never fluked up Lesions with raised edges aft of LD Scars on rostrum Skin+ blubber from 2 hits, Second hit: broken biopsy dart
15/08/2018	004	Humpback whale	1	1	1	A	FLV	RD, LD, FLD, DM: scars on RDv	1	A	ID065	BY045	18071042	25	13.3 m, Feeding (open mouth), Video taken
15/08/2018	005	Humpback whale	2	2	1	A	N/A	LD, RD, FLD	2	A	ID066	BY046	18071043_A 18071044_B	35	A: 12.8 m, B: 12.6 m, A+B associated Animal A never fluked Animal B reaction to dart: defecation, red feces
						B	FLV	LD, FLD							
15/08/2018	009	Humpback whale	1	1	1	A	FLV	(FLD), DM: scar FL notch	0	N/A	ID067	N/A	N/A	0	Whale A breached twice before photographing Opportunistic photos. Black fluke-ventral.
15/08/2018	013	Humpback whale	1	1	1	A	FLV	RD, LD	1	A	ID068	BY047	18071045	34	12.9 m, Feeding: Bubble net and open mouth observed Red feces. Seabirds following surfacings No photos of biopsy sampling (too close to bow for angle)
15/08/2018	014	Humpback whale	1	1	1	A	FLV	LD (RD, FLD) DM: Trailing edge rake	1	A	ID069	BY048	18071046	6	13.8 m, Feeding, seabirds following surfacings Biopsy sample: only skin
16/08/2018	002	Fin whale	1	1	1	A	RD	(HDR, RL) DM: RD hole	1	A	ID070	BY049	18051047	23	16.3 m,
16/08/2018	003	Humpback whale	1	1	1	A	FLV	RD, DM: scars RD, ped and LE FL, DM: FLD scars, trailing edge damage	1	A	ID071	BY050	18071048	16	13.4 m, Reaction to dart: tail flick, Feeding; open mouth, bubble net observed Breached Healed entanglement scars on leading edge of flukes and peduncle Considerable FLD scarring and trailing edge damage.
16/08/2018	005	Fin whale	1	1	1	A	LD	LL, HDR	1	A	ID072	BY051	18051049	45	20.3 m, Subsurface feeding suspected, video taken.
16/08/2018	010	Fin whale	2	1	1	A	RD, LD	RL, LL, DM: RD nicks	0	N/A	ID073	BY052	No sample	35	Subsurface feeding suspected.
17/08/2018	001	Humpback whale	1	1	1	A	FLV	LD, RD, FLD, DM: FLD leading edge scars	0	N/A	ID074	BY054	No sample	33	
17/08/2018	003	Fin whale	1	1	1	A	RD	DM: RD nick	0	N/A	ID075	BY053	No sample	14	
17/08/2018	004	Fin whale	3	3	3	A	RD	RL	1	A	ID076	BY055	18051050	9	A: 17.6 m, Fast movement – lots of white water Animals A-C all associated with coordinated surfacings. Continued photo-analysis is required.
						B	RD	RL							
						C	RD	DM: RD hole							
17/08/2018	005	Killer whale	3	3	3	A	LD, (RD)	OT: L Eye patch	1	A	ID077	BY056	18271051_A	38	A: 5.4 m, A + B associated; C separated.

						B	LD (RD)	DM: Dorsal nicks							
						C	RD	DM: Dorsal nick							
17/08/2018	006	Humpback whale	1	1	1	A	FLV	RD, LD, DM: RD scar	1	A	ID078	BY057	18071052	14	A: 13.2 m, Feeding
17/08/2018	012	Common minke whale	1	1	1	A	RL, RD	N/A	0	N/A	ID079	N/A	N/A	0	Opportunistic photos
17/08/2018	013	Common minke whale	1	1	0	A	N/A	N/A	0	N/A	ID080	N/A	N/A	0	Opportunistic photos
17/08/2018	014	Humpback whale	1	1	1	A	FLV	RD, LD, (FLD)	1	A	ID081	BY058	18071053	31	A: 12.6m,
17/08/2018	023	Fin whale	1	1	1	A	LD, (RD)	LL, DM: LD Nick	1	A	ID082	BY059	18051054	23	20.8 m,
18/08/2018	001	Fin whale	1	1	1	A	LD, (RD)	(RL, LL), DM: Dorsal nicks	0	N/A	ID083	BY060	No sample	37	21.3 m,
18/08/2018	003	Humpback whale	1	1	1	A	FLV	LD, RD, DM: FLV Rake marks	1	A	ID084	BY061	18071055	24	12.7 m, Feeding Fresh wound after darting. Video taken.
23/08/2018	001	Humpback whale	1	1	1	A	FLV	RD, LD, FLD, (HDR)	1	A	ID085	BY062	18071056	11	Red Feces (photos). White fluke-ventral. 13.3 m.
23/08/2018	004	Baird's Beaked whale	17	7	TBD	TBD	N/A	N/A	0	N/A	ID086	N/A	N/A	0	Opportunistic photos. Divided school of 7 and 10 individuals.
23/08/2018	006	Common Minke whale	1	1	1	A	LL, LD	DM: Pockmarks LL	0	N/A	ID087	N/A	N/A	0	Opportunistic photo.
23/08/2018	008	Humpback whale	1	1	0	A	N/A	RD, HD, LD, DM: LL and RL skin condition	1	A	ID088	BY063	18071057	23	Video taken 12.6m Feeding, open mouth and bubble net observed Never fluked during experiment, 1 fluke up before approach, Mostly black FLV with white patches near trailing edge.
24/08/2018	002	Fin whale	2	2	2	A	LD, RD	Rl, LL DM: hole in dorsal	2	A, B	ID089	BY064	18051058	19	A: 21.3 m, Mother of M/C pair, Thin, Influenced by platform: change in direction on approach, short bursts of fast movement.
						B	LD, RD	RL, HDR					18051059		B: 12.8 m, Calf Influenced by platform: change in direction on approach, short bursts of fast movement.
24/08/2018	004	Humpback whale	1	1	1	A	FLV	LD, RD, FLD, OT: Fluke LE and TE	1	A	ID090	BY065	18071060	28	A: 11.4 m, Very surface active, full spinning breach, inverted fluke slaps, 3x lobtails, Video taken, Almost black (Fluke-ventral).
24/08/2018	005	Fin whale	1	1	1	A	RD,LD	HDR, RL	1	A	ID091	BY066	18051061	30	20.2 m
24/08/2018	008	Humpback whale	1	1	1	A	FLV	LD, FLD, RD	1	A	ID092	BY067	18071062	42	A: 13.3 m, Fluke-up. Black (fluke-ventral).
24/08/2018	012	Fin whale	1	1	1	A	RD	(RL)	0	A	ID093	BY068	No sample	33	20.3 m, No chance to biopsy.
25/08/2018	001	Fin whale	1	1	1	A	LD, RD	LL. RL	0	A	ID094	BY069	No sample	43	18.4 m, No chance to biopsy.
25/08/2018	002	Humpback whale	1	1	1	A	FLV	RD, (LD)	0	A	ID095	BY070	No sample	69	12.9 m, Black& white (fluke-ventral).

25/08/2018	003	Humpback whale	1	1	1	A	(FLV)	LD, RD, FLD, OT: FLD leading edge	1	A	ID096	BY071	18071063	33	14.1 m, White flipper, Low fluking dives.
25/08/2018	004	Humpback whale	2	2	0	A	N/A	RD	0	A	ID097	BY072	No Sample	35	A: 13.6 m, B: 13.4 m, A never fluked up, just high round out before diving. Suspected feeding: Many seabirds following surfacings and diving in footprints, no open mouth or filtering observed. A and B not associated
						B	N/A	(LD)							
26/08/2018	001	Fin whale	1	1	1	A	RD, LD	RL, LL, OT: Chevron	0	A	ID098	BY073	No Sample	34	
26/08/2018	009	Dall's Porpoise	5	5	0	A	N/A	DM: Fluke nick	0	N/A	ID099	N/A	N/A	0	Bow-riding Opportunistically photo'd during sight #007
26/08/2018	007	Fin whale	1	1	1	A	LD (RD)	RL, (HDR)	1	A	ID100	BY074	18051064	30	14.1 m, Diatoms.
26/08/2018	014	Dall's porpoise	11	11	0	N/A	N/A	N/A	0	N/A	ID101	N/A	N/A	0	3 calves Opportunistic photos
26/08/2018	016	Fin whale	1	1	0	N/A	N/A	(RD)	0	0	N/A	N/A	N/A		Couldn't resight upon approach No Natural marking sheet
26/08/2018	018	Dall's porpoise	8	8	0	N/A	N/A	N/A	0	N/A	ID102	N/A	N/A	0	Opportunistically photo'd on approach to sight #016
26/08/2018	022	Sperm whale	1	1	0	A	(FL)	RD, LD, Ped, DM: LL	0	N/A	ID103	N/A	N/A	0	Opportunistic photo's Distinctive marking anterior to Dorsal – possible callous patch.
27/08/2018	005	Fin whale	1	1	1	A	LD	LL	1	A	ID104	BY075	18051065	9	A: 16.2 m,
31/08/2018	002	Fin whale	1	1	1	A	LD	(HDL, LL, HDR, RL) DM: LD nick	0	A	ID105	BY076	No Sample	60	A: 22.1 m, Platform avoidance (direction change) during one vessel approach. No reaction to darting attempt.
31/08/2018	003	Fin whale	2	2	2	A	LD,	HDL, LL (HDR, RL)	0	N/A	ID106	BY077	No Sample	67	No chance to dart.
						B	LD (RD)	HDL, LL,							
31/08/2018	005	Fin whale	1	1	0	A	(RD, LD)	(HDR)	0	A	ID107	BY078	No Sample	54	No chance to dart.
01/09/2018	002	Fin whale	1	1	1	A	RD	HDR, RL	1	A	ID108	BY079	18051066	32	19.7m.
01/09/2018	003	Fin whale	1	1	1	A	LD, RD	LL, RL	0	A	ID109	BY080	No sample	25	No chance to dart. Possible feeding.
01/09/2018	005+009	Killer whale	2	2	2	A	LD, RD	OT: eyepatch L+R	0	N/A	ID110	N/A	N/A	0	Joined with Sight #009 Large male.
						B	LD, RD	OT: eyepatch L+R			ID111				Joined with Sight #005
01/09/2018	004	Fin whale	4	3	3	A	(LD)	LL	1	C	ID112	BY081	18051067	27	A: mother: 22.3 m, B: calf: 12.4 m, Mum/calf pair associated with animal C (19.5 m, biopsy sampled), fourth animal joined at end of sighting (no photos) Platform avoidance: fast movement upon approach Preliminary PhotoID: Needs further analysis
						B	LD, RD	HDR							
						C	RD	RL							
01/09/2018	013	Fin whale	2	2	2	A	LD	LL	0	N/A	ID113	BY082	No Sample	19	A+B associated. No chance to biopsy.
						B	LD	LL							
01/09/2018	014	Fin whale	1	1	1	A	LD (RD)	RL	0	N/A	ID114	BY083	No Sample	45	No chance to biopsy Influenced by platform, direction changes on vessel approaches
01/09/2018	016	Fin whale	1	1	1	A	RD	DM: RD Bent	0	N/A	ID115	BY084	No Sample	50	Long dives; No chance to biopsy, Dall's porpoise in area towards end of BX but no mixing occurred.

02/09/2018	003	Humpback whale	1	1	1	A	FLV	LD, FLD, RD	1	A	ID116	BY085	18071068	70	A: 11.7 m, Skin only sample Trumpeted during vessel close approach, no reaction to darting.
02/09/2018	005	Fin Whale	1	1	1	A	LD, RD	LL,RL, HDL, HDR	0	A	ID117	BY086	No Sample	50	Random subsurface movements at beginning of experiment, Jumping fish observed in vicinity (not photo'd)
02/09/2018	007	Fin Whale	1	1	1	A	RD (LD)	(RL), DM: Dorsal fin nick and bent L	0	N/A	ID118	BY087	No Sample	39	No chance to biopsy. Long dives.
02/09/2018	012	Fin whale	4	2	2	A	RD, LD	RL, LL, HDL, DM: dorsal fin nicks and hole	1	A	ID119	BY088	18051069	26	A: 21.7 m, Not associated with other animals in school.
						B	LD, (RD)	HDR							Not associated with other animals in
02/09/2018	016	Fin whale	2	2	2	A	LD, RD	HDL, LL DM: DF nick	0	N/A	ID120	BY089	No Sample	67	No chance to biopsy. Animals A and B associated, coordinated surfacing.
						B	LD, RD	RL, HDR. DM: DF damage							
03/09/2018	017	Fin whale	1	1	1	A	RD	LL	1	A	ID121	BY090	18051070	8	A: 21.3 m.
03/09/2018	022	Fin whale	1	1	1	A	LD	LL	0	A	ID122	BY091	No Sample	19	No chance to biopsy.
03/09/2018	026	Fin whale	1	1	1	A	RD	RL, HDR	0	A	ID123	BY092	No Sample	28	No chance to biopsy.
06/09/2018	001	Fin whale	2	1	1	A	RD (LD)	N/A	0	A	ID124	BY093	No Sample	18	No chance to dart. Singleton.
06/09/2018	022	Fin whale	1	1	1	A	RD	HDR, RL	0	A	ID125	BY094	No Sample	22	No chance to dart.
08/09/2018	003	Humpback whale	1	1	1	A	FLV	LD, RD, DM: Divot RL, DM: Missing FL tip, FLV rake marks	0	A	ID126	BY095	No Sample	46	No chance to dart. Fluke-up. Missing right fluke tip. Upturned flukes.
09/09/2018	001	Humpback whale	1	1	1	A	FLV	LD, RD, DM: FLV rake marks	0	A	ID127	BY096	No Sample	41	No chance to dart.
21/09/2018	003	Fin whale	1	1	1	A	RD, LD	LD, RD	0	N/A	ID128	BY097	No Sample	38	A: 20.9 m,
21/09/2018	004	Blue whale	2	2	2	A	RD, LD	RD, LD, FL,	1	A	ID129	BY098	18061071 (A)	7	A: 25.2 m,
21/09/2018	005	Sperm whale	1	1	1	A	LD, HD, RD	LD, RD,	0	A	ID130	N/A	No Sample	-	Opportunistic photos. A: 14.2 m,
21/09/2018	006	Blue whale	1	1	1	A	LD, RD,	HD	1	A	ID131	BY099	18061072	59	A: 25.6 m,
21/09/2018	008	Blue whale	1	1	1	A	LD, RD	HD	1	A	ID132	BY100	18061073	12	A: 26.3 m,
21/09/2018	009	Fin whale	2	2	2	A	RD (A),	HD	0	A	ID133	BY101	18051074(A),	11	A: 21.2 m,
21/09/2018	011	Blue whale	1	1	1	A	LD, RD		0	A	ID134	BY102	No Sample	43	A: 23.7 m,
22/09/2018	014	Killer whale	25	20	17	A	LD, RD	N/A	1	A	ID135	BY103	18271076	66	A: 3.8 m,
						B	RD, LD	N/A	0	N/A			No Sample		Biopsy missed. Large male.
						C	RD	N/A	0	N/A					Large male.
						D	RD	N/A	0	N/A					Like male.
						E	RD	N/A	0	N/A					Gray dot on saddle patch.
						F	RD	N/A	0	N/A					Large male, eye patch.
						G	RD	N/A	0	N/A					Surface with D&E, No dots or scars.
						H	LD	N/A	0	N/A					Like mother, swimming with calf.
						I	LD	FL	0	N/A					Calf, tail slaps.
						J	LD	N/A	0	N/A					Immature, Black-line on saddle patch. Gray scars on peduncle.
						K	LD	N/A	0	N/A					Large male, distinctive saddle patch.
						L	LD	N/A	0	N/A					Angled saddle patch, gray small dot on back.
						M	LD	N/A	0	N/A					Scars on back.
						N	RD	N/A	0	N/A					Black-scar on bottom of saddle patch.
						O	RD	N/A	0	N/A					Large male,
						P	RD	N/A	0	N/A					Large male,
						Q	RD	N/A	0	N/A					Large male, wide dorsal fin, eye patch. Lack of dorsal fin.

Table 5a. Summary of North Pacific right whale sightings. ID Form No: natural marking datasheet form number. BY Form No: Biopsy datasheet form number. S/No: Biopsy sample number is concatenated Year (18) | Species code (e.g. NP right whale 08) | Boat code (1) | Serial number (consecutive number for all samples throughout the cruise starting at 001). If S/No is N/A no biopsy attempt was made. If S/No is 'No Sample' a biopsy attempt was made i.e. shooters were on standby, but no sample was collected (shots may or may not have been fired).

Survey Date	Sight No	School Size	Photographed	Photo IDed	Biopsied	ID Form No	BY Form No	S/No	North Pacific right whale Sighting Notes e.g. Behavs, Assocs, Reaction to dart, Unusual
18/07/2018	022	1	1	1	1	ID004	BY003	18081004	Matched to individual MML25, sex previously unknown. Biopsy results reveal sex is male. Feeding, filtering water from closed mouth at surface. Red feces observed. Many humpback and fin whales in close proximity.
18/07/2018	023	1	1	1	1	ID005	BY004	18081005	Confirmed new individual. Biopsy results reveal sex is male. Many humpback and fin whales in close proximity.
26/07/2018	018	1	1	1	1	ID024	BY014	18081014	Confirmed new individual. Biopsy results reveal sex is male. Animal was re-sighted 24 days later actively feeding with humpbacks in Pengkingney Fjord (near Bering Strait).
Total	**3**	**3**	**3**	**3**	**3**				

Table 5b. Summary of gray whale sightings. ID Form No: natural marking datasheet form number. BY Form No: Biopsy datasheet form number. S/No: Biopsy sample number is concatenated Year (18) | Species code (e.g. Gray whale 01) | Boat code (1) | Serial number (consecutive number for all samples throughout the cruise starting at 001). If S/No is N/A no biopsy attempt was made. If S/No is 'No Sample' a biopsy attempt was made; i.e.i shooters were on standby, but no sample was collected (shots may or may not have been fired).

Survey Date	Sight No	School Size	Photographed	Photo IDed	Biopsied	ID Form No	BY Form No	S/No	Gray whale Sighting Notes e.g. Behavs, Assocs, Reaction to dart, Unusual
22/07/2018	002	2	1	1	0	ID010	N/A	N/A	Feeding: mud expelled from mouth at surface Defecation, brown feces (unphoto'd)
22/07/2018	003	2	2	2	2	ID011	BY005	18011006_A 18011007_B	Feeding: mud expelled from mouth of animal A on surfacing A and B not associated
24/07/2018	001	2	2	2	0	ID013	BY007	No sample	A & B associated Unusual: both animals have bulges near shoulders (R+L sides), possibly thin
24/07/2018	003	1	1	1	1	ID014	BY008	18011009	Probable feeding: Mud at surface when animal
25/07/2018	002	2	1	1	0	ID015	BY009	No Sample	Breach Not associated with unphoto'd animal No chance to dart
25/07/2018	008	5	4	4	0	ID016	N/A	N/A	Coordinated surfacings between animals A-D
25/07/2018	006	15	12	10	0	ID017	N/A	N/A	Feeding aggregation, no consistent associations observed. Video taken
25/07/2018	007	7	4	4	1	ID018	BY010	18011010_A	Feeding; Coordinated surfacings between animals A-
25/07/2017	011	5	5	5	2	ID019	BY011	18011011_A 18011012_B	Animal A matched to animal A on 26/07/2018 sightings #001 and #003
26/07/2018	001	5	4	4	1	ID020	BY012	18011013_D	Animal A duplicate in PA (sight#003), also matched to animal A from 25/07/2018 sight#011 Animal B duplicate in PA (sight#003)
26/07/2018	002	2	1	1	0	ID021	N/A	N/A	

Survey Date	Sight No	School Size	Photographed	Photo IDed	Biopsied	ID Form No	BY Form No	S/No	Gray whale Sighting Notes e.g. Behavs, Assocs, Reaction to dart, Unusual
26/07/2018	003	2	2.	2	0	ID022	BY013	No Sample	Animal A duplicate in PA (sight#001), also matched to animal A from 25/07/2018 (sight#011) Animal B duplicate in PA (sight#001)
26/07/2018	012	11	10	7	0	ID023	N/A	N/A	Feeding aggregation Many seabirds in close proximity Opportunistic photos
Total	**13**	**61**	**49**	**44***	**7**				

*: Includes 3 resights/duplicates. 41 unique individuals.

Table 5c. Summary of humpback whale sightings. ID Form No: natural marking datasheet form number. BY Form No: Biopsy datasheet form number. S/No: Biopsy sample number is concatenated Year (18) | Species code (e.g. humpback whale 07) | Boat code (1) | Serial number (consecutive number for all samples throughout the cruise starting at 001). If S/No is N/A no biopsy attempt was made. If S/No is 'No Sample' a biopsy attempt was made; i.e.' shooters were on standby, but no sample was collected (shots may or may not have been fired).

Survey Date	Sight No	School Size	Photographed	Photo IDed	Biopsied	ID Form Number	BY Form Number	S/No	Humpback whale Sighting Notes e.g. Behavs, Assocs, Reaction to dart, Unusual
19/07/2018	001	1	1	0	0	ID006	N/A	N/A	Opportunistic photos.
19/07/2018	003	4	3	1	0	ID007	N/A	N/A	Red faeces, Opportunistic photos.
19/07/2018	010	1	1	1	0	ID008	N/A	N/A	Fluke Slapping Opportunistic photos
21/07/2018	002	2	1	0	0	ID009	N/A	N/A	Opportunistic photos
22/07/2018	005	1	1	1	1	ID012	BY006	18071008	Low fluking dives, Fluke breach, Broken biopsy dart (x2)
06/08/2018	010	1	1	1	1	ID033	BY021	18071021	Trumpeted during vessel close approaches.
12/08/2018	017	4	4	1	2	ID050	BY032	18071030 (A), 18071031 (B)	Mixed school with Orca sight#016
13/08/2018	005	1	1	1	1	ID052	BY033	18071032	Feeding
13/08/2018	009	1	1	1	1	ID053	BY034	18071033	
14/08/2018	003	2	2	2	2	ID054	BY035	18071034_A 18071035_B	Animals A and B coordinated surfacings Animal A pec slapping Broken biopsy dart (A)
14/08/2018	004	1	1	1	0	ID055	BY036	No sample	
14/08/2018	005	1	1	1	1	ID056	BY037	18071036	
14/08/2018	006	1	1	1	1	ID057	BY038	18071037	Feeding
14/08/2018	007	1	1	1	0	ID058	BY039	No sample	Pec Slapping
14/08/2018	009	1	1	1	0	ID059	N/A	N/A	Opportunistic photos
14/08/2018	011	2	2	2	0	ID060	BY040	No sample	Mother/Calf pair, Reaction to darting: fluke flick from animal A (Mother)
14/08/2018	012	1	1	1	1	ID061	BY041	18071038	Feeding
14/08/2018	014	2	2	1	0	ID062	BY042	No sample	Heavy parasite load (barnacles)
14/08/2018	015	4	4	4	2	ID063	BY043	18071039 (A)	Whales A and C associated Whales B and D associated
15/08/2018	003	1	1	0	1	ID064	BY044	18071041	Singleton, broken biopsy dart Never raised flukes, Lesions with raised edges
15/08/2018	004	1	1	1	1	ID065	BY045	18071042	Feeding Video Taken
15/08/2018	005	2	2	1	2	ID066	BY046	18071043_A 18071044_B	Suspected feeding Animals A and B coordinated surfacings Animal B reaction to dart: defecation (red faeces)
15/08/2018	009	1	1	1	0	ID067	N/A	N/A	Breached twice prior to PX Opportunistic photos

Survey Date	Sight No	School Size	Photographed	Photo IDed	Biopsied	ID Form Number	BY Form Number	S/No	Humpback whale Sighting Notes e.g. Behavs, Assocs, Reaction to dart, Unusual
15/08/2018	013	1	1	1	1	ID068	BY047	18071045	Feeding: Bubble net and open mouth observed Red faeces, Many seabirds following surfacings.
15/08/2018	014	1	1	1	1	ID069	BY048	18071046	Feeding, Skin only biopsy sample. Seabirds following surfacings
16/08/2018	003	1	1	1	1	ID071	BY050	18071048	Feeding: bubble net and open mouth observed, Breach, Considerable scarring to dorsal flukes, damage to trailing edge Healed entanglement scars on leading edge and peduncle Reaction to dart: tail flick
17/08/2018	001	1	1	1	0	ID074	BY054	No sample	
17/08/2018	006	1	1	1	1	ID078	BY057	18071052	Feeding
17/08/2018	014	1	1	1	1	ID081	BY058	18071053	
18/08/2018	003	1	1	1	1	ID084	BY061	18071055	Feeding
23/08/2018	001	1	1	1	1	ID085	BY062	18071056	Red faeces
23/08/2018	008	1	1	0	1	ID088	BY063	18071057	Feeding, Video taken, Fluke unphoto'd, 1x fluke up before approach, mostly black FLV with white patches near fluke tips
24/08/2018	004	1	1	1	1	ID090	BY065	18071060	Full breach, inverted fluke slaps, 3x lobtails
24/08/2018	008	1	1	1	1	ID092	BY067	18071062	
25/08/2018	002	1	1	1	0	ID095	BY070	No sample	
25/08/2018	003	1	1	1	1	ID096	BY071	18071063	Low fluking dives
25/08/2018	004	2	2	0	0	ID097	BY072	No Sample	Never fluked up, Suspected feeding, many seabirds following surfacings and feeding in whale flukeprints, No open mouth or filtering observed
02/09/2018	003	1	1	1	1	ID116	BY085	18071068	Loud trumpeting during vessel close approach No reaction to darting, skin only sample
08/09/2018	003	1	1	1	0	ID126	BY095	No Sample	
09/09/2018	001	1	1	1	0	ID127	BY096	No Sample	
Total	**29**	**40**	**56**	**54**	**39**				

Table 5d. Summary of fin whale sightings. ID Form No: natural marking datasheet form number. BY Form No: Biopsy datasheet form number. S/No: Biopsy sample number is concatenated Year (18) | Species code (e.g. fin whale 05) | Boat code (1) | Serial number (consecutive number for all samples throughout the cruise starting at 001). If S/No is N/A no biopsy attempt was made. If S/No is 'No Sample' a biopsy attempt was made; i.e., shooters were on standby, but no sample was collected (shots may or may not have been fired).

Survey Date	Sight No	School Size	Photographed	Photo IDed	Biopsied	ID Form Number	BY Form Number	S/No	Fin whale Sighting Notes e.g. Behavs, Assocs, Reaction to dart, Unusual
11/07/2018	004	3	1	1	0	ID003	N/A	N/A	Red faeces
18/07/2018	025	1	1	0	0	N/A	N/A	N/A	Secondary sighting during sight#023
01/08/2018	004	1	1	1	0	ID027	BY016	No Sample	Feeding
01/08/2018	002	3	3	3	1	ID028	BY017	18051018_A	Animals A-C were associated
05/08/2018	003	3	1	1	0	ID029	N/A	N/A	Opportunistic photos, many seabirds, Whale A not associated with others in school
06/08/2018	001	1	1	1	1	ID030	BY018	18051019	Biopsy dart sampled splashguard, no reaction to dart
06/08/2018	003	1	1	1	1	ID031	BY019	18051020	Unusual: nick on left mandible
06/08/2018	006	3	2	2	0	ID032	BY020	No Sample	A+B associated
06/08/2018	011	4	3	3	0	ID034	N/A	N/A	Opportunistic photos All four whales in school were associated
07/08/2018	001	2	2	2	1	ID035	BY022	18051022_A	A+B associated
07/08/2018	002	5	1	0	2	ID036	BY023	18051023_A, 18051024_B	All five animals in school had coordinated surfacings Biopsies of A and B taken simultaneously No photos of A, no ID shots of either biopsied whale
07/08/2018	004	4	2	2	0	ID037	N/A	N/A	A+B associated Opportunistic photos
07/08/2018	005	4	2	1	0	ID038	N/A	N/A	A+B associated, Opportunistic photos

Survey Date	Sight No	School Size	Photographed	Photo IDed	Biopsied	ID Form Number	BY Form Number	S/No	Fin whale Sighting Notes e.g. Behavs, Assocs, Reaction to dart, Unusual
07/08/2018	011	1	1	0	0	ID039	BY024	No Sample	Thin, Fast movement
07/08/2018	014	1	1	1	1	ID041	BY026	18051026	
08/08/2018	003	1	1	1	1	ID043	BY027	18051027	
08/08/2018	008	2	2	2	1	ID044	BY028	18051028_A	A+B associated
08/08/2018	009	1	1	1	0	ID045	BY029	No Sample	Feeding
10/08/2018	012	2	1	1	0	ID046	N/A	N/A	A+B associated Opportunistic photos
10/08/2018	033	3	3	1	0	ID047	N/A	N/A	Mum/calf pair associated with animal C Opportunistic photos
16/08/2018	002	1	1	1	1	ID070	BY049	18051047	
16/08/2018	005	1	1	1	1	ID072	BY051	18051049	Subsurface feeding suspected
16/08/2018	010	2	1	1	0	ID073	BY052	No Sample	Subsurface feeding suspected
17/08/2018	003	1	1	1	0	ID075	BY053	No Sample	
17/08/2018	004	3	3	3	1	ID076	BY055	18051050	Fast movement A-C were associated
17/08/2018	023	1	1	1	1	ID082	BY059	18051054	
18/08/2018	001	1	1	1	0	ID083	BY060	No Sample	
24/08/2018	002	2	2	2	2	ID089	BY064	18051058_A, 18051059_B	Mum/calf pair Influenced by platform; change in direction on approach, short bursts of fast movement, Animal A thin,
24/08/2018	005	1	1	1	1	ID091	BY066	18051061	
24/08/2018	012	1	1	1	0	ID093	BY068	No Sample	
24/08/2018	001	1	1	1	0	ID094	BY069	No Sample	
26/08/2018	001	1	1	1	0	ID098	BY073	No Sample	
26/08/2018	007	1	1	1	1	ID100	BY074	18051064	
26/08/2018	016	1	1	0	0	N/A	N/A	N/A	Couldn't resight animal upon approach No natural marking sheet
27/08/2018	005	1	1	1	1	ID104	BY075	18051065	
31/08/2018	002	1	1	1	0	ID105	BY076	No Sample	Platform avoidance: fast movement and direction change during one vessel approach
31/08/2018	003	2	2	2	0	ID106	BY077	No Sample	
31/08/2018	005	1	1	1	0	ID107	BY078	No Sample	
01/09/2018	002	1	1	1	1	ID108	BY079	18051066	
01/09/2018	003	1	1	1	0	ID109	BY080	No Sample	
01/09/2018	004	4	3	3	1	ID112	BY081	18051067_C	Mum/calf pair associated with animal C, fourth animal joined at end of sighting (no photos), Platform avoidance: fast movement upon approach, Preliminary PhotoID: Needs further analysis
01/09/2018	013	2	2	2	0	ID113	BY082	No Sample	A+B Associated Evasive to platform: burst of fast movement away from vessel
01/09/2018	014	1	1	1	0	ID114	BY083	No Sample	Platform avoidance: fast movement and direction changes on vessel approaches
01/09/2018	016	1	1	1	0	ID115	BY084	No Sample	Long dives, dall's porpoise in vicinity
02/09/2018	005	1	1	1	0	ID117	BY086	No Sample	Random subsurface movements and fast movements (at surface) at beginning of sighting, Jumping fish observed in area (no photos)
02/09/2018	007	1	1	1	0	ID118	BY087	No Sample	Long dives
02/09/2018	012	4	2	2	1	ID119	BY088	18051069	Animals A and B were both singletons
02/09/2018	016	2	2	2	0	ID120	BY089	No Sample	
03/09/2018	017	1	1	1	1	ID121	BY090	18051070	
03/09/2018	022	1	1	1	0	ID122	BY091	No Sample	
03/09/2018	026	1	1	1	0	ID123	BY092	No Sample	
06/09/2018	001	2	1	1	0	ID124	BY093	No Sample	Singleton
06/09/2018	022	1	1	1	0	ID125	BY094	No Sample	Short burst of fast movement

Survey Date	Sight No	School Size	Photographed	Photo IDed	Biopsied	ID Form Number	BY Form Number	S/No	Fin whale Sighting Notes e.g. Behavs, Assocs, Reaction to dart, Unusual
21/09/2018	009	2	2	2	2	ID133	BY101	18051074 (A), 18051075 (B)	A: 21.2 m, B: 18.4 m
Total	**53**	**95**	**75**	**68**	**24**				

Table 5e. Summary of killer whale sightings. ID Form No: natural marking datasheet form number. BY Form No: Biopsy datasheet form number. S/No: Biopsy sample number is concatenated Year (18) | Species code (e.g. killer whale 27) | Boat code (1) | Serial number (consecutive number for all samples throughout the cruise starting at 001). If S/No is N/A no biopsy attempt was made. If S/No is 'No Sample' a biopsy attempt was made; i.e., shooters were on standby, but no sample was collected (shots may or may not have been fired).

Survey Date	Sight No	School Size	Photographed	Photo IDed	Biopsied	ID Form No	BY Form No	S/No	Killer whale Sighting Notes e.g. Behavs, Assocs, Reaction to dart, Unusual
26/07/2018	018	12	8	6	3	ID0026	BY015	18271015_A 18271016_B 18271017_C	Further photo-analysis is required
07/08/2018	012	1	1	1	1	ID040	BY025	18271025	Male
12/08/2018	002	15	8	5	0	ID048	BY030	No Sample	Further photo- analysis is required School was divided into 3 groups
12/08/2018	016	5	5	5	1	ID049	BY031	18271029_A	Mixed school with sight#017 Reaction to dart: shiver and tail slash before submerging Broken dart
17/08/2018	005	3	3	3	1	ID077	BY005	17271015_A	School was divided, A and B associated All individuals were evasive
01/09/2018	005	1	1	1	1	ID110	N/A	N/A	Male Joined with sight#009
01/09/2018	009	1	1	1	0	ID111	N/A	N/A	Joined with sight#005
22/09/2018	014	25	20	17	1	ID135	BY103	18271076	Gray colored feces.
Total	**8**	**63**	**47**	**39**	**7**				

Table 6a. Success rate per sonobuoy type, manufacturer, and year for the 2018 IWC-POWER cruise. 77C sonobuoys were only deployed in deep water.

Type	Manuf.	Year	# deployed	# successful	% success rate
53F	UND	2008	93	83	89%
		2012	113	104	92%
	SPW	2011	1	1	100%
		2012	2	2	100%
		2014	1	1	100%
77C	UND	2004	33	16	48%
	SPW	2005	10	10	100%
Total			**253**	**217**	**86%**

Table 6b. Weekly summary of successful sonobuoy deployments (# deployed sonobuoys), recording hours, and species detected (on # of buoys).

Dates	# successful (# deployed)	Recording time (hh:mm:ss)	Fin	Killer	Sperm	NPRW	Hump	Gray	Fish	Other
16-21 July	36 (38)	71:58:05	11	9 (3)	1	9	5	0	1	0
22-28 July	17 (18)*	79:56:50	3	3 (1)	0	3	2	9	1	0
29 July – 4 Aug	20 (20)	80:41:06	5	0	0	0	(3)	1	1	0
5-11 August	25 (27)	76:14:45	20	9	15	0	1 (1)	0	0	0
12-18 August	25 (37)	78:20:57	7	12 (1)	24	0	8	0	0	0
19-25 August	16 (21)*	68:23:23	2	2 (1)	7	0	(1)	0	1	Baird's beaked whale – 1
26 Aug – 1 Sept	21 (24)	73:09:34	14	8 (2)	20	0	1	0	0	0
2-11 Sept	59 (68)	171:01:22**	39	13	5	15(2)	7(3)	0	4	Possible earthquake - 2
TOTAL	**217 (253)**	**699:46:12**	**101**	**56 (8)**	**72**	**27 (2)**	**24 (8)**	**10**	**8**	**3**

*Decreased sonobuoy deployments were the result of inclement weather.
**Overly inflated recording hours are a result of multiple buoys deployed and monitored at once while in the NPRW critical habitat.

Table 7. Summary of marine debris observations during whole cruise. On-effort observations were made only during the first 15 minutes of each hour while on survey. Off-effort observations were strictly opportunistic.

IWC code	Description	ON Effort	OFF Effort	Total
134	Single fishing float	2	1	3
136	Wood plank, single, natural, length 10 m	2	1	3
162	Plastic, less than 1 square meter (plastic sheet)	1	0	1
163	Plastic, 1-3 square meters (plastic sheet)	1	4	5
199	Plastic bottle, clear color, 2.0 liters	4	1	5
199	Plastic jug/bottle, clear color, 4.0 liters	1	0	1
199	Electric light bulb (red, 0.3 m)	0	1	1
	Total	11	8	19

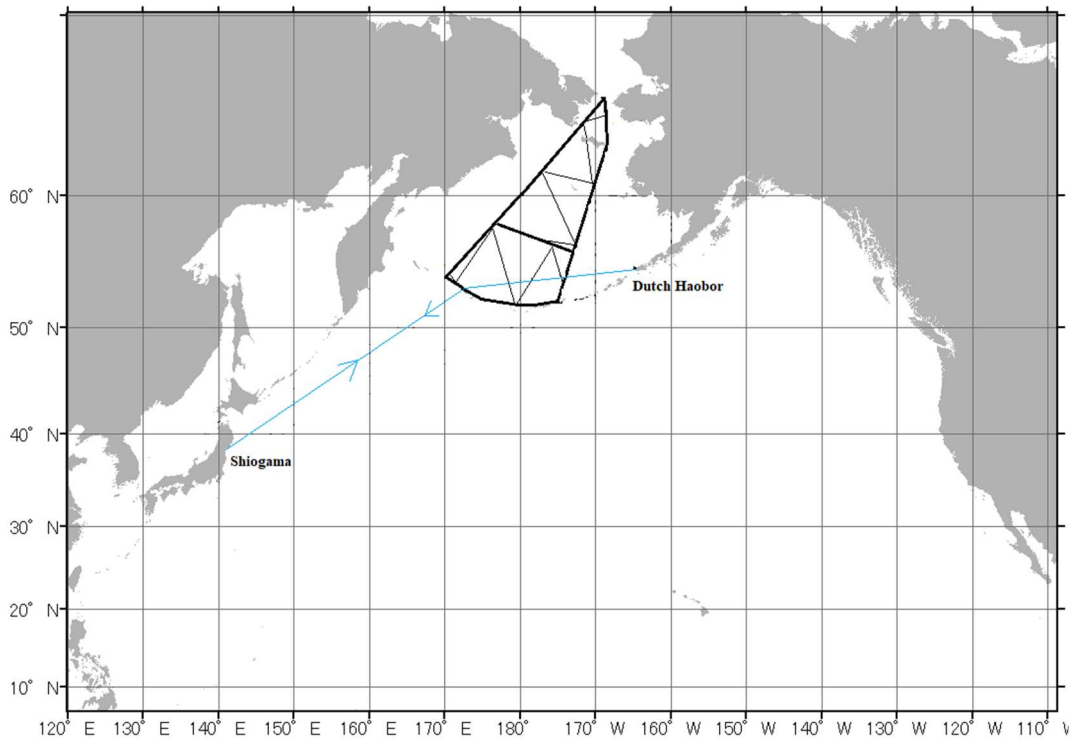

Figure 1a. Research area, transit and survey track lines with start and end points for the 2018 IWC-POWER cruise.

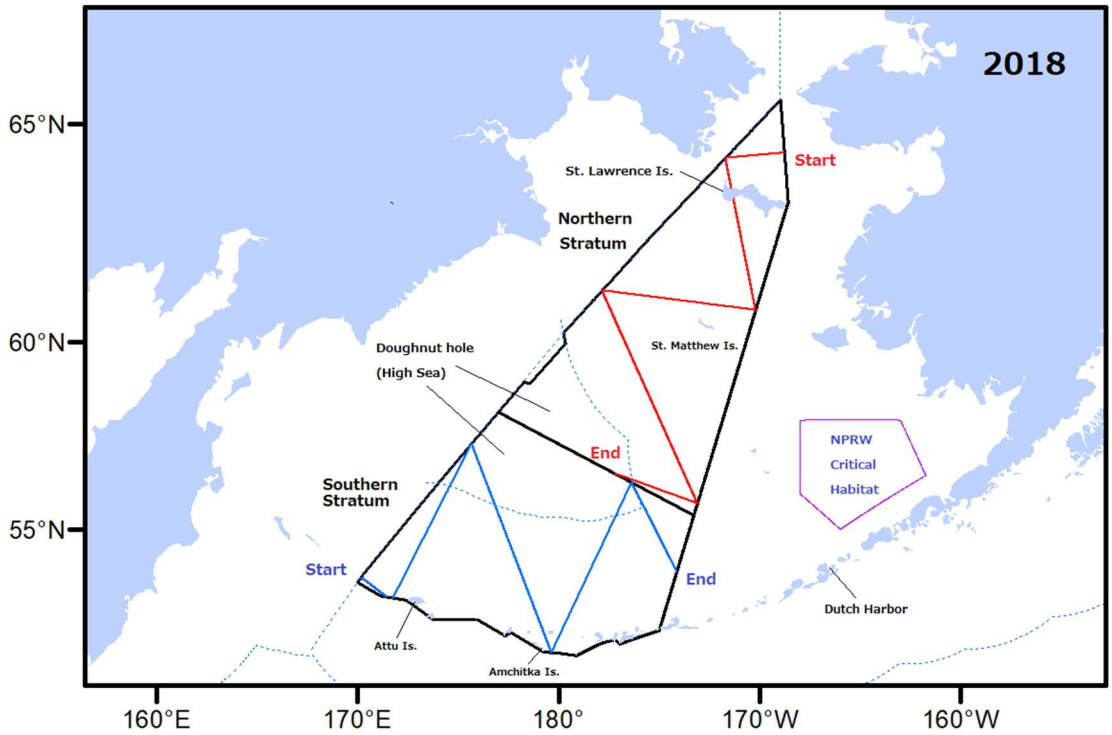

Figure 1b. Predetermined cruise track lines (red: Northern Stratum, blue: Southern Stratum) and course directions taken within the main survey area for the 2018 IWC-POWER cruise survey.

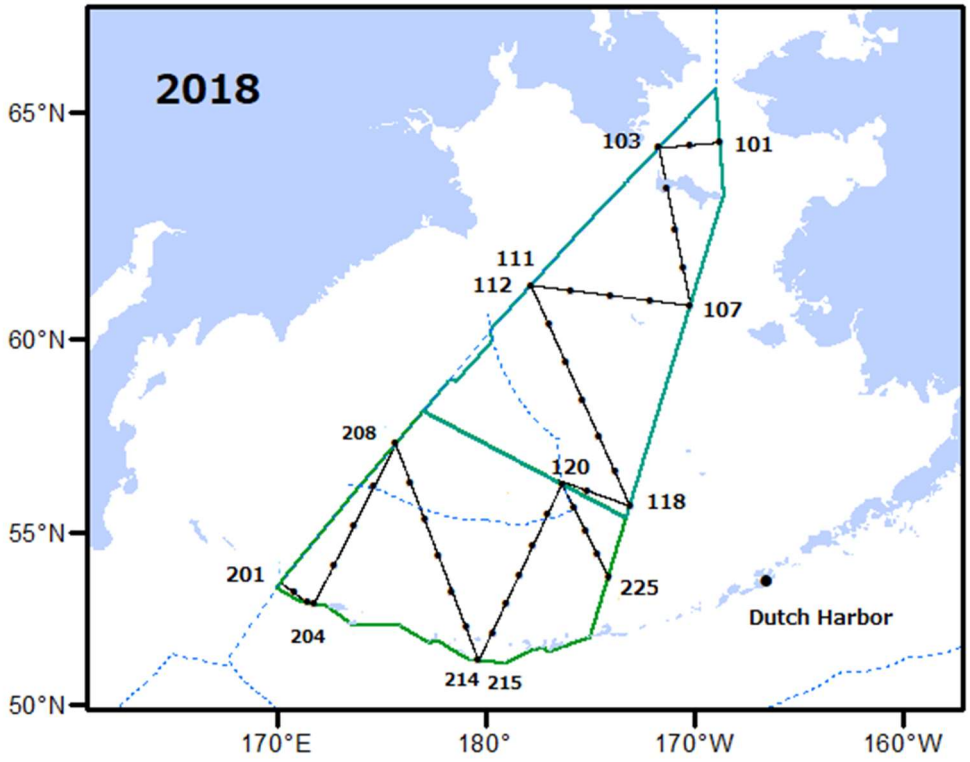

Figure 1c. The waypoint number and course directions (Northern Stratum: from 101 to 120, Southern Stratum: from 201-225) taken within the main survey area for the 2018 IWC-POWER cruise survey.

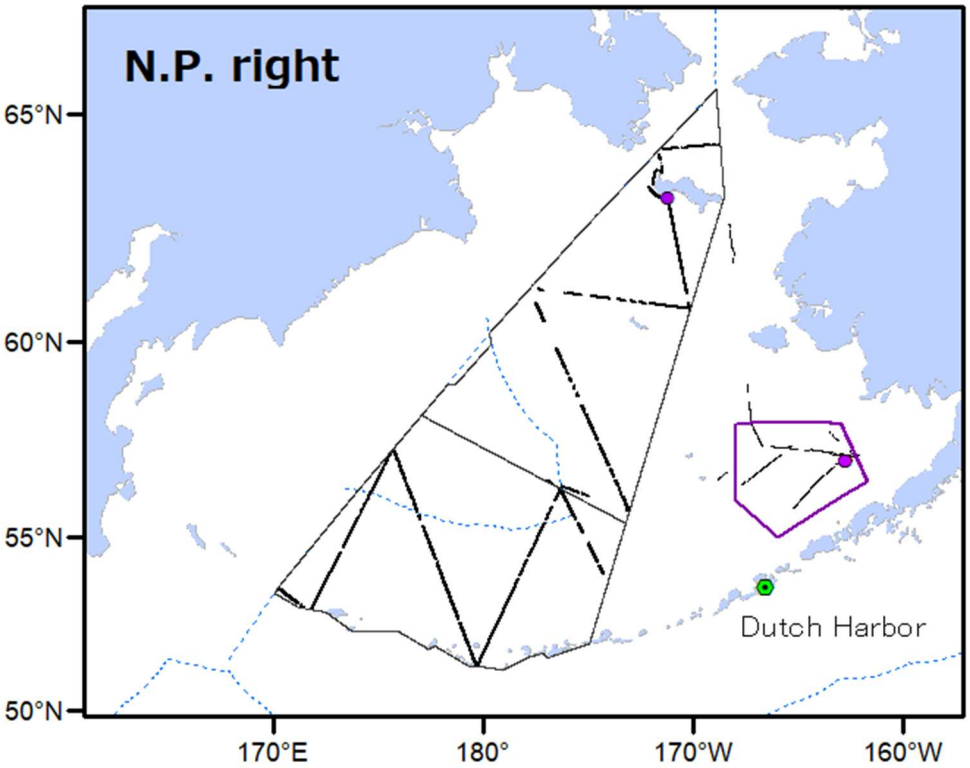

Figure 2a. The searching effort (thin line) and sighting positions (purple circles) of North Pacific right whale (NPRW; 3 schools/3 individuals) during the 2018 IWC-POWER cruise. Pentagon (purple line) delineates the critical habitat area for NPRW (NOAA, 2016). A solitary school (n=1) was sighted on the trackline in the northern stratum. The other two solitary schools were sighted close to each other in the NPRW critical habitat. These sightings were detected by acoustics and then sighted during transit between Dutch Harbor and the start point of the northern stratum.

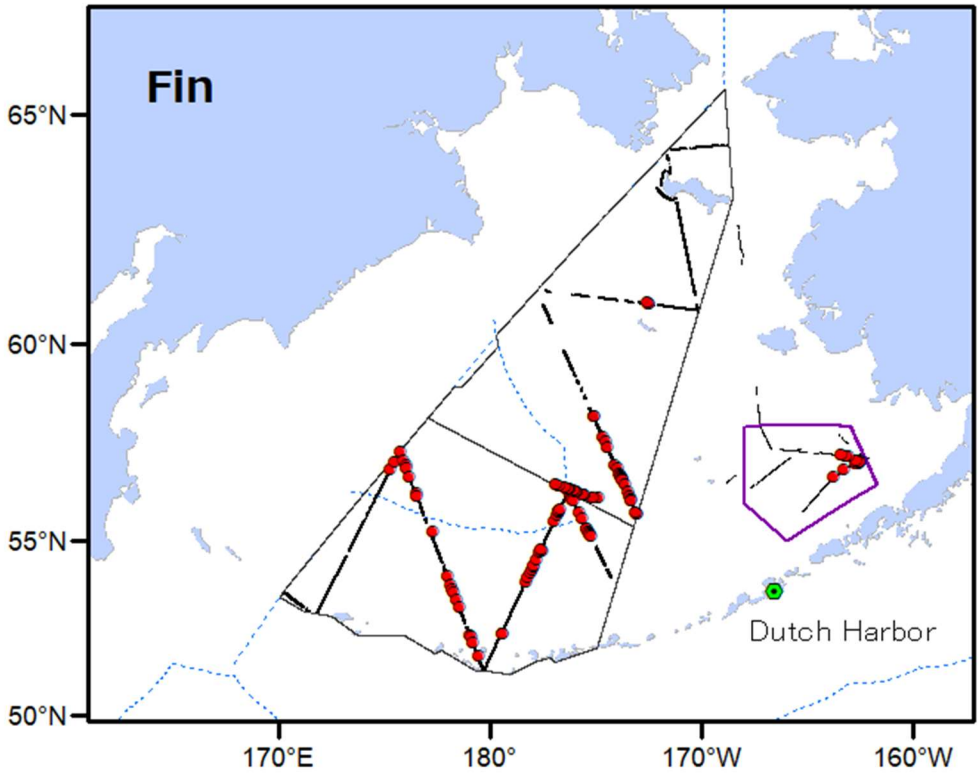

Figure 2b. The searching effort (thin line) and sighting positions of fin whales (red circles) during the 2018 IWC-POWER cruise.

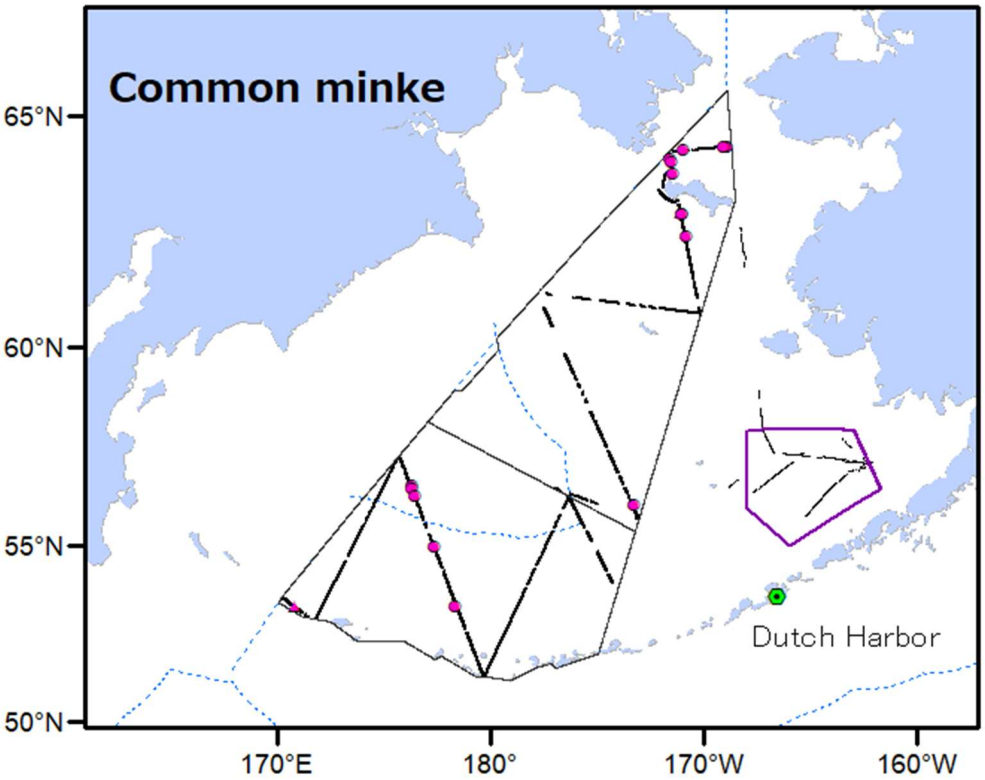

Figure 2c. The searching effort (thin line) and sighting positions of common minke whales (pink circles) during the 2018 IWC-POWER cruise.

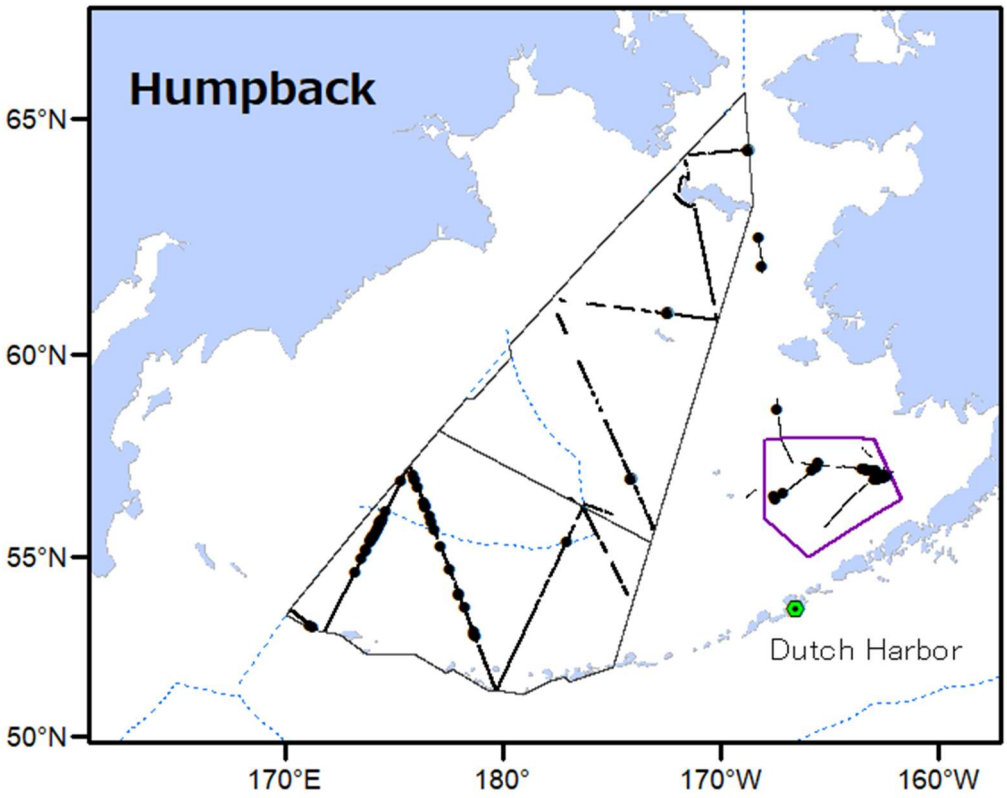

Figure 2d. The searching effort (thin line) and sighting positions of humpback whales (black circles) during the 2018 IWC-POWER cruise.

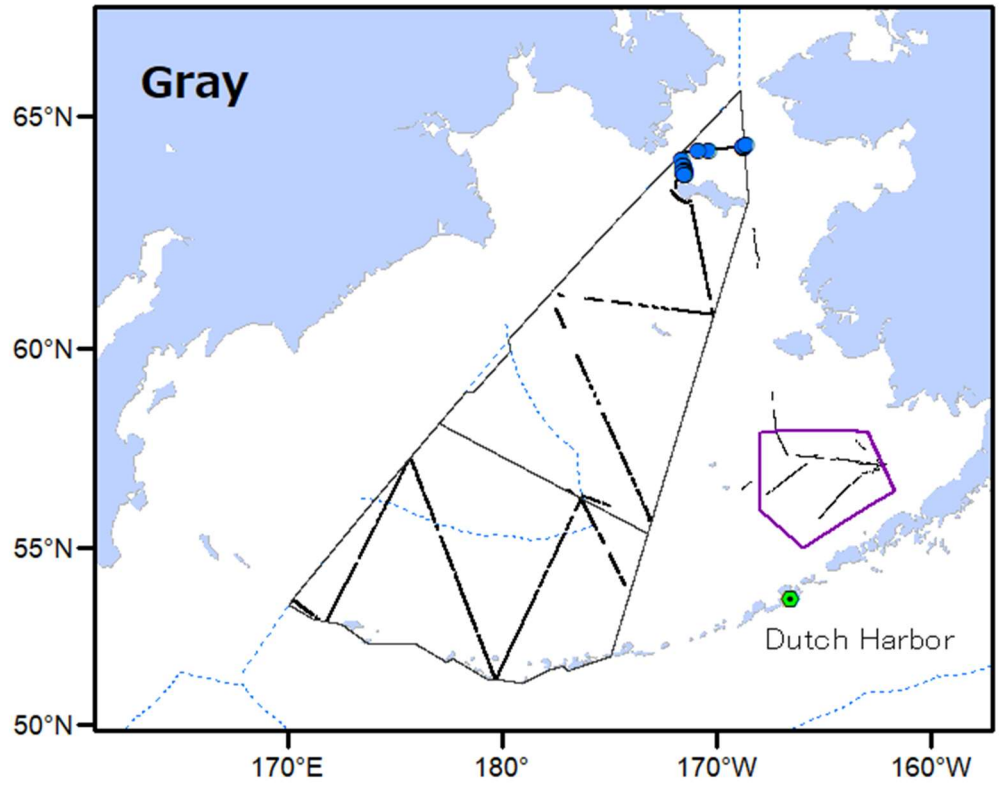

Figure 2e. The searching effort (thin line) and sighting positions of gray whales (blue circles) during the 2018 IWC-POWER cruise.

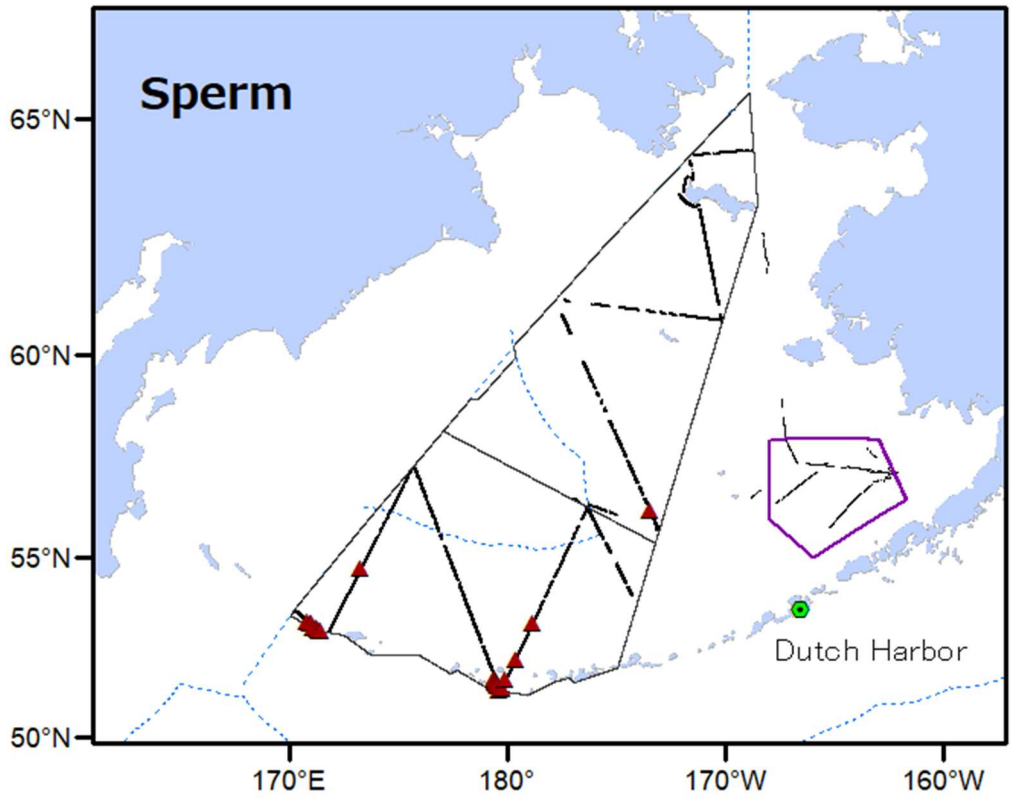

Figure 2f. The searching effort (thin line) and sighting positions (red triangles) of sperm whales during the 2018 IWC-POWER cruise.

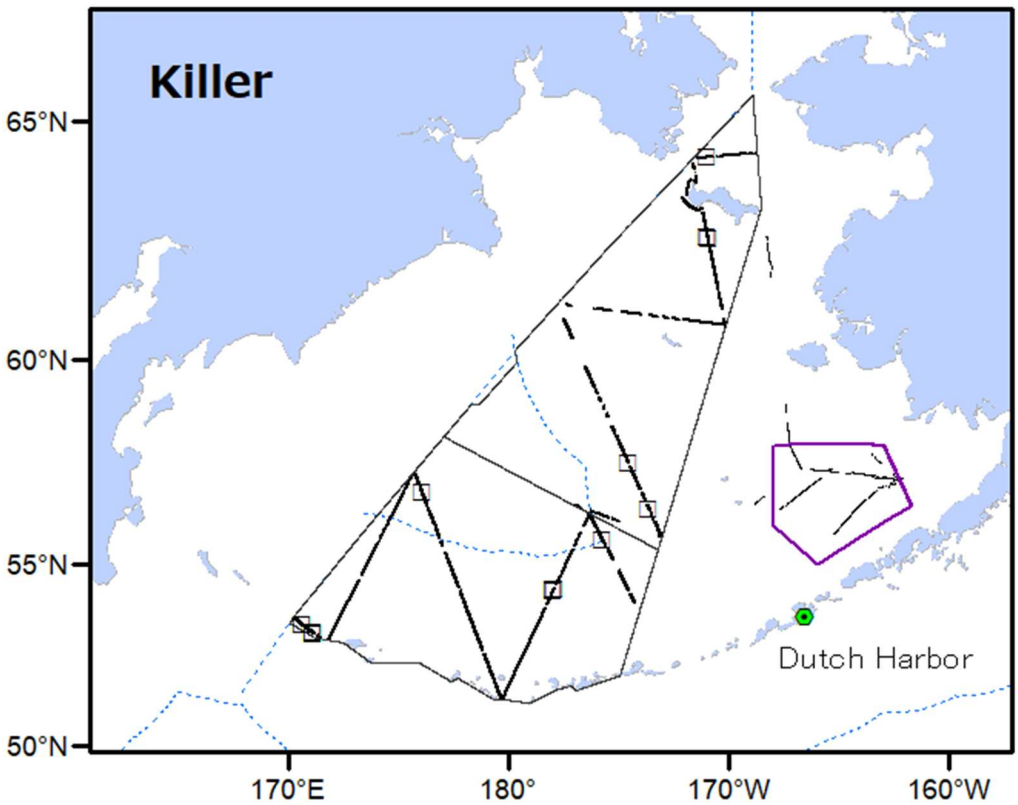

Figure 2g. The searching effort (thin line) and sighting positions (open squares) of killer whales during the 2018 IWC-POWER cruise.

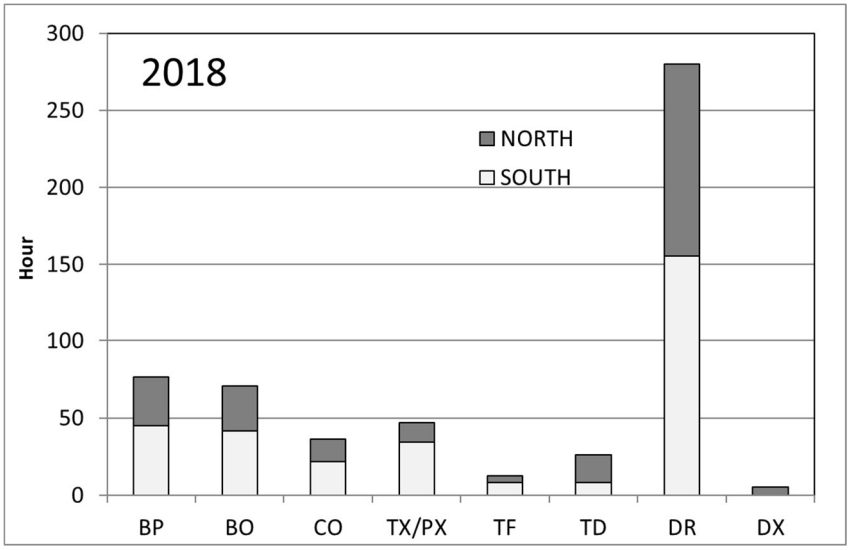

Figure 3. Breakdown of research time in hours, by effort code in the research area during the 2018 POWER cruise (Original trackline, Area code: 72 and 73). BP: Passing mode searching, BO: Independent Observer mode, CO: Confirmation of school, TX/PX: Biopsy / Photo-ID experiments, TF: Time back to trackline, TD: Top down steaming, DR: Drifting (including 16 hours between northern and southern off-effort steaming), DX: Distance and angle estimate experiment.

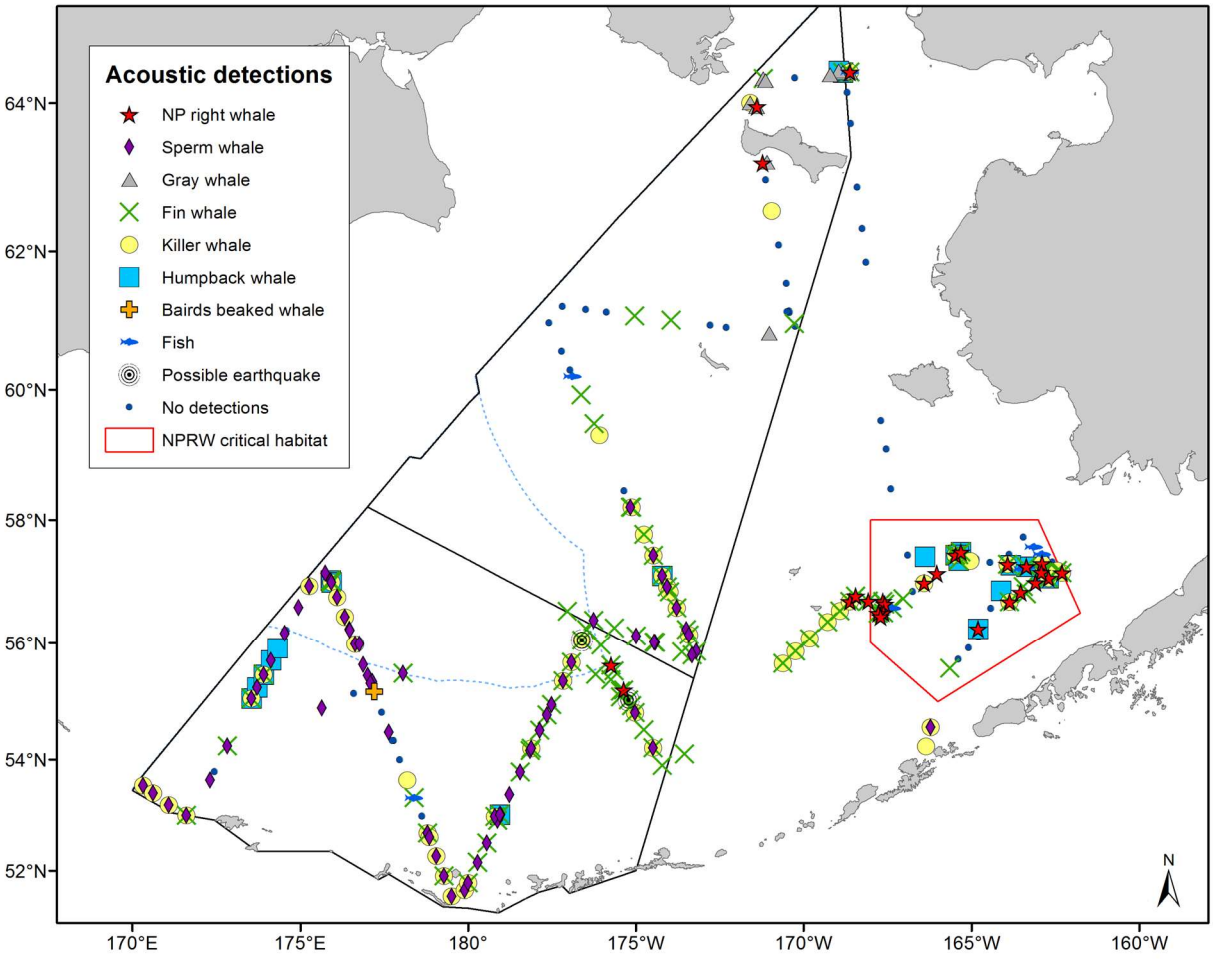

Figure 4. Location and species detected on all sonobuoy deployments during the 2018 POWER cruise.

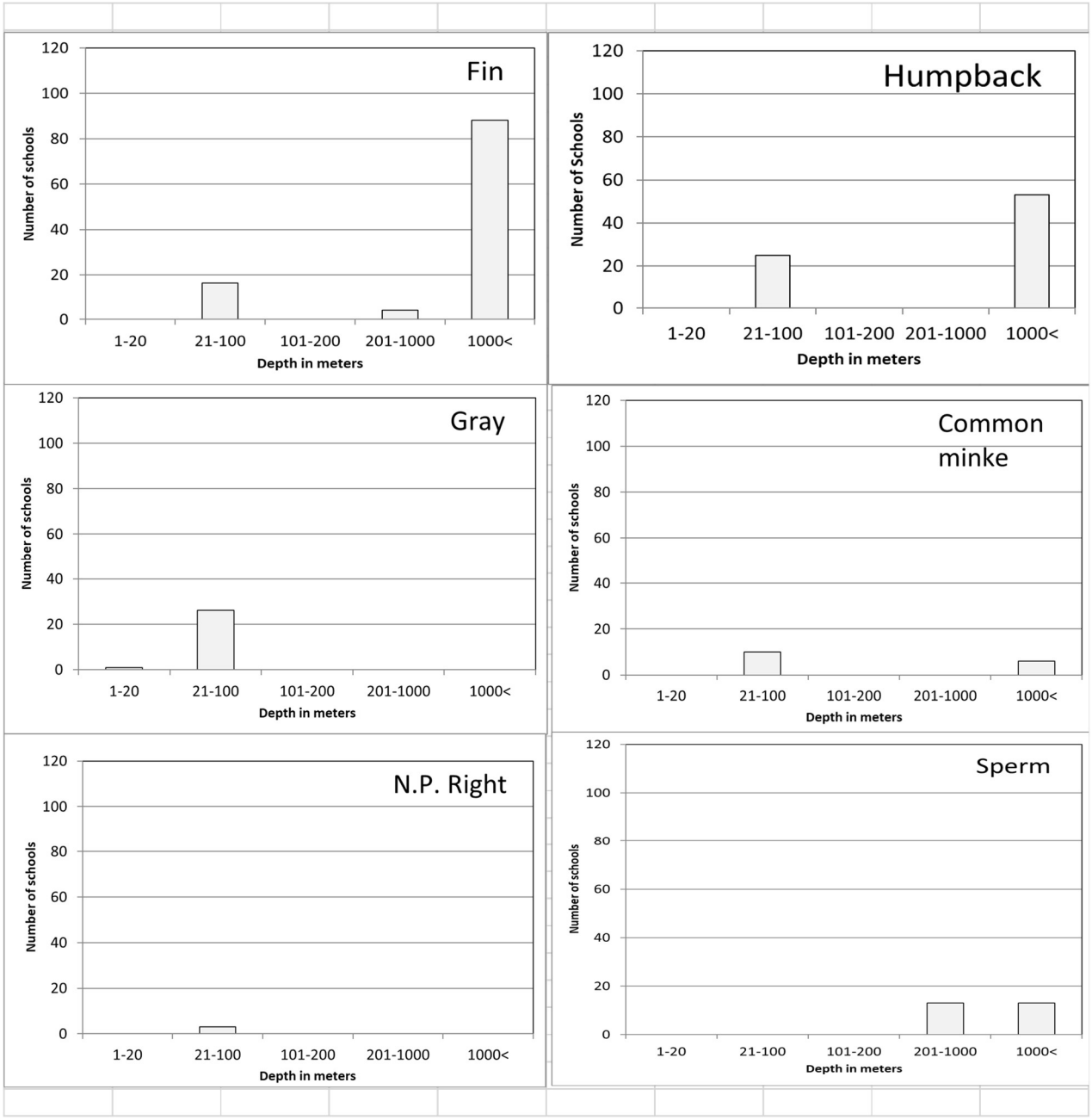

Figure 5. Breakdown of the water depth (m) at the sighting positions for the main species sighted in the research area.

APPENDICES

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

Ship photo:

Ship specifications:

	Yushin-Maru No.2
Call sign	JPPV
Length overall [m]	69.61m
Molded breadth [m]	11.5m
Gross tonnage (GT)	747
Barrel height [m]	19.5m
IO barrel height [m]	13.5m
Upper bridge height [m]	11.5m
Bow height [m]	6.5m
Engine power [PS / kW]	5303/3900 (PS/kW)

Crew list:

Title	***Yushin-Maru No.2***
Captain	Hidenori Kasai
Chief Officer	Tohru Takamatsu
Second Officer	Kazuu Tamahashi
Chief Engineer	Yoshihiro Ohura
First Engineer	Kazuhito Abe
Second Engineer	Kazuo Mito
Third Engineer	Masahiro Matsuda
Chief Operator/Purser	Jun Kuwaoka
Boatswain	Kenji Wakatsuki
Quartermaster	Takato Sawabe
Quartermaster	Yamato Sekine
Quartermaster	Kohsuke Matsuguchi
Sailor	Kaimu Sato
Sailor	Toshikazu Takahashi
Sailor	Yushin Toguchi
Chief Steward	Akihiko Toyomura
Steward	Jyunya Oguchi

Appendix B. Comparison of weather conditions (wind speed / visibility) among past cruises (2010-2018).

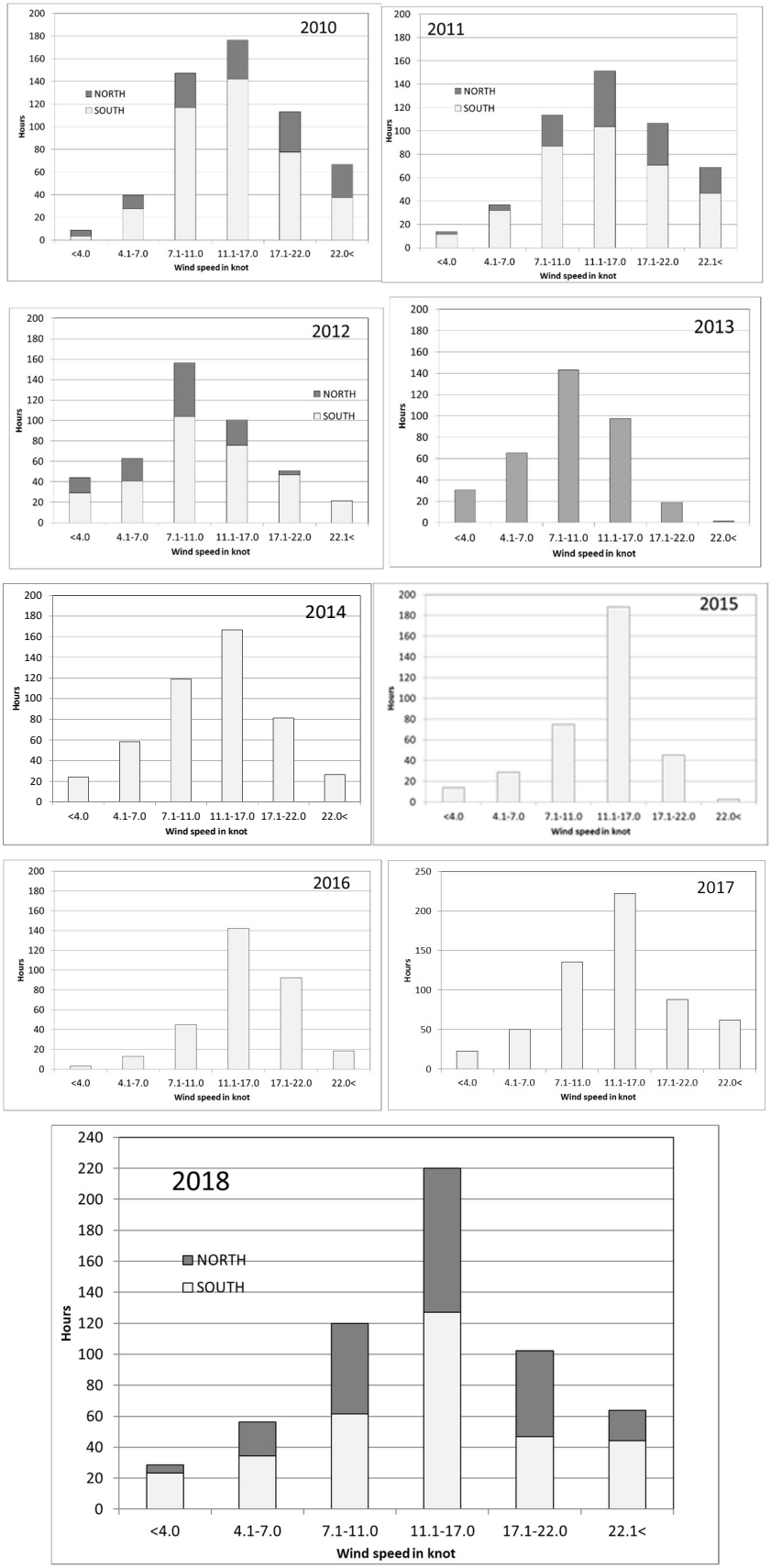

Figure B1. Breakdown of research time in hours during 2010 to 2018 surveys in research area by wind speed (in knots).

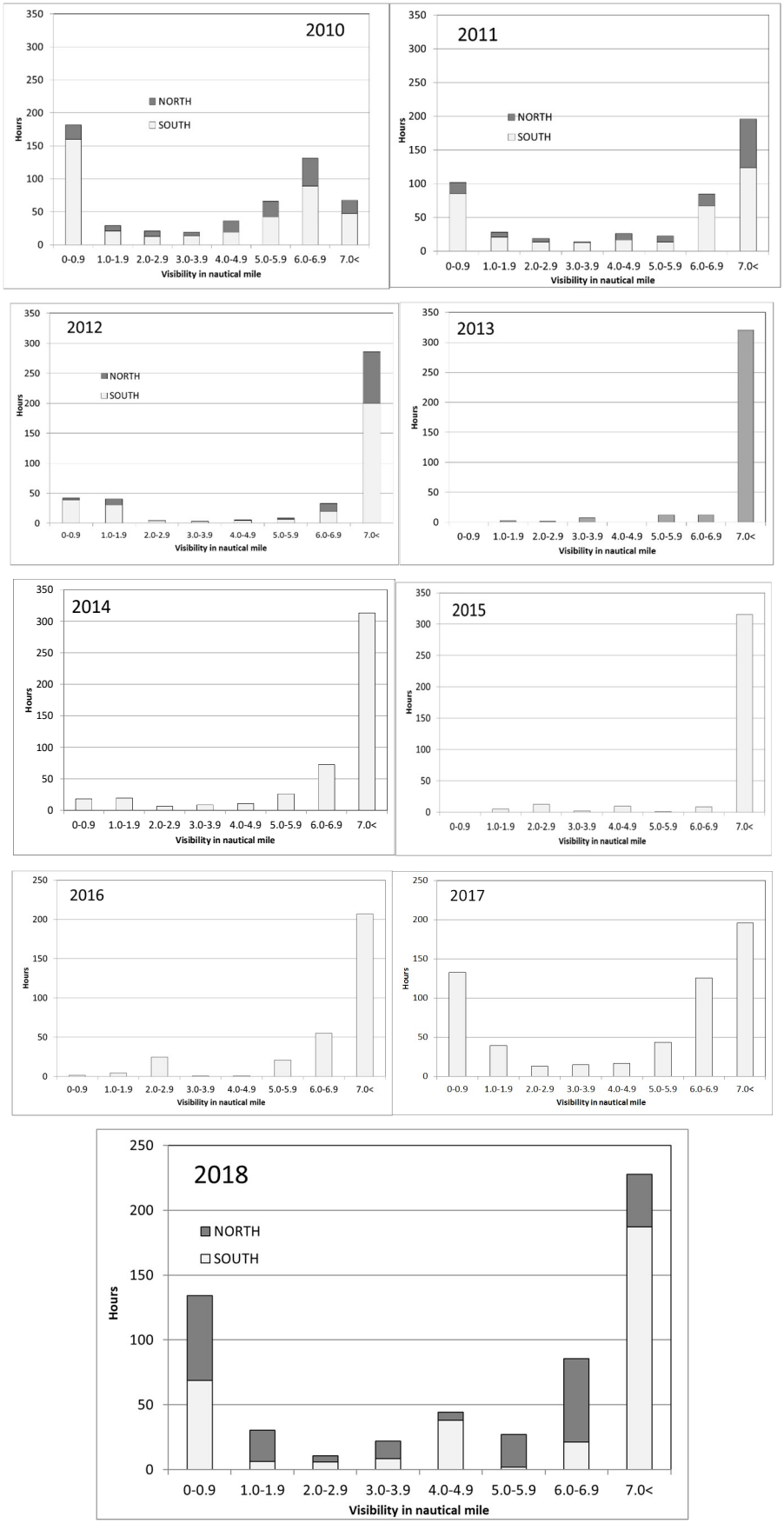

Figure B2. Breakdown of research time in hours during 2010 to 2018 surveys in research area by visibility (in nautical miles).

Appendix C. Complete list of all sonobuoy deployments and species detected during the 2018 POWER cruise. Success: 1 = successful, 0 = not successful. ADT = Alaska Daylight Time. Detections: 0 = not detected, 1 = detected, 2 = maybe. Unknown = unknown species or signal.

Station#	Success?	Date	Time (ADT)	Latitude	Longitude	Water depth (m)	NPRW	Humpback	Fin	Orca	Gray	Sperm	Fish	Other	Notes
1	1	16-Jul	15:03:36	54.22448	-166.35359	780	0	0	0	1	0	0	0	0	
2	1	16-Jul	18:25:58	54.55794	-166.21655	477	0	0	0	1	0	1	0	0	
3	1	17-Jul	7:39:40	55.56201	-165.63972	120	0	0	1	0	0	0	0	0	
4	1	17-Jul	8:49:46	55.72073	-165.39262	112	0	0	0	0	0	0	0	0	
5	1	17-Jul	12:27:34	55.91087	-165.08224	100	0	0	0	0	0	0	0	0	
6	1	17-Jul	13:44:26	56.0993	-164.78052	95	0	0	0	0	0	0	0	0	
7	1	17-Jul	15:05:10	56.30215	-164.46296	90	0	0	0	2	0	0	0	0	
8	1	17-Jul	16:17:50	56.48072	-164.17878	82	0	0	0	2	0	0	0	0	
9	1	17-Jul	17:38:10	56.68061	-163.86193	72	1	0	1	1	0	0	0	0	
10	1	17-Jul	19:03:20	56.83718	-163.53229	71	1	0	0	0	0	0	0	0	
11	1	18-Jul	6:29:58	56.93202	-163.44894	67	0	0	1	0	0	0	0	0	
12	1	18-Jul	7:05:26	56.81232	-163.35616	71	0	0	1	0	0	0	0	0	
13	1	18-Jul	8:40:40	56.99337	-163.0824	67	1	0	0	0	0	0	0	0	
14	1	18-Jul	9:54:40	57.06468	-162.69963	60	1	1	1	1	0	0	0	0	
15	1	18-Jul	11:18:12	57.15648	-162.29344	57	1	0	1	1	0	0	0	0	
16	0	18-Jul	12:47:46	57.21327	-162.42993	55	0	0	0	0	0	0	0	0	
17	1	18-Jul	12:57:04	57.18893	-162.43074	53	0	0	1	1	0	0	0	0	
18	1	18-Jul	19:09:48	57.16169	-162.82989	57	0	1	1	0	0	0	0	0	
19	1	19-Jul	6:19:54	57.30222	-162.88745	57	1	0	0	1	0	0	0	0	
20	1	19-Jul	7:01:26	57.16325	-162.91261	57	1	1	1	0	0	0	0	0	
21	1	19-Jul	8:36:45	57.25595	-163.3629	58	1	1	1	0	0	0	1	0	
22	1	19-Jul	10:07:04	57.29214	-163.9216	54	1	0	1	1	0	0	0	0	
23	1	19-Jul	11:19:04	57.32031	-164.43756	56	0	0	0	0	0	0	0	0	
24	1	19-Jul	12:53:22	57.34486	-165.01962	64	0	0	0	1	0	0	0	0	
25	1	19-Jul	14:02:50	57.37069	-165.44314	67	0	0	0	0	0	0	0	0	
26	1	19-Jul	15:27:38	57.39604	-165.9592	70	0	0	0	0	0	0	0	1	unknown
27	1	19-Jul	16:36:40	57.41577	-166.38302	70	0	1	0	0	0	0	0	0	
28	1	19-Jul	18:00:50	57.44122	-166.89642	70	0	0	0	0	0	0	0	0	
29	0	19-Jul	21:13:38	57.88806	-167.29669	68	0	0	0	0	0	0	0	0	
30	1	20-Jul	7:40:48	58.00012	-167.29101	64	0	0	0	2	0	0	0	0	
31	1	20-Jul	10:08:06	58.48542	-167.39447	47	0	0	0	0	0	0	0	0	
32	1	20-Jul	16:43:28	59.10418	-167.54073	46	0	0	0	0	0	0	0	0	
33	1	20-Jul	18:59:04	59.53484	-167.69746	35	0	0	0	0	0	0	0	0	
34	1	21-Jul	7:08:42	61.84658	-168.13808	30	0	0	0	0	0	0	0	0	
35	1	21-Jul	9:35:48	62.31479	-168.25555	33	0	0	0	0	0	0	0	0	
36	1	21-Jul	12:33:00	62.88464	-168.40204	40	0	0	0	0	0	0	0	0	
37	1	21-Jul	16:32:40	63.73734	-168.59788	34	0	0	0	0	0	0	0	0	
38	1	21-Jul	18:30:34	64.14258	-168.69381	40	0	0	0	0	0	0	0	0	
39	1	22-Jul	6:39:50	64.40493	-168.62195	43	1	0	1	1	1	0	1	0	
40	1	22-Jul	7:43:48	64.40012	-168.82497	43	0	1	1	0	1	0	0	0	
41	0	23-Jul	6:35:20	64.43581	-168.94878	43	0	0	0	0	0	0	0	0	
42	1	23-Jul	6:41:20	64.41981	-168.95242	42	0	1	0	2	1	0	0	0	
43	1	24-Jul	10:25:12	64.37241	-169.20644	42	0	0	0	0	1	0	0	0	
44	1	24-Jul	12:56:02	64.33019	-170.26833	40	0	0	0	0	0	0	0	0	
45	1	24-Jul	17:57:10	64.32186	-171.19888	45	0	0	1	0	1	0	0	0	
46	1	25-Jul	7:34:17	64.2974	-171.12736	45	0	0	0	0	1	0	0	0	
47	1	25-Jul	13:58:02	64.00896	-171.58113	30	0	0	0	1	1	0	0	0	
48	1	26-Jul	7:33:56	63.95695	-171.39142	30	1	0	0	0	1	0	0	0	
49	1	26-Jul	20:57:06	63.21082	-171.21646	42	1	0	0	0	0	0	0	0	
50	1	27-Jul	7:36:32	63.2208	-171.08363	38	0	0	0	0	1	0	0	0	
51	1	27-Jul	15:47:42	62.98378	-171.12729	42	0	0	0	0	0	0	0	0	
52	1	27-Jul	19:31:52	62.56093	-170.94641	45	0	0	0	1	0	0	0	0	
53	1	28-Jul	8:02:34	62.48984	-170.91274	45	0	0	0	0	0	0	0	0	

Station#	Success?	Date	Time (ADT)	Latitude	Longitude	Water depth (m)	NPRW	Humpback	Fin	Orca	Gray	Sperm	Fish	Other	Notes
54	1	28-Jul	10:48:59	62.08705	-170.73937	50	0	0	0	0	0	0	0	0	
55	1	28-Jul	14:02:06	61.54799	-170.5127	49	0	0	0	0	0	0	0	0	
56	1	28-Jul	18:10:02	61.12828	-170.42521	50	0	0	0	0	0	0	0	0	
57	1	29-Jul	7:47:56	61.15243	-170.42833	52	0	0	0	0	0	0	0	0	
58	1	29-Jul	18:16:36	61.14196	-170.49389	52	0	0	0	0	0	0	0	0	
59	1	30-Jul	9:00:00	61.13905	-170.49107	52	0	0	0	0	0	0	0	0	
60	1	31-Jul	17:01:04	60.96912	-170.27533	53	0	2	1	0	0	0	0	0	
61	1	1-Aug	9:02:06	60.93043	-170.25607	53	0	0	0	0	0	0	0	0	
62	1	1-Aug	11:48:26	60.8328	-171.01196	58	0	0	0	0	1	0	0	0	
63	1	1-Aug	14:56:42	60.91444	-172.30213	68	0	0	0	0	0	0	0	0	
64	1	1-Aug	18:22:20	60.94482	-172.78715	67	0	0	0	0	0	0	0	0	
65	1	2-Aug	9:02:18	60.97271	-173.26679	72	0	2	0	0	0	0	0	0	
66	1	2-Aug	10:33:12	61.01795	-173.94633	82	0	0	1	0	0	0	0	0	
67	1	2-Aug	14:27:46	61.08215	-175.02993	97	0	0	1	0	0	0	0	0	
68	1	2-Aug	17:49:10	61.13578	-175.87238	107	0	0	0	0	0	0	0	0	
69	1	2-Aug	19:16:42	61.17176	-176.49338	115	0	0	0	0	0	0	0	0	
70	1	3-Aug	9:01:54	61.21749	-177.18985	172	0	0	0	0	0	0	0	0	
71	1	3-Aug	10:59:52	60.98067	-177.59045	170	0	0	0	0	0	0	0	0	
72	1	3-Aug	16:59:00	60.56688	-177.21089	150	0	0	0	0	0	0	0	0	
73	1	3-Aug	19:46:30	60.29105	-176.9618	147	0	0	0	0	0	0	0	0	
74	1	4-Aug	9:16:52	60.20195	-176.87924	142	0	0	0	0	0	0	1	0	
75	1	4-Aug	14:46:18	59.91961	-176.63274	145	0	2	1	0	0	0	0	0	
76	1	4-Aug	18:31:56	59.49047	-176.24366	138	0	0	1	0	0	0	0	0	
77	1	5-Aug	9:02:00	59.31482	-176.08479	140	0	0	0	1	0	0	0	0	
78	1	5-Aug	14:36:02	58.86593	-175.69654	133	0	2	0	0	0	0	0	0	
79	1	5-Aug	16:59:32	58.45644	-175.34729	164	0	0	0	0	0	0	0	0	
80	0	5-Aug	20:15:08	58.22162	-175.12402	1150	0	0	0	0	0	0	0	0	
81	1	5-Aug	20:24:32	58.20165	-175.1531	1150	0	0	1	0	0	1	0	0	
82	1	6-Aug	9:02:32	58.20074	-175.12222	1100	0	0	1	1	0	0	0	0	
83	1	6-Aug	11:30:24	57.7669	-174.75993	1100	0	0	1	1	0	0	0	0	
84	1	6-Aug	14:26:24	57.43236	-174.47615	1001	0	0	1	1	0	1	0	0	
85	1	6-Aug	18:17:20	57.10614	-174.21544	1670	0	1	1	1	0	1	0	0	
86	1	6-Aug	20:49:28	56.92438	-174.06408	>1000	0	0	1	1	0	1	0	0	
87	1	7-Aug	10:02:06	56.84331	-173.99252	>1000	0	0	1	1	0	0	0	0	
88	1	7-Aug	17:15:34	56.5772	-173.77429	2880	0	0	1	1	0	1	0	0	
89	0	7-Aug	21:26:02	56.23121	-173.49934	>1000	0	0	0	0	0	0	0	0	
90	1	7-Aug	21:29:54	56.22084	-173.48962	>1000	0	0	1	0	0	1	0	0	
91	1	8-Aug	10:02:04	56.13226	-173.4169	>1000	0	0	1	1	0	1	0	0	
92	1	8-Aug	19:01:50	55.85329	-173.19872	>1000	0	0	1	0	0	1	0	0	
93	1	8-Aug	22:05:24	55.78756	-173.32445	>1000	0	0	1	0	0	1	0	0	
94	1	9-Aug	10:02:06	55.83871	-173.63088	>1000	0	0	1	0	0	0	0	0	
95	1	10-Aug	10:02:34	56.00201	-174.41969	>1000	0	0	1	0	0	1	0	0	
96	1	10-Aug	10:10:12	56.00906	-174.45448	>1000	0	0	1	0	0	1	0	0	
97	1	10-Aug	11:47:08	56.11238	-174.98424	>1000	0	0	1	0	0	1	0	0	
98	1	10-Aug	16:26:06	56.24655	-175.64241	>1000	0	0	1	0	0	0	0	0	
99	1	10-Aug	19:09:38	56.3686	-176.2511	>1000	0	0	1	0	0	1	0	0	
100	1	10-Aug	21:50:42	56.5251	-177.0419	>1000	0	0	1	0	0	0	0	0	
101	1	11-Aug	12:01:36	55.47783	178.05991	>1000	0	0	1	0	0	1	0	0	
102	1	11-Aug	16:12:42	55.1347	176.59083	>1000	0	0	0	0	0	0	0	0	
103	1	11-Aug	19:03:40	54.88866	175.64462	>1000	0	0	0	0	0	1	0	0	
104	0	12-Aug	11:23:07	53.54641	170.29378	>1000	0	0	0	0	0	0	0	0	
105	1	12-Aug	11:28:11	53.53596	170.31617	>1000	0	0	0	1	0	1	0	0	
106	1	12-Aug	13:18:52	53.39917	170.61175	957	0	0	0	1	0	1	0	0	
107	1	12-Aug	15:14:08	53.18542	171.08066	>1000	0	0	0	1	0	1	0	0	
108	1	12-Aug	18:45:06	53.00302	171.60752	940	0	0	1	1	0	1	0	0	
109	1	12-Aug	22:44:34	53.63191	172.31353	>1000	0	0	0	0	0	1	0	0	
110	1	13-Aug	11:01:48	53.78093	172.43845	>1000	0	0	0	0	0	0	0	0	

Station#	Success?	Date	Time (ADT)	Latitude	Longitude	Water depth (m)	NPRW	Humpback	Fin	Orca	Gray	Sperm	Fish	Other	Notes
111	0	13-Aug	13:25:22	54.20535	172.80729	>1000	0	0	0	0	0	0	0	0	
112	1	13-Aug	13:33:56	54.23113	172.82797	>1000	0	0	1	0	0	1	0	0	
113	0	13-Aug	17:04:04	54.70168	173.23977	>1000	0	0	0	0	0	1	0	0	
114	0	13-Aug	20:00:54	54.98732	173.48631	>1000	0	0	0	0	0	1	0	0	
115	1	13-Aug	20:20:22	55.05103	173.54831	>1000	0	1	1	1	0	1	0	0	
116	0	14-Aug	11:01:50	55.08544	173.58008	>1000	0	0	0	0	0	0	0	0	
117	0	14-Aug	11:08:38	55.10558	173.59832	>1000	0	1	1	1	0	1	0	0	
118	1	14-Aug	13:43:50	55.24283	173.71923	>1000	0	1	0	0	0	1	0	0	
119	1	14-Aug	16:25:44	55.4571	173.91243	>1000	0	1	1	1	0	1	0	0	
120	1	15-Aug	11:01:48	55.69947	174.13145	>1000	0	1	0	0	0	1	0	0	
121	1	15-Aug	14:06:26	55.9084	174.31733	>1000	0	1	0	0	0	0	0	0	
122	0	15-Aug	16:41:16	56.13227	174.52056	>1000	0	0	0	0	0	0	0	0	
123	1	15-Aug	16:47:58	56.15232	174.53973	>1000	0	0	0	0	0	1	0	0	
124	1	16-Aug	11:01:48	56.20387	174.58396	>1000	0	0	0	0	0	0	0	0	
125	0	16-Aug	13:04:04	56.56685	174.92563	>1000	0	0	0	0	0	0	0	0	
126	1	16-Aug	13:10:32	56.58617	174.94355	>1000	0	0	0	0	0	1	0	0	
127	0	16-Aug	15:55:26	56.92256	175.27499	>1000	0	0	0	0	0	0	0	0	
128	1	16-Aug	16:01:32	56.93912	175.26691	>1000	0	0	0	1	0	1	0	0	
129	0	16-Aug	20:40:06	57.27333	175.73771	>1000	0	0	0	0	0	0	0	0	
130	1	16-Aug	20:44:52	57.74897	175.74897	>1000	0	0	0	0	0	1	0	0	
131	0	16-Aug	22:45:02	57.00436	175.91144	>1000	0	0	0	0	0	0	0	0	
132	1	16-Aug	22:53:24	57.03144	175.90653	>1000	0	1	1	0	0	1	0	0	
133	1	17-Aug	11:01:52	57.00044	175.93252	>1000	0	1	1	1	0	1	0	0	
134	1	17-Aug	15:44:42	56.75723	176.10268	>1000	0	0	0	1	0	1	0	0	
135	1	17-Aug	18:20:40	56.42522	176.33071	>1000	0	0	0	1	0	1	0	0	
136	1	17-Aug	21:04:04	56.22773	176.46167	>1000	0	0	0	0	0	1	0	0	
137	0	18-Aug	11:01:48	56.21882	176.47183	>1000	0	0	0	0	0	0	0	0	
138	1	18-Aug	11:06:30	56.20487	176.48136	>1000	0	0	0	2	0	1	0	0	
139	1	18-Aug	14:12:12	55.97544	176.64307	>1000	0	0	0	1	0	1	0	0	
140	1	18-Aug	23:00:36	55.90999	176.69968	>1000	0	0	0	0	0	0	0	0	
141	1	21-Aug	11:01:22	55.97323	176.76585	>1000	0	2	0	2	0	1	0	0	
142	1	21-Aug	16:55:35	55.62735	176.87728	>1000	0	0	0	0	0	1	0	0	
143	0	22-Aug	11:01:21	55.46988	176.9878	>1000	0	0	0	0	0	0	0	0	
144	0	22-Aug	11:07:55	55.4504	177.00195	>1000	0	0	0	0	0	0	0	0	
145	1	22-Aug	11:11:26	55.43983	177.00931	>1000	0	0	0	0	0	1	0	0	
146	0	22-Aug	22:12:54	55.33719	177.15596	>1000	0	0	0	0	0	0	0	0	
147	1	22-Aug	22:17:08	55.33769	177.14811	>1000	0	0	0	0	0	1	0	0	
148	0	23-Aug	11:01:46	55.32433	177.08292	>1000	0	0	0	0	0	0	0	0	
149	1	23-Aug	11:06:08	55.3107	177.09266	>1000	0	0	0	0	0	1	0	0	
150	1	23-Aug	13:19:58	55.16722	177.20853	>1000	0	0	0	0	0	0	0	1	Baird's beaked whale
151	0	23-Aug	15:24:42	54.82214	177.41835	>1000	0	0	0	0	0	0	0	0	
152	1	23-Aug	15:28:10	54.81146	177.42578	>1000	0	0	0	0	0	0	0	0	
153	1	23-Aug	18:25:33	54.47007	177.64566	>1000	0	0	0	0	0	1	0	0	
154	1	23-Aug	22:26:30	54.32154	177.77672	>1000	0	0	0	0	0	0	0	0	
155	1	24-Aug	11:03:34	54.32044	177.74629	>1000	0	0	0	0	0	0	0	0	
156	1	24-Aug	13:47:48	53.98604	177.96598	>1000	0	0	0	0	0	0	0	0	
157	1	24-Aug	17:25:14	53.63325	178.19257	>1000	0	0	0	1	0	0	0	0	
158	1	24-Aug	22:15:46	53.31785	178.39305	>1000	0	0	1	0	0	0	0	0	
159	1	25-Aug	11:01:44	53.31991	178.39086	>1000	0	0	0	0	0	0	1	0	
160	1	25-Aug	15:48:14	52.98824	178.62276	>1000	0	0	0	0	0	0	0	0	
161	1	25-Aug	20:09:00	52.68221	178.79568	>1000	0	0	1	1	0	1	0	0	
162	1	26-Aug	10:06:59	52.60778	178.84646	>1000	0	0	0	1	0	1	0	0	
163	1	26-Aug	12:55:00	52.26608	179.05956	>1000	0	0	0	1	0	1	0	0	
164	1	26-Aug	16:00:46	51.89928	179.28434	485	0	0	1	1	0	1	0	0	
165	1	26-Aug	18:53:02	51.52422	179.51862	500	0	0	0	1	0	1	0	0	
166	1	26-Aug	21:49:17	51.63968	179.90468	>1000	0	0	0	1	0	1	0	0	
167	1	27-Aug	10:06:50	51.77573	-179.99744	>1000	0	0	1	1	0	1	0	0	

Station#	Success?	Date	Time (ADT)	Latitude	Longitude	Water depth (m)	NPRW	Humpback	Fin	Orca	Gray	Sperm	Fish	Other	Notes
168	0	27-Aug	12:02:36	52.12174	-179.7363	252	0	0	0	0	0	0	0	0	
169	1	27-Aug	12:11:56	52.1497	-179.71336	277	0	0	1	0	0	1	0	0	
170	0	27-Aug	14:51:02	52.473	-179.46552	>1000	0	0	0	0	0	0	0	0	
171	1	27-Aug	15:01:24	52.50444	-179.44086	>1000	0	0	1	0	0	1	0	0	
172	1	27-Aug	17:46:24	52.91484	-179.1206	>1000	0	0	1	0	0	1	0	0	
173	1	28-Aug	9:43:29	52.98438	-179.19482	>1000	0	0	1	1	0	1	0	0	
174	1	30-Aug	21:22:14	53.01866	-179.02986	>1000	0	0	0	0	0	1	0	0	
175	0	31-Aug	10:07:12	52.98631	-179.06697	>1000	0	0	0	0	0	0	0	0	
176	1	31-Aug	10:16:34	53.01487	-179.04505	>1000	0	1	1	0	0	1	0	0	
177	1	31-Aug	12:15:12	53.3715	-178.76341	>1000	0	0	0	0	0	1	0	0	
178	1	31-Aug	14:29:14	53.77569	-178.44394	>1000	0	0	1	0	0	1	0	0	
179	0	31-Aug	18:55:56	54.0657	-178.21549	>1000	0	0	1	0	0	1	0	0	
180	1	31-Aug	19:24:06	54.14887	-178.14399	>1000	0	0	1	2	0	1	0	0	
181	1	1-Sep	10:02:20	54.19105	-178.11443	>1000	0	0	1	1	0	1	0	0	
182	0	1-Sep	13:53:11	54.48356	-177.88137	>1000	0	0	0	0	0	0	0	0	
183	1	1-Sep	14:00:03	54.50396	-177.86649	>1000	0	0	1	0	0	1	0	0	
184	1	1-Sep	17:42:54	54.76776	-177.64684	>1000	0	0	1	2	0	1	0	0	
185	1	1-Sep	19:46:26	54.94559	-177.50399	>1000	0	0	1	0	0	1	0	0	
186	0	2-Sep	10:02:16	54.9936	-177.46463	>1000	0	0	0	0	0	0	0	0	
187	0	2-Sep	10:08:30	55.02166	-177.44976	>1000	0	0	1	0	0	1	0	0	
188	1	2-Sep	12:02:15	55.35016	-177.17162	>1000	0	0	1	1	0	1	0	0	
189	1	2-Sep	16:30:48	55.66671	-176.91244	>1000	0	0	1	1	0	1	0	0	
190	1	2-Sep	21:16:26	56.03733	-176.60189	>1000	0	0	1	1	0	0	0	1	rumble - earthquake?
191	1	3-Sep	10:01:30	56.21605	-176.45333	>1000	0	0	1	0	0	0	0	0	
192	1	3-Sep	12:35:28	55.95408	-176.04215	>1000	0	0	1	0	0	0	0	0	
193	1	3-Sep	14:47:54	55.61857	-175.74284	>1000	1	0	1	0	0	0	0	0	
194	1	3-Sep	15:21:42	55.51919	-175.65189	>1000	0	0	1	0	0	0	0	0	
195	1	3-Sep	17:27:26	55.19246	-175.35825	>1000	1	2	1	0	0	0	0	0	
196	1	3-Sep	19:23:56	55.17741	-175.4539	>1000	0	0	1	0	0	0	0	0	
197	0	3-Sep	20:25:22	55.31756	-175.72991	>1000	0	0	0	0	0	0	0	0	
198	1	3-Sep	20:37:30	55.37188	-175.74511	>1000	0	0	1	0	0	0	0	0	
199	1	4-Sep	10:02:52	55.46068	-176.20075	>1000	0	0	1	0	0	0	0	0	
200	1	4-Sep	21:30:03	55.07741	-175.44994	>1000	0	0	1	0	0	0	0	0	
201	0	5-Sep	10:01:12	55.03894	-175.22585	>1000	0	0	0	0	0	0	0	0	
202	1	5-Sep	10:06:56	55.02207	-175.21122	>1000	0	0	1	0	0	0	0	1	rumble - earthquake?
203	0	5-Sep	21:01:04	54.93901	-175.13358	>1000	0	0	0	0	0	0	0	0	
204	1	5-Sep	21:09:28	54.92754	-175.1254	>1000	0	0	1	0	0	0	0	0	
205	1	6-Sep	10:01:10	54.92588	-175.1239	>1000	0	0	1	0	0	0	0	0	
206	1	6-Sep	14:53:16	54.80955	-175.01818	>1000	0	0	1	1	0	1	0	0	
207	1	6-Sep	16:31:04	54.51179	-174.75795	>1000	0	0	1	0	0	0	0	0	
208	1	6-Sep	18:07:58	54.19537	-174.48212	>1000	0	0	1	1	0	1	0	0	
209	1	6-Sep	20:17:18	53.88781	-174.21617	>1000	0	0	1	0	0	0	0	0	
210	1	6-Sep	23:07:36	54.08751	-173.54959	>1000	0	0	1	0	0	0	0	0	
211	1	7-Sep	9:42:04	55.64929	-170.62082	>1000	0	0	1	1	0	0	0	0	
212	1	7-Sep	11:04:09	55.85163	-170.23846	>1000	0	0	1	1	0	0	0	0	
213	1	7-Sep	12:34:34	56.06682	-169.81991	190	0	0	1	1	0	0	0	0	
214	1	7-Sep	14:31:54	56.34534	-169.28417	130	0	0	1	1	0	0	0	0	
215	1	7-Sep	15:48:00	56.53054	-168.91976	100	0	0	1	1	0	0	0	0	
216	1	7-Sep	16:55:40	56.686	-168.61622	110	1	0	1	1	0	0	0	0	
217	1	7-Sep	17:33:42	56.77175	-168.44561	100	1	0	1	0	0	0	0	0	
218	1	7-Sep	18:33:22	56.69371	-168.07298	108	1	0	1	0	0	0	0	0	
219	1	7-Sep	19:26:02	56.68814	-167.63793	100	1	0	1	0	0	0	0	0	
220	1	7-Sep	19:38:34	56.64276	-167.57633	100	1	0	1	0	0	0	0	0	
221	1	8-Sep	9:17:30	56.49571	-167.61334	113	1	0	1	0	0	0	0	0	
222	1	8-Sep	9:42:58	56.49175	-167.77917	113	1	0	1	0	0	0	0	0	
223	1	8-Sep	11:23:12	56.43604	-167.71074	113	1	0	0	0	0	0	0	0	
224	1	8-Sep	12:44:58	56.58188	-167.3488	107	0	0	1	0	0	0	1	0	

Station#	Success?	Date	Time (ADT)	Latitude	Longitude	Water depth (m)	NPRW	Humpback	Fin	Orca	Gray	Sperm	Fish	Other	Notes
225	1	8-Sep	13:53:00	56.72714	-167.02828	97	0	0	1	0	0	0	0	0	
226	1	8-Sep	14:52:22	56.85104	-166.74698	80	0	0	0	0	0	0	0	0	
227	1	8-Sep	16:00:54	56.98772	-166.40949	80	1	0	0	1	0	0	0	0	
228	0	8-Sep	17:10:55	57.1311	-166.0633	73	0	0	0	0	0	0	0	0	
229	1	8-Sep	17:17:30	57.14466	-166.03081	73	1	0	0	0	0	0	0	0	
230	1	8-Sep	19:56:49	57.43724	-165.46468	66	1	1	1	1	0	0	0	0	
231	1	8-Sep	20:53:18	57.49075	-165.3114	67	1	1	1	0	0	0	0	0	
232	1	9-Sep	8:30:26	57.44268	-165.38336	68	0	1	1	0	0	0	0	0	
233	1	9-Sep	8:58:10	57.35531	-165.37759	70	0	1	1	0	0	0	0	0	
234	0	9-Sep	10:45:56	57.38173	-164.90965	70	0	0	0	0	0	0	0	0	
235	1	9-Sep	10:55:46	57.37958	-164.85036	67	0	0	0	0	0	0	0	0	
236	1	9-Sep	12:09:40	57.33108	-164.40999	65	2	0	0	0	0	0	0	0	
237	0	9-Sep	13:41:04	57.28371	-163.85762	63	0	0	0	0	0	0	0	0	
238	1	9-Sep	13:46:54	57.28094	-163.82246	63	0	1	0	0	0	0	0	0	
239	1	9-Sep	15:36:28	57.21798	-163.46123	62	0	0	0	0	0	0	1	0	
240	1	9-Sep	16:38:50	57.2013	-163.0824	57	2	0	0	0	0	0	0	0	
241	1	9-Sep	17:45:04	57.18303	-162.67507	57	0	0	0	0	0	0	0	0	
242	0	9-Sep	19:31:18	57.32332	-162.62783	53	0	0	0	0	0	0	0	0	
243	1	9-Sep	20:02:18	57.3952	-162.76604	52	0	0	0	0	0	0	0	0	
244	1	10-Sep	7:59:58	57.32507	-162.57736	54	0	0	0	0	0	0	0	0	
245	1	10-Sep	8:29:18	57.28222	-162.7098	55	0	2	0	0	0	0	0	0	
246	1	10-Sep	10:33:18	57.45582	-162.88859	50	0	0	0	0	0	0	1	0	
247	1	10-Sep	11:26:05	57.57238	-163.13276	52	0	0	0	0	0	0	1	0	
248	1	10-Sep	12:31:19	57.72949	-163.44512	47	0	0	0	0	0	0	0	0	
249	1	10-Sep	14:40:40	57.45382	-163.87649	52	0	0	0	0	0	0	0	0	
250	1	10-Sep	16:02:30	57.16684	-164.0974	68	0	2	0	0	0	0	0	0	
251	1	11-Sep	7:02:10	56.86322	-164.1177	73	2	1	0	0	0	0	0	0	
252	1	11-Sep	8:34:54	56.57361	-164.41721	79	0	0	0	0	0	0	0	0	
253	1	11-Sep	10:23:10	56.23365	-164.79695	93	1	1	0	0	0	0	0	0	

Appendix D. Sighting results in the US EEZ

1. Dates and Locations of Survey Effort in US waters

The ship first entered the US EEZ at location 51°-57.1'N, 167°-05.5'E on 8 July 2018 at 00:19 (SMT: GMT-11.0 hours); final departure from the US EEZ was at location 50°-46.9'N, 168°-07.3'E, on 19 September 2018 at 09:51 (SMT: GMT+13.0 hours). Total searching distance in the US EEZ was 2,110.92 n.miles.

Appendix Table **D1**. Summary of searching effort by each survey mode in the US EEZ.

Area	Start	End	NSP		IO		NSP+IO		Photo-ID, Biopsy	Estimated angle and distance training / experiment
	Date Time	Date Time	Time	Dist. (n.m.)	Time	Dist. (n.m.)	Time	Dist. (n.m.)	Time	Time
US-EEZ (transit survey to Dutch Harbor)	8-Jul. 6:35	12-Jul. 18:00	5:31:59	56.00	0:00:00	0.00	5:31:59	56.00	0:00:00	0:00:00
US-EEZ (transit survey from D.H to Northern Stratum)	16-Jul. 13:00	22-Jul. 10:38	27:43:22	331.68	0:00:00	0.00	27:43:22	331.68	2:08:07	3:27:36
US-EEZ (in the research area, northern stratum)	22-Jul. 10:38	10-Aug. 15:22	31:31:29	369.17	27:24:09	322.21	58:55:38	691.38	12:16:24	5:18:18
US-EEZ (in the research area, southern stratum)	11-Aug. 8:11	16-Aug. 6:02	12:00:35	143.88	7:34:09	90.58	19:34:44	234.46	9:05:30	0:00:00
US-EEZ (in the research area, southern stratum)	21-Aug. 11:22	2-Sep. 8:17	22:11:55	265.20	18:44:41	224.05	40:56:36	489.25	14:06:02	0:00:00
US-EEZ (in the research area, southern stratum)	3-Sep. 7:58	6-Sep. 16:56	4:23:21	52.88	4:12:00	50.54	8:35:21	103.42	1:32:17	0:00:00
US-EEZ (transit survey from Southern Stratum to D.H)	6-Sep. 16:56	11-Sep. 18:00	17:03:52	204.73	0:00:00	0.00	17:03:52	204.73	1:26:01	0:00:00
US-EEZ (transit survey to Shiogama)	17-Sep. 9:10	19-Sep. 18:00	0:00:00	0.00	0:00:00	0.00	0:00:00	0.00	0:00:00	0:00:00
Total	8-Jul. 6:35	19-Sep. 18:00	120:26:33	1,423.54	57:54:59	687.38	178:21:32	2,110.92	40:34:21	8:45:54

2. Sightings

Appendix Table D2 shows total sightings in the US EEZ. Almost all schools of whales sighted were approached for species confirmation and photo-ID/ biopsy sampling. The group of sperm and dolphins/ porpoises were approached briefly to within 0.1-1.0 miles for long distance species confirmation. Number of calves are included in the number of individuals.

Appendix Table **D2**. Summary of all sightings in the US-EEZ.

Species	Transit to Dutch Harbor (US-EEZ)			Transit from D.H. to research area (US-EEZ)			Research area Northern Stratum (US-EEZ)			Research area Southern Stratum (US-EEZ)			Transit from research area to D.H. (US-EEZ)			Transit to Shiogama (US-EEZ)			Total		
	Sch.	Ind.	Calf	Sch.	Ind.	Calf	Sch.	Ind.	Calf	Sch.	Ind.	Calf	Sch.	Ind.	Calf	Sch.	Ind.	Calf	Sch.	Ind.	Calf
Fin whale	12	22	0	13	21	0	33	55	0	44	55	2	0	0	0	0	0	0	102	153	2
Like fin	1	2	0	2	2	0	6	8	0	5	5	0	1	1	0	0	0	0	15	18	0
Common minke whale	0	0	0	0	0	0	11	11	0	2	2	0	0	0	0	0	0	0	13	13	0
Like minke	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	2	2	0
Humpback whale	0	0	0	23	39	0	3	3	0	38	58	1	7	7	0	0	0	0	71	107	1
Like humpback	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	2	2	0
North pacific right whale	0	0	0	2	2	0	1	1	0	0	0	0	0	0	0	0	0	0	3	3	0
Gray whale	0	0	0	1	2	0	26	85	0	0	0	0	0	0	0	0	0	0	27	87	0
Like gray	0	0	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0	0	1	4	0
Sperm whale	0	0	0	0	0	0	1	1	0	25	26	0	0	0	0	0	0	0	26	27	0
Like sperm	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0
Baird's beaked whale	0	0	0	0	0	0	0	0	0	2	24	0	0	0	0	0	0	0	2	24	0
Killer whale	0	0	0	0	0	0	5	27	2	12	80	2	0	0	0	0	0	0	17	107	4
Habour porpoise	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	1	2	0
Dalli type Dall's porpoise	0	0	0	1	3	0	6	19	0	41	199	7	1	3	0	0	0	0	49	224	7
Unid. type Dall's porpoise	2	3	0	1	2	0	2	5	0	3	8	0	0	0	0	0	0	0	8	18	0
Unid. large baleen whale	0	0	0	0	0	0	1	4	0	1	1	0	0	0	0	0	0	0	2	5	0
Unid. dolphin	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0	0	1	3	0
Unid. cetacean	0	0	0	0	0	0	2	2	0	2	2	0	0	0	0	0	0	0	4	4	0
Total	15	27	0	43	71	0	101	231	2	179	464	12	9	11	0	0	0	0	347	804	14

Appendix Table D**3**. Sightings in the US-EEZ with locations and sea surface temperature (SST).

Date					Sighting No.	Species	School size	Calf	Lat.					Long.					S.Temp. (℃)
2018	/	7	/	10	001	Fin whale	2	0	54	°	20.0	’	N	177	°	56.6	’	W	7.0
2018	/	7	/	10	002	Fin whale	3	0	54	°	21.1	’	N	177	°	47.8	’	W	7.0
2018	/	7	/	10	003	Unid. type Dall's porpoise	1	0	54	°	22.0	’	N	177	°	41.7	’	W	7.0
2018	/	7	/	10	004	Fin whale	3	0	54	°	20.0	’	N	177	°	27.9	’	W	7.1
2018	/	7	/	10	005	Fin whale	2	0	54	°	18.8	’	N	177	°	15.5	’	W	7.2
2018	/	7	/	10	006	Fin whale	2	0	54	°	18.6	’	N	177	°	06.8	’	W	7.3
2018	/	7	/	10	007	Unid. type Dall's porpoise	2	0	54	°	18.9	’	N	176	°	55.9	’	W	7.4
2018	/	7	/	10	008	Fin whale	2	0	54	°	19.2	’	N	176	°	43.8	’	W	7.9
2018	/	7	/	10	009	Fin whale	1	0	54	°	19.1	’	N	176	°	40.9	’	W	7.4
2018	/	7	/	10	010	Fin whale	1	0	54	°	19.7	’	N	176	°	35.0	’	W	7.6
2018	/	7	/	10	011	Fin whale	1	0	54	°	20.6	’	N	176	°	11.8	’	W	8.4
2018	/	7	/	10	012	Fin whale	2	0	54	°	20.8	’	N	176	°	05.7	’	W	8.3
2018	/	7	/	10	013	Fin whale	2	0	54	°	20.8	’	N	176	°	05.8	’	W	8.1
2018	/	7	/	10	014	Fin whale	1	0	54	°	21.5	’	N	176	°	03.8	’	W	8.4
2018	/	7	/	10	015	Like fin	2	0	54	°	23.6	’	N	176	°	01.3	’	W	8.6
2018	/	7	/	17	001	Dalli type Dall's porpoise	3	0	56	°	10.6	’	N	164	°	39.7	’	W	9.1
2018	/	7	/	17	002	Unid. type Dall's porpoise	2	0	56	°	25.6	’	N	164	°	15.7	’	W	9.2
2018	/	7	/	17	003	Fin whale	1	0	56	°	42.4	’	N	163	°	49.1	’	W	9.6
2018	/	7	/	18	001	Fin whale	1	0	56	°	53.5	’	N	163	°	18.7	’	W	9.6
2018	/	7	/	18	002	Like fin	1	0	56	°	55.9	’	N	163	°	17.9	’	W	9.6
2018	/	7	/	18	003	Humpback whale	1	0	56	°	59.8	’	N	162	°	59.6	’	W	9.3
2018	/	7	/	18	004	Humpback whale	1	0	56	°	59.9	’	N	162	°	53.3	’	W	9.3
2018	/	7	/	18	005	Humpback whale	6	0	57	°	01.2	’	N	162	°	49.5	’	W	9.3
2018	/	7	/	18	006	Fin whale	2	0	57	°	02.4	’	N	162	°	46.9	’	W	9.3
2018	/	7	/	18	007	Humpback whale	2	0	57	°	04.1	’	N	162	°	44.6	’	W	9.4
2018	/	7	/	18	008	Humpback whale	1	0	57	°	04.2	’	N	162	°	44.2	’	W	9.4
2018	/	7	/	18	009	Fin whale	1	0	57	°	04.3	’	N	162	°	43.6	’	W	9.4

2018	/	7	/	18	010	Fin whale	1	0	57	°	03.7	’	N	162	°	41.4	’	W	9.3
2018	/	7	/	18	011	Fin whale	1	0	57	°	03.3	’	N	162	°	39.7	’	W	9.2
2018	/	7	/	18	012	Humpback whale	1	0	57	°	03.0	’	N	162	°	38.4	’	W	9.2
2018	/	7	/	18	013	Humpback whale	1	0	57	°	03.5	’	N	162	°	36.6	’	W	9.1
2018	/	7	/	18	014	Fin whale	3	0	57	°	04.1	’	N	162	°	35.2	’	W	9.2
2018	/	7	/	18	015	Humpback whale	2	0	57	°	05.3	’	N	162	°	27.8	’	W	9.1
2018	/	7	/	18	016	Humpback whale	1	0	57	°	07.2	’	N	162	°	34.3	’	W	9.3
2018	/	7	/	18	017	Humpback whale	2	0	57	°	06.9	’	N	162	°	35.0	’	W	9.4
2018	/	7	/	18	018	Fin whale	1	0	57	°	06.6	’	N	162	°	35.6	’	W	9.3
2018	/	7	/	18	019	Fin whale	2	0	57	°	05.4	’	N	162	°	39.4	’	W	9.4
2018	/	7	/	18	020	Humpback whale	1	0	57	°	04.5	’	N	162	°	41.1	’	W	9.5
2018	/	7	/	18	021	Humpback whale	1	0	57	°	01.8	’	N	162	°	44.1	’	W	9.7
2018	/	7	/	18	022	North pacific right whale	1	0	57	°	03.2	’	N	162	°	47.8	’	W	9.6
2018	/	7	/	18	023	North pacific right whale	1	0	57	°	03.6	’	N	162	°	47.8	’	W	9.7
2018	/	7	/	18	024	Humpback whale	1	0	57	°	04.1	’	N	162	°	47.9	’	W	9.7
2018	/	7	/	18	025	Fin whale	1	0	57	°	06.4	’	N	162	°	47.2	’	W	10.0
2018	/	7	/	19	001	Humpback whale	1	0	57	°	14.3	’	N	162	°	54.0	’	W	9.5
2018	/	7	/	19	002	Fin whale	3	0	57	°	15.0	’	N	163	°	08.7	’	W	9.4
2018	/	7	/	19	003	Humpback whale	4	0	57	°	15.0	’	N	163	°	08.9	’	W	9.4
2018	/	7	/	19	004	Humpback whale	1	0	57	°	15.1	’	N	163	°	14.1	’	W	9.7
2018	/	7	/	19	005	Fin whale	3	0	57	°	15.1	’	N	163	°	18.5	’	W	9.7
2018	/	7	/	19	006	Humpback whale	1	0	57	°	15.1	’	N	163	°	18.8	’	W	9.7
2018	/	7	/	19	007	Humpback whale	4	0	57	°	15.4	’	N	163	°	21.8	’	W	9.7
2018	/	7	/	19	008	Humpback whale	1	0	57	°	15.6	’	N	163	°	23.9	’	W	9.7
2018	/	7	/	19	009	Fin whale	1	0	57	°	15.9	’	N	163	°	27.5	’	W	9.7
2018	/	7	/	19	010	Humpback whale	1	0	57	°	16.0	’	N	163	°	29.5	’	W	9.7
2018	/	7	/	19	011	Like fin	1	0	57	°	16.2	’	N	163	°	32.4	’	W	9.7
2018	/	7	/	20	001	Humpback whale	1	0	58	°	43.7	’	N	167	°	26.6	’	W	8.5
2018	/	7	/	21	001	Humpback whale	2	0	61	°	57.5	’	N	168	°	10.4	’	W	9.6
2018	/	7	/	21	002	Humpback whale	2	0	62	°	35.9	’	N	168	°	19.5	’	W	9.0
2018	/	7	/	22	001	Gray whale	2	0	64	°	26.6	’	N	168	°	40.1	’	W	6.4
2018	/	7	/	22	002	Gray whale	2	0	64	°	23.2	’	N	168	°	46.2	’	W	6.0
2018	/	7	/	22	003	Gray whale	2	0	64	°	23.2	’	N	168	°	46.3	’	W	5.9
2018	/	7	/	22	004	Gray whale	2	0	64	°	24.3	’	N	168	°	46.9	’	W	6.1
2018	/	7	/	22	005	Humpback whale	1	0	64	°	23.0	’	N	168	°	49.5	’	W	6.1
2018	/	7	/	23	001	Common minke whale	1	0	64	°	22.1	’	N	168	°	58.5	’	W	6.4
2018	/	7	/	23	002	Common minke whale	1	0	64	°	22.6	’	N	169	°	01.7	’	W	6.5
2018	/	7	/	23	003	Common minke whale	1	0	64	°	22.3	’	N	169	°	08.3	’	W	7.4
2018	/	7	/	24	001	Gray whale	2	0	64	°	19.6	’	N	170	°	22.6	’	W	7.7
2018	/	7	/	24	003	Gray whale	1	0	64	°	18.4	’	N	170	°	51.7	’	W	7.7
2018	/	7	/	24	005	Common minke whale	1	0	64	°	18.0	’	N	171	°	02.0	’	W	8.3
2018	/	7	/	24	006	Killer whale	5	0	64	°	18.6	’	N	171	°	02.3	’	W	7.9
2018	/	7	/	24	007	Unid. cetacean	1	0	64	°	17.7	’	N	171	°	11.8	’	W	7.3

2018	/	7	/	25	001	Common minke whale	1	0	64	°	08.2	’	N	171	°	38.4	’	W	9.0
2018	/	7	/	25	002	Gray whale	2	0	64	°	07.6	’	N	171	°	37.9	’	W	9.2
2018	/	7	/	25	003	Common minke whale	1	0	64	°	04.0	’	N	171	°	36.7	’	W	9.8
2018	/	7	/	25	004	Unid. large baleen whale	4	0	64	°	03.0	’	N	171	°	33.1	’	W	9.4
2018	/	7	/	25	005	Gray whale	2	0	64	°	00.8	’	N	171	°	35.0	’	W	9.4
2018	/	7	/	25	006	Gray whale	15	0	64	°	00.7	’	N	171	°	35.0	’	W	9.3
2018	/	7	/	25	007	Gray whale	7	0	64	°	00.6	’	N	171	°	34.9	’	W	9.3
2018	/	7	/	25	008	Gray whale	5	0	63	°	59.8	’	N	171	°	34.5	’	W	9.1
2018	/	7	/	25	009	Harbour porpoise	2	0	63	°	59.2	’	N	171	°	33.1	’	W	7.7
2018	/	7	/	25	010	Gray whale	1	0	63	°	55.6	’	N	171	°	33.2	’	W	8.5
2018	/	7	/	25	011	Gray whale	5	0	63	°	55.5	’	N	171	°	33.2	’	W	8.5
2018	/	7	/	26	001	Gray whale	5	0	63	°	53.4	’	N	171	°	31.9	’	W	7.7
2018	/	7	/	26	002	Gray whale	2	0	63	°	52.7	’	N	171	°	31.6	’	W	6.4
2018	/	7	/	26	003	Gray whale	2	0	63	°	52.6	’	N	171	°	31.6	’	W	5.8
2018	/	7	/	26	004	Gray whale	2	0	63	°	51.4	’	N	171	°	33.7	’	W	7.4
2018	/	7	/	26	005	Gray whale	3	0	63	°	52.1	’	N	171	°	34.7	’	W	6.7
2018	/	7	/	26	006	Gray whale	2	0	63	°	52.7	’	N	171	°	34.5	’	W	8.1
2018	/	7	/	26	007	Gray whale	1	0	63	°	50.2	’	N	171	°	30.5	’	W	7.6
2018	/	7	/	26	008	Gray whale	2	0	63	°	49.7	’	N	171	°	30.3	’	W	7.8
2018	/	7	/	26	009	Common minke whale	1	0	63	°	49.1	’	N	171	°	30.1	’	W	8.0
2018	/	7	/	26	010	Gray whale	1	0	63	°	48.9	’	N	171	°	30.0	’	W	7.9
2018	/	7	/	26	011	Gray whale	4	0	63	°	47.6	’	N	171	°	30.8	’	W	7.9
2018	/	7	/	26	012	Gray whale	11	0	63	°	49.0	’	N	171	°	34.7	’	W	7.5
2018	/	7	/	26	013	Like gray	4	0	63	°	49.8	’	N	171	°	36.7	’	W	8.2
2018	/	7	/	26	014	Gray whale	1	0	63	°	48.7	’	N	171	°	50.5	’	W	8.5
2018	/	7	/	26	015	Gray whale	1	0	63	°	40.5	’	N	171	°	54.9	’	W	8.1
2018	/	7	/	26	016	Gray whale	2	0	63	°	32.6	’	N	171	°	58.8	’	W	8.3
2018	/	7	/	26	017	Unidentified cetacean	1	0	63	°	15.4	’	N	171	°	15.0	’	W	8.2
2018	/	7	/	26	018	North pacific right whale	1	0	63	°	14.8	’	N	171	°	14.7	’	W	8.9
2018	/	7	/	27	001	Like common minke	1	0	63	°	00.2	’	N	171	°	08.2	’	W	9.1
2018	/	7	/	27	002	Common minke whale	1	0	62	°	59.0	’	N	171	°	07.6	’	W	9.2
2018	/	7	/	27	003	Common minke whale	1	0	62	°	58.0	’	N	171	°	07.0	’	W	9.2
2018	/	7	/	27	004	Killer whale	12	2	62	°	41.9	’	N	171	°	00.4	’	W	8.9
2018	/	7	/	27	005	Killer whale	3	0	62	°	40.1	’	N	170	°	56.6	’	W	9.4
2018	/	7	/	27	006	Common minke whale	1	0	62	°	30.7	’	N	170	°	55.4	’	W	9.6
2018	/	8	/	1	001	Humpback whale	1	0	60	°	55.6	’	N	172	°	30.9	’	W	9.2
2018	/	8	/	1	002	Fin whale	3	0	60	°	55.8	’	N	172	°	33.4	’	W	8.9

2018	/	8	/	1	004	Fin whale	1	0	60	°	55.9	’	N	172	°	34.9	’	W	8.7
2018	/	8	/	1	005	Fin whale	1	0	60	°	57.6	’	N	172	°	38.9	’	W	8.0
2018	/	8	/	2	001	Unid. dolphin	3	0	61	°	03.8	’	N	174	°	41.9	’	W	9.5
2018	/	8	/	5	001	Dalli type Dall's porpoise	3	0	58	°	42.1	’	N	175	°	33.5	’	W	9.5
2018	/	8	/	5	002	Fin whale	1	0	58	°	14.3	’	N	175	°	09.2	’	W	9.8
2018	/	8	/	5	003	Fin whale	3	0	58	°	13.9	’	N	175	°	08.9	’	W	9.8
2018	/	8	/	6	001	Fin whale	1	0	57	°	42.6	’	N	174	°	42.5	’	W	9.7
2018	/	8	/	6	003	Fin whale	1	0	57	°	35.9	’	N	174	°	37.3	’	W	9.7
2018	/	8	/	6	004	Like fin	1	0	57	°	34.4	’	N	174	°	35.9	’	W	9.6
2018	/	8	/	6	005	Killer whale	6	0	57	°	33.5	’	N	174	°	36.5	’	W	9.6
2018	/	8	/	6	006	Fin whale	3	0	57	°	27.8	’	N	174	°	30.3	’	W	9.7
2018	/	8	/	6	007	Dalli type Dall's porpoise	3	0	57	°	26.5	’	N	174	°	29.1	’	W	9.7
2018	/	8	/	6	008	Dalli type Dall's porpoise	2	0	57	°	23.3	’	N	174	°	26.7	’	W	9.6
2018	/	8	/	6	009	Fin whale	1	0	57	°	01.5	’	N	174	°	08.8	’	W	9.6
2018	/	8	/	6	010	Humpback whale	1	0	57	°	01.4	’	N	174	°	08.8	’	W	9.6
2018	/	8	/	6	011	Fin whale	4	0	56	°	54.9	’	N	174	°	03.4	’	W	9.9
2018	/	8	/	6	012	Dalli type Dall's porpoise	3	0	56	°	52.9	’	N	173	°	59.0	’	W	10.0
2018	/	8	/	7	001	Fin whale	2	0	56	°	46.5	’	N	173	°	56.3	’	W	9.4
2018	/	8	/	7	002	Fin whale	5	0	56	°	44.1	’	N	173	°	54.3	’	W	9.5
2018	/	8	/	7	003	Fin whale	1	0	56	°	42.4	’	N	173	°	52.9	’	W	9.6
2018	/	8	/	7	004	Fin whale	4	0	56	°	39.8	’	N	173	°	50.7	’	W	9.5
2018	/	8	/	7	005	Fin whale	4	0	56	°	39.0	’	N	173	°	50.3	’	W	9.5
2018	/	8	/	7	007	Fin whale	1	0	56	°	38.6	’	N	173	°	50.0	’	W	9.4
2018	/	8	/	7	008	Unid. type Dall's porpoise	3	0	56	°	38.2	’	N	173	°	49.5	’	W	9.2
2018	/	8	/	7	009	Like fin	2	0	56	°	36.8	’	N	173	°	43.7	’	W	9.8
2018	/	8	/	7	010	Like fin	1	0	56	°	30.6	’	N	173	°	43.0	’	W	9.8
2018	/	8	/	7	011	Fin whale	1	0	56	°	30.4	’	N	173	°	42.8	’	W	9.7
2018	/	8	/	7	012	Killer whale	1	0	56	°	25.4	’	N	173	°	39.3	’	W	9.7
2018	/	8	/	7	014	Fin whale	1	0	56	°	19.5	’	N	173	°	34.3	’	W	9.7
2018	/	8	/	7	015	Sperm whale	1	0	56	°	13.5	’	N	173	°	29.6	’	W	9.7

2018	/	8	/	7	017	Fin whale	1	0	56	°	11.0	’	N	173	°	27.6	’	W	9.7
2018	/	8	/	7	018	Like fin	2	0	56	°	10.3	’	N	173	°	27.1	’	W	9.7
2018	/	8	/	8	001	Fin whale	1	0	56	°	08.2	’	N	173	°	25.2	’	W	9.7
2018	/	8	/	8	002	Unid. type Dall's porpoise	2	0	56	°	07.0	’	N	173	°	24.3	’	W	9.8
2018	/	8	/	8	003	Fin whale	1	0	56	°	04.7	’	N	173	°	22.5	’	W	9.9
2018	/	8	/	8	004	Common minke whale	1	0	56	°	04.4	’	N	173	°	22.3	’	W	9.9
2018	/	8	/	8	006	Dalli type Dall's porpoise	3	0	55	°	58.7	’	N	173	°	17.9	’	W	10.2
2018	/	8	/	8	007	Fin whale	1	0	55	°	44.6	’	N	173	°	09.4	’	W	10.3
2018	/	8	/	8	008	Fin whale	2	0	55	°	44.6	’	N	173	°	09.5	’	W	10.2
2018	/	8	/	8	009	Fin whale	1	0	55	°	45.1	’	N	173	°	12.7	’	W	10.2
2018	/	8	/	10	001	Fin whale	1	0	56	°	09.8	’	N	174	°	55.6	’	W	9.5
2018	/	8	/	10	002	Fin whale	1	0	56	°	10.1	’	N	175	°	15.2	’	W	9.6
2018	/	8	/	10	003	Fin whale	1	0	56	°	14.9	’	N	175	°	39.1	’	W	9.7
2018	/	8	/	10	004	Fin whale	1	0	56	°	15.2	’	N	175	°	40.6	’	W	9.7
2018	/	8	/	10	005	Fin whale	1	0	56	°	15.3	’	N	175	°	41.5	’	W	9.7
2018	/	8	/	10	008	Fin whale	1	0	56	°	18.8	’	N	175	°	58.7	’	W	9.8
2018	/	8	/	10	009	Fin whale	1	0	56	°	19.2	’	N	176	°	00.6	’	W	9.7
2018	/	8	/	10	012	Fin whale	2	0	56	°	20.0	’	N	176	°	04.9	’	W	9.8
2018	/	8	/	10	014	Fin whale	1	0	56	°	20.9	’	N	176	°	09.0	’	W	9.8
2018	/	8	/	10	016	Like fin	1	0	56	°	21.2	’	N	176	°	10.7	’	W	9.8
2018	/	8	/	10	017	Dalli type Dall's porpoise	5	0	56	°	22.7	’	N	176	°	12.3	’	W	10.0
2018	/	8	/	10	018	Like fin	1	0	56	°	22.1	’	N	176	°	14.9	’	W	9.8
2018	/	8	/	12	001	Unid. type Dall's porpoise	2	0	53	°	25.2	’	N	170	°	33.9	’	E	11.6
2018	/	8	/	12	002	Killer whale	15	2	53	°	24.7	’	N	170	°	35.0	’	E	11.6
2018	/	8	/	12	003	Killer whale	12	0	53	°	24.5	’	N	170	°	35.4	’	E	11.6
2018	/	8	/	12	004	Dalli type Dall's porpoise	2	0	53	°	24.8	’	N	170	°	36.0	’	E	11.5
2018	/	8	/	12	005	Like common minke	1	0	53	°	19.5	’	N	170	°	46.3	’	E	11.4
2018	/	8	/	12	006	Sperm whale	1	0	53	°	18.5	’	N	170	°	48.5	’	E	11.3
2018	/	8	/	12	008	Sperm whale	1	0	53	°	15.5	’	N	170	°	54.8	’	E	11.5
2018	/	8	/	12	009	Unid. cetacean	1	0	53	°	15.3	’	N	170	°	55.3	’	E	11.6
2018	/	8	/	12	011	Sperm whale	1	0	53	°	13.7	’	N	170	°	59.1	’	E	11.6
2018	/	8	/	12	013	Killer whale	15	0	53	°	12.0	’	N	171	°	02.8	’	E	11.5
2018	/	8	/	12	015	Killer whale	6	0	53	°	11.0	’	N	171	°	05.2	’	E	11.5
2018	/	8	/	12	016	Killer whale	5	0	53	°	10.9	’	N	171	°	05.4	’	E	11.5
2018	/	8	/	12	017	Humpback whale	5	0	53	°	10.9	’	N	171	°	05.4	’	E	11.5
2018	/	8	/	12	020	Sperm whale	1	0	53	°	08.3	’	N	171	°	04.9	’	E	11.7
2018	/	8	/	12	021	Humpback whale	1	0	53	°	06.8	’	N	171	°	14.0	’	E	11.5
2018	/	8	/	12	022	Sperm whale	1	0	53	°	06.6	’	N	171	°	14.4	’	E	11.5
2018	/	8	/	12	024	Sperm whale	1	0	53	°	04.9	’	N	171	°	18.2	’	E	11.4
2018	/	8	/	12	025	Sperm whale	1	0	53	°	02.5	’	N	171	°	23.5	’	E	11.5
2018	/	8	/	12	027	Sperm whale	1	0	53	°	01.6	’	N	171	°	25.6	’	E	11.5
2018	/	8	/	12	028	Unid. cetacean	1	0	53	°	06.9	’	N	171	°	52.4	’	E	11.7
2018	/	8	/	13	001	Dalli type Dall's porpoise	3	0	53	°	59.0	’	N	172	°	36.8	’	E	11.5
2018	/	8	/	13	002	Dalli type Dall's porpoise	5	0	54	°	05.1	’	N	172	°	42.3	’	E	11.5
2018	/	8	/	13	003	Like fin	1	0	54	°	35.0	’	N	173	°	08.4	’	E	11.4
2018	/	8	/	13	005	Humpback whale	1	0	54	°	36.5	’	N	173	°	09.8	’	E	11.4
2018	/	8	/	13	007	Sperm whale	2	0	54	°	43.4	’	N	173	°	15.6	’	E	11.5
2018	/	8	/	13	009	Humpback whale	1	0	54	°	58.2	’	N	173	°	28.8	’	E	11.1
2018	/	8	/	14	001	Dalli type Dall's porpoise	3	0	55	°	07.9	’	N	173	°	37.4	’	E	11.5
2018	/	8	/	14	002	Dalli type Dall's porpoise	3	0	55	°	09.2	’	N	173	°	38.4	’	E	11.5

2018	/	8	/	14	003	Humpback whale	2	0	55	°	10.0	’	N	173	°	39.1	’	E	11.4
2018	/	8	/	14	004	Humpback whale	1	0	55	°	12.7	’	N	173	°	41.4	’	E	11.4
2018	/	8	/	14	005	Humpback whale	1	0	55	°	24.0	’	N	173	°	51.9	’	E	12.0
2018	/	8	/	14	006	Humpback whale	1	0	55	°	26.7	’	N	173	°	54.1	’	E	12.2
2018	/	8	/	14	007	Humpback whale	1	0	55	°	26.7	’	N	173	°	54.1	’	E	12.2
2018	/	8	/	14	008	Humpback whale	1	0	55	°	29.7	’	N	173	°	56.7	’	E	12.7
2018	/	8	/	14	009	Humpback whale	1	0	55	°	30.1	’	N	173	°	57.1	’	E	12.7
2018	/	8	/	14	010	Dalli type Dall's porpoise	2	0	55	°	30.5	’	N	173	°	57.5	’	E	12.7
2018	/	8	/	14	011	Humpback whale	2	1	55	°	31.3	’	N	173	°	58.2	’	E	12.7
2018	/	8	/	14	012	Humpback whale	1	0	55	°	32.6	’	N	174	°	01.3	’	E	12.3
2018	/	8	/	14	013	Humpback whale	2	0	55	°	33.2	’	N	174	°	00.0	’	E	13.1
2018	/	8	/	14	014	Humpback whale	2	0	55	°	33.4	’	N	174	°	00.2	’	E	13.0
2018	/	8	/	14	015	Humpback whale	4	0	55	°	33.5	’	N	174	°	00.3	’	E	12.9
2018	/	8	/	14	016	Humpback whale	4	0	55	°	36.6	’	N	174	°	03.1	’	E	12.6

2018	/	8	/	15	001	Humpback whale	3	0	55	°	41.8	’	N	174	°	07.7	’	E	11.6
2018	/	8	/	15	002	Humpback whale	1	0	55	°	42.0	’	N	174	°	07.9	’	E	11.6
2018	/	8	/	15	003	Humpback whale	1	0	55	°	46.9	’	N	174	°	12.2	’	E	11.7
2018	/	8	/	15	004	Humpback whale	1	0	55	°	47.2	’	N	174	°	12.4	’	E	11.6
2018	/	8	/	15	005	Humpback whale	2	0	55	°	51.5	’	N	174	°	16.4	’	E	11.7
2018	/	8	/	15	006	Like humpback	1	0	55	°	51.6	’	N	174	°	16.4	’	E	11.7
2018	/	8	/	15	007	Humpback whale	2	0	55	°	54.0	’	N	174	°	18.7	’	E	11.7
2018	/	8	/	15	008	Humpback whale	2	0	55	°	54.4	’	N	174	°	19.0	’	E	11.7
2018	/	8	/	15	009	Humpback whale	1	0	55	°	55.2	’	N	174	°	19.8	’	E	11.7
2018	/	8	/	15	010	Humpback whale	1	0	55	°	56.0	’	N	174	°	20.4	’	E	11.7
2018	/	8	/	15	011	Humpback whale	1	0	55	°	56.3	’	N	174	°	20.7	’	E	11.8
2018	/	8	/	15	012	Humpback whale	1	0	55	°	57.5	’	N	174	°	21.6	’	E	11.7
2018	/	8	/	15	013	Humpback whale	1	0	55	°	57.6	’	N	174	°	21.7	’	E	11.8
2018	/	8	/	15	014	Humpback whale	1	0	55	°	59.5	’	N	174	°	25.9	’	E	11.8
2018	/	8	/	15	015	Like humpback	1	0	56	°	09.9	’	N	174	°	33.1	’	E	11.7
2018	/	8	/	23	001	Humpback whale	1	0	55	°	17.5	’	N	177	°	06.4	’	E	10.6
2018	/	8	/	23	002	Baird's beaked whale	7	0	55	°	15.2	’	N	177	°	11.6	’	E	10.6
2018	/	8	/	23	003	Fin whale	1	0	55	°	15.3	’	N	177	°	12.1	’	E	10.6
2018	/	8	/	23	004	Baird's beaked whale	17	0	55	°	13.3	’	N	177	°	09.1	’	E	10.6
2018	/	8	/	23	005	Dalli type Dall's porpoise	3	0	55	°	10.3	’	N	177	°	13.7	’	E	10.7
2018	/	8	/	23	006	Common minke whale	1	0	54	°	57.6	’	N	177	°	19.2	’	E	10.9
2018	/	8	/	23	007	Dalli type Dall's porpoise	2	0	54	°	49.4	’	N	177	°	25.0	’	E	10.7
2018	/	8	/	23	008	Humpback whale	1	0	54	°	40.7	’	N	177	°	30.5	’	E	10.8
2018	/	8	/	23	009	Dalli type Dall's porpoise	4	0	54	°	28.9	’	N	177	°	38.3	’	E	10.8
2018	/	8	/	24	001	Humpback whale	1	0	54		03.4	’	N	177		54.8	’	E	10.8
2018	/	8	/	24	002	Fin whale	2	1	54		02.9	’	N	177		55.1	’	E	10.8
2018	/	8	/	24	004	Humpback whale	1	0	53		59.7	’	N	177		57.6	’	E	10.8
2018	/	8	/	24	005	Fin whale	1	0	53		47.3	’	N	178		05.2	’	E	10.7
2018	/	8	/	24	006	Dalli type Dall's porpoise	5	0	53		45.7	’	N	178		09.3	’	E	10.7
2018	/	8	/	24	007	Fin whale	1	0	53		40.7	’	N	178		09.8	’	E	10.6
2018	/	8	/	24	008	Humpback whale	1	0	53		38.8	’	N	178		11.0	’	E	10.6
2018	/	8	/	24	009	Dalli type Dall's porpoise	3	0	53		37.5	’	N	178		09.4	’	E	10.4
2018	/	8	/	24	010	Fin whale	2	0	53		34.7	’	N	178		13.6	’	E	10.5
2018	/	8	/	24	012	Fin whale	1	0	53		21.8	’	N	178		21.9	’	E	10.3
2018	/	8	/	24	013	Common minke whale	1	0	53		20.1	’	N	178		16.9	’	E	10.0
2018	/	8	/	25	001	Fin whale	1	0	53	°	09.8	’	N	178	°	29.6	’	E	10.4
2018	/	8	/	25	002	Humpback whale	1	0	53	°	00.2	’	N	178	°	35.7	’	E	10.4
2018	/	8	/	25	003	Humpback whale	1	0	52	°	54.1	’	N	178	°	39.3	’	E	10.8
2018	/	8	/	25	004	Humpback whale	2	0	52	°	52.5	’	N	178	°	42.4	’	E	10.8
2018	/	8	/	25	005	Dalli type Dall's porpoise	3	0	52	°	52.7	’	N	178	°	43.7	’	E	10.7
2018	/	8	/	26	001	Fin whale	1	0	52	°	21.5	’	N	178	°	59.9	’	E	10.3
2018	/	8	/	26	002	Dalli type Dall's porpoise	5	0	52	°	20.4	’	N	179	°	00.9	’	E	10.6
2018	/	8	/	26	003	Fin whale	1	0	52	°	18.8	’	N	179	°	01.8	’	E	10.6
2018	/	8	/	26	005	Dalli type Dall's porpoise	7	0	52	°	14.0	’	N	179	°	04.7	’	E	10.3
2018	/	8	/	26	006	Dalli type Dall's porpoise	5	0	52	°	13.4	’	N	179	°	05.0	’	E	10.2
2018	/	8	/	26	007	Fin whale	1	0	52	°	08.0	’	N	179	°	08.1	’	E	10.2
2018	/	8	/	26	009	Dalli type Dall's porpoise	5	0	52	°	06.8	’	N	179	°	08.8	’	E	10.2
2018	/	8	/	26	010	Dalli type Dall's porpoise	6	0	52	°	07.5	’	N	179	°	10.3	’	E	10.2
2018	/	8	/	26	011	Dalli type Dall's porpoise	6	0	52	°	06.0	’	N	179	°	09.7	’	E	10.1
2018	/	8	/	26	012	Dalli type Dall's porpoise	2	0	52	°	04.1	’	N	179	°	10.8	’	E	10.0
2018	/	8	/	26	013	Dalli type Dall's porpoise	14	0	51	°	50.9	’	N	179	°	19.0	’	E	7.1
2018	/	8	/	26	014	Dalli type Dall's porpoise	11	3	51	°	49.9	’	N	179	°	19.7	’	E	7.4
2018	/	8	/	26	015	Dalli type Dall's porpoise	8	1	51	°	48.3	’	N	179	°	20.7	’	E	7.9
2018	/	8	/	26	016	Fin whale	1	0	51	°	46.0	’	N	179	°	22.0	’	E	8.9
2018	/	8	/	26	017	Dalli type Dall's porpoise	7	1	51	°	44.7	’	N	179	°	20.3	’	E	9.3
2018	/	8	/	26	018	Dalli type Dall's porpoise	8	1	51	°	45.4	’	N	179	°	19.9	’	E	8.9
2018	/	8	/	26	019	Sperm whale	1	0	51	°	43.5	’	N	179	°	23.4	’	E	9.2
2018	/	8	/	26	020	Sperm whale	1	0	51	°	40.4	’	N	179	°	25.4	’	E	9.1
2018	/	8	/	26	022	Sperm whale	1	0	51	°	38.7	’	N	179	°	26.4	’	E	8.6
2018	/	8	/	26	024	Sperm whale	1	0	51	°	36.1	’	N	179	°	28.1	’	E	8.3
2018	/	8	/	26	025	Sperm whale	1	0	51	°	35.1	’	N	179	°	28.8	’	E	7.9
2018	/	8	/	26	028	Sperm whale	1	0	51	°	34.5	’	N	179	°	29.1	’	E	8.0
2018	/	8	/	26	029	Sperm whale	1	0	51	°	33.7	’	N	179	°	29.6	’	E	8.6
2018	/	8	/	26	030	Sperm whale	1	0	51	°	32.7	’	N	179	°	30.3	’	E	8.5
2018	/	8	/	26	031	Sperm whale	1	0	51	°	31.4	’	N	179	°	31.2	’	E	8.3
2018	/	8	/	26	033	Sperm whale	1	0	51	°	29.8	’	N	179	°	32.0	’	E	8.3

2018	/	8	/	26	034	Like sperm	1	0	51	°	29.7	’	N	179	°	32.0	’	E	8.1
2018	/	8	/	26	035	Sperm whale	1	0	51	°	22.0	’	N	179	°	36.7	’	E	8.3
2018	/	8	/	26	036	Dalli type Dall's porpoise	2	0	51	°	21.2	’	N	179	°	37.2	’	E	8.6
2018	/	8	/	26	038	Sperm whale	1	0	51	°	24.0	’	N	179	°	43.3	’	E	8.4
2018	/	8	/	26	039	Sperm whale	1	0	51	°	25.0	’	N	179	°	44.0	’	E	8.6
2018	/	8	/	26	040	Sperm whale	2	0	51	°	37.3	’	N	179	°	53.5	’	E	7.8
2018	/	8	/	26	041	Sperm whale	1	0	51	°	39.0	’	N	179	°	54.7	’	E	7.8
2018	/	8	/	26	042	Sperm whale	5	0	51	°	39.6	’	N	179	°	55.1	’	E	7.8
2018	/	8	/	27	001	Sperm whale	1	0	52	°	13.7	’	N	179	°	38.9	’	W	9.1
2018	/	8	/	27	003	Dalli type Dall's porpoise	1	0	52	°	18.8	’	N	179	°	34.9	’	W	8.8
2018	/	8	/	27	004	Dalli type Dall's porpoise	6	0	52	°	22.8	’	N	179	°	32.0	’	W	9.3
2018	/	8	/	27	005	Fin whale	1	0	52	°	24.6	’	N	179	°	30.5	’	W	9.0
2018	/	8	/	27	006	Fin whale	1	0	52	°	24.8	’	N	179	°	30.4	’	W	9.0
2018	/	8	/	27	007	Unid. type Dall's porpoise	3	0	52	°	34.9	’	N	179	°	22.9	’	W	9.1
2018	/	8	/	27	008	Dalli type Dall's porpoise	7	0	52	°	42.6	’	N	179	°	16.6	’	W	9.2
2018	/	8	/	27	009	Dalli type Dall's porpoise	4	0	52	°	54.5	’	N	179	°	07.5	’	W	10.4
2018	/	8	/	31	001	Sperm whale	1	0	53	°	14.0	’	N	178	°	52.3	’	W	9.6
2018	/	8	/	31	002	Fin whale	1	0	53	°	52.4	’	N	178	°	21.9	’	W	8.7
2018	/	8	/	31	003	Fin whale	2	0	53	°	58.9	’	N	178	°	16.8	’	W	8.4
2018	/	8	/	31	005	Fin whale	1	0	54	°	07.9	’	N	178	°	09.5	’	W	8.7
2018	/	8	/	31	006	Unid. type Dall's porpoise	3	0	54	°	09.5	’	N	178	°	08.2	’	W	8.8

2018	/	9	/	1	001	Dalli type Dall's porpoise	10	0	54	°	12.2	’	N	178	°	06.3	’	W	8.7
2018	/	9	/	1	002	Fin whale	1	0	54	°	12.3	’	N	178	°	06.2	’	W	8.7
2018	/	9	/	1	003	Fin whale	1	0	54	°	16.0	’	N	178	°	03.2	’	W	9.3
2018	/	9	/	1	004	Fin whale	4	1	54	°	19.6	’	N	178	°	00.3	’	W	9.1
2018	/	9	/	1	005	Killer whale	1	0	54	°	20.2	’	N	177	°	59.9	’	W	9.1
2018	/	9	/	1	006	Killer whale	3	0	54	°	20.7	’	N	177	°	59.4	’	W	9.1
2018	/	9	/	1	009	Killer whale	1	0	54	°	22.9	’	N	177	°	57.7	’	W	9.1
2018	/	9	/	1	011	Fin whale	1	0	54	°	30.3	’	N	177	°	51.9	’	W	9.6
2018	/	9	/	1	013	Fin whale	2	0	54	°	41.4	’	N	177	°	43.0	’	W	9.5
2018	/	9	/	1	014	Fin whale	1	0	54	°	42.7	’	N	177	°	41.8	’	W	9.4
2018	/	9	/	1	015	Fin whale	1	0	54	°	43.4	’	N	177	°	35.6	’	W	9.7
2018	/	9	/	1	016	Fin whale	1	0	54	°	45.9	’	N	177	°	39.0	’	W	9.6
2018	/	9	/	1	017	Dalli type Dall's porpoise	6	0	54	°	45.9	’	N	177	°	39.0	’	W	9.6
2018	/	9	/	1	018	Dalli type Dall's porpoise	7	0	54	°	44.2	’	N	177	°	37.6	’	W	9.7
2018	/	9	/	1	019	Dalli type Dall's porpoise	5	0	54	°	56.3	’	N	177	°	30.6	’	W	9.6
2018	/	9	/	1	020	Dalli type Dall's porpoise	4	0	54	°	57.7	’	N	177	°	29.5	’	W	9.6
2018	/	9	/	2	001	Dalli type Dall's porpoise	8	1	55	°	06.7	’	N	177	°	22.1	’	W	9.4
2018	/	9	/	2	002	Dalli type Dall's porpoise	2	0	55	°	20.7	’	N	177	°	10.6	’	W	9.4
2018	/	9	/	3	009	Dalli type Dall's porpoise	4	0	56	°	00.2	’	N	176	°	07.0	’	W	9.6
2018	/	9	/	3	010	Dalli type Dall's porpoise	2	0	55	°	57.1	’	N	176	°	02.4	’	W	9.5
2018	/	9	/	3	011	Like fin	1	0	55	°	50.8	’	N	175	°	56.8	’	W	9.6
2018	/	9	/	3	012	Fin whale	2	0	55	°	46.5	’	N	175	°	52.9	’	W	9.6
2018	/	9	/	3	013	Killer whale	2	0	55	°	40.1	’	N	175	°	47.2	’	W	9.6
2018	/	9	/	3	015	Fin whale	1	0	55	°	36.7	’	N	175	°	44.2	’	W	9.6
2018	/	9	/	3	017	Fin whale	1	0	55	°	21.1	’	N	175	°	30.0	’	W	9.6
2018	/	9	/	3	018	Fin whale	1	0	55	°	21.0	’	N	175	°	30.0	’	W	9.6
2018	/	9	/	3	021	Fin whale	1	0	55	°	15.6	’	N	175	°	25.3	’	W	9.1
2018	/	9	/	3	022	Fin whale	1	0	55	°	11.9	’	N	175	°	21.8	’	W	9.3
2018	/	9	/	3	023	Fin whale	2	0	55	°	09.9	’	N	175	°	19.9	’	W	9.3
2018	/	9	/	3	026	Fin whale	1	0	55	°	08.7	’	N	175	°	18.7	’	W	9.4
2018	/	9	/	3	028	Unid. large baleen whale	1	0	55	°	08.1	’	N	175	°	18.2	’	W	9.4
2018	/	9	/	6	001	Fin whale	2	0	54	°	51.0	’	N	175	°	03.0	’	W	9.6
2018	/	9	/	6	002	Fin whale	1	0	54	°	50.4	’	N	174	°	59.9	’	W	9.6
2018	/	9	/	6	003	Fin whale	1	0	54	°	49.3	’	N	175	°	01.8	’	W	9.6
2018	/	9	/	6	004	Like fin	1	99	54	°	49.2	’	N	175	°	01.7	’	W	9.6
2018	/	9	/	6	005	Fin whale	1	0	54	°	48.3	’	N	175	°	00.8	’	W	9.7
2018	/	9	/	6	006	Like fin	1	99	54	°	47.2	’	N	174	°	59.7	’	W	9.8
2018	/	9	/	6	007	Fin whale	1	0	54	°	46.4	’	N	174	°	58.9	’	W	9.8
2018	/	9	/	6	008	Fin whale	2	0	54	°	40.5	’	N	174	°	54.1	’	W	9.7
2018	/	9	/	6	009	Fin whale	1	0	54	°	36.0	’	N	174	°	50.3	’	W	9.8
2018	/	9	/	6	010	Fin whale	1	0	54	°	33.0	’	N	174	°	47.6	’	W	9.6
2018	/	9	/	6	011	Fin whale	1	0	54	°	31.1	’	N	174	°	45.8	’	W	9.6
2018	/	9	/	6	012	Like fin	1	99	54	°	22.3	’	N	174	°	38.1	’	W	9.6
2018	/	9	/	6	013	Fin whale	1	0	54	°	22.2	’	N	174	°	38.0	’	W	9.7
2018	/	9	/	6	014	Dalli type Dall's porpoise	2	0	54	°	14.8	’	N	174	°	31.5	’	W	9.6
2018	/	9	/	6	015	Killer whale	12	0	54	°	14.1	’	N	174	°	31.0	’	W	9.6
2018	/	9	/	6	016	Killer whale	4	0	54	°	13.8	’	N	174	°	30.8	’	W	9.6
2018	/	9	/	6	019	Killer whale	4	0	54	°	12.5	’	N	174	°	29.6	’	W	9.7
2018	/	9	/	6	021	Fin whale	1	0	54	°	12.4	’	N	174	°	29.5	’	W	9.7
2018	/	9	/	6	022	Fin whale	1	0	54	°	09.4	’	N	174	°	27.0	’	W	9.7
2018	/	9	/	7	001	Dalli type Dall's porpoise	3	0	56	°	37.1	’	N	168	°	45.0	’	W	10.0
2018	/	9	/	7	002	Like fin	1	99	56	°	41.8	’	N	168	°	35.7	’	W	10.0
2018	/	9	/	7	003	Humpback whale	1	0	56	°	35.6	’	N	167	°	37.6	’	W	10.3
2018	/	9	/	8	001	Humpback whale	1	0	56	°	30.7	’	N	167	°	32.2	’	W	10.2
2018	/	9	/	8	002	Humpback whale	1	0	56	°	39.8	’	N	167	°	10.7	’	W	10.2
2018	/	9	/	8	003	Humpback whale	1	0	57	°	13.2	’	N	165	°	50.7	’	W	10.5
2018	/	9	/	8	004	Humpback whale	1	0	57	°	19.1	’	N	165	°	38.8	’	W	10.6
2018	/	9	/	8	005	Humpback whale	1	0	57	°	25.2	’	N	165	°	34.4	’	W	10.5
2018	/	9	/	9	001	Humpback whale	1	0	57	°	15.7	’	N	163	°	31.9	’	W	10.2

3. Photo-ID

Appendix Table D4. Summary of photo-ID effort in the US EEZ by Species.

N.P. right	Total Sightings		Ind.	Sch.	Ind. Photo-	Ind. Photo-
	Sch.	ind.	Biopsy	graphed	graphed	ID'd
Transit from Shiogama to D.H. (US-EEZ)	0	0	0	0	0	0
Transit from D.H to northern Stratum (All US-EEZ)	2	2	2	2	2	2
Northern stratum (US-EEZ)	1	1	1	1	1	1
Southern stratum (US-EEZ)	0	0	0	0	0	0
Transit from southern stratum to D.H (All US-EEZ)	0	0	0	0	0	0
Transit from D.H to Shiogama (US-EEZ)	0	0	0	0	0	0
Total	**3**	**3**	**3**	**3**	**3**	**3**

Gray whale	Total Sightings		Ind.	Sch.	Ind. Photo-	Ind. Photo-
	Sch.	ind.	Biopsy	graphed	graphed	ID'd
Transit from Shiogama to D.H. (US-EEZ)	0	0	0	0	0	0
Transit from D.H to northern Stratum (All US-EEZ)	1	2	0	0	0	0
Northern stratum (US-EEZ)	26	86	7	13	49	41
Southern stratum (US-EEZ)	0	0	0	0	0	0
Transit from southern stratum to D.H (All US-EEZ)	0	0	0	0	0	0
Transit from D.H to Shiogama (US-EEZ)	0	0	0	0	0	0
Total	**27**	**88**	**7**	**13**	**49**	**41**

Humpback whale	Total Sightings		Ind.	Sch.	Ind. Photo-	Ind. Photo-
	Sch.	ind.	Biopsy	graphed	graphed	ID'd
Transit from Shiogama to D.H. (US-EEZ)	0	0	0	0	0	0
Transit from D.H to northern Stratum (All US-EEZ)	23	39	0	4	6	2
Northern stratum (US-EEZ)	3	3	2	2	2	2
Southern stratum (US-EEZ)	38	58	22	26	38	27
Transit from southern stratum to D.H (All US-EEZ)	7	7	0	2	2	2
Transit from D.H to Shiogama (US-EEZ)	0	0	0	0	0	0
Total	**71**	**107**	**24**	**34**	**48**	**33**

Fin whale	Total Sightings		Ind.	Sch.	Ind. Photo-	Ind. Photo-
	Sch.	ind.	Biopsy	graphed	graphed	ID'd
Transit from Shiogama to D.H. (US-EEZ)	12	22	0	1	1	1
Transit from D.H to northern Stratum (All US-EEZ)	13	21	0	1	1	0
Northern stratum (US-EEZ)	33	55	9	17	26	23
Southern stratum (US-EEZ)	44	55	8	22	27	26
Transit from southern stratum to D.H (All US-EEZ)	0	0	0	0	0	0
Transit from D.H to Shiogama (US-EEZ)	0	0	0	0	0	0
Total	**102**	**153**	**17**	**41**	**55**	**50**

Killer whale	Total Sightings		Ind.	Sch.	Ind. Photo-	Ind. Photo-
	Sch.	ind.	Biopsy	graphed	graphed	ID'd
Transit from Shiogama to D.H. (US-EEZ)	0	0	0	0	0	0
Transit from D.H to northern Stratum (All US-EEZ)	0	0	0	0	0	0
Northern stratum (US-EEZ)	5	27	4	2	1	1
Southern stratum (US-EEZ)	12	80	1	4	15	12
Transit from southern stratum to D.H (All US-EEZ)	0	0	0	0	0	0
Transit from D.H to Shiogama (US-EEZ)	0	0	0	0	0	0
Total	**17**	**107**	**5**	**6**	**16**	**13**

4. Biopsy

A total of 56 biopsy (skin and blubber) samples were collected from 3 North Pacific right, 17 fin, 24 humpback, 7 gray, and 5 killer whales using the Larsen biopsy system within the boundaries of the US EEZ, including samples from one mother-calf pair of fin whales.

Appendix Table D5. Summary of biopsy samples collected in the US EEZ.

Biopsy samples	Fin*	Humpback	N.P Right	Gray	Killer	Total
Transit from Dutch Harbor to Northern Stratum (All US-EEZ, area code 74)	0	0	2	0	0	2
Northern Stratum (US-EEZ, area code 72)	9	2	1	7	4	23
Southern Stratum (US-EEZ, area code 73)	8	22	0	0	1	31
Transit from Southern Stratum to Dutch Harbor (All US-EEZ, area code 75)	0	0	0	0	0	0
Total	17	24	3	7	5	56

Fin* Including one mother and calf pair (sampled at Southern Stratum (US-EEZ, area code 72).

5. Passive Acoustics

Appendix Table D7. Complete list of all sonobuoy deployments and species detected in the US EEZ during the 2018 POWER cruise. Success: 1 = successful, 0 = not successful. ADT = Alaska Daylight Time. Detections: 0 = not detected, 1 = detected, 2 = maybe. Unknown = unknown species or signal.

Station #	Success?	Date	Time (ADT)	Latitude °N	Longitude ° W	Water depth (m)	NPRW	Humpback	Fin	Orca	Gray	Sperm	Fish	Other	Notes
1	1	16-Jul	15:03:36	54.22448	-166.35359	780	0	0	0	1	0	0	0	0	
2	1	16-Jul	18:25:58	54.55794	-166.21655	477	0	0	0	1	0	1	0	0	
3	1	17-Jul	7:39:40	55.56201	-165.63972	120	0	0	1	0	0	0	0	0	
4	1	17-Jul	8:49:46	55.72073	-165.39262	112	0	0	0	0	0	0	0	0	
5	1	17-Jul	12:27:34	55.91087	-165.08224	100	0	0	0	0	0	0	0	0	
6	1	17-Jul	13:44:26	56.0993	-164.78052	95	0	0	0	0	0	0	0	0	
7	1	17-Jul	15:05:10	56.30215	-164.46296	90	0	0	0	2	0	0	0	0	
8	1	17-Jul	16:17:50	56.48072	-164.17878	82	0	0	0	2	0	0	0	0	
9	1	17-Jul	17:38:10	56.68061	-163.86193	72	1	0	1	1	0	0	0	0	
10	1	17-Jul	19:03:20	56.83718	-163.53229	71	1	0	0	0	0	0	0	0	
11	1	18-Jul	6:29:58	56.93202	-163.44894	67	0	0	1	0	0	0	0	0	
12	1	18-Jul	7:05:26	56.81232	-163.35616	71	0	0	1	0	0	0	0	0	
13	1	18-Jul	8:40:40	56.99337	-163.0824	67	1	0	0	0	0	0	0	0	
14	1	18-Jul	9:54:40	57.06468	-162.69963	60	1	1	1	1	0	0	0	0	
15	1	18-Jul	11:18:12	57.15648	-162.29344	57	1	0	1	1	0	0	0	0	
16	0	18-Jul	12:47:46	57.21327	-162.42993	55	0	0	0	0	0	0	0	0	
17	1	18-Jul	12:57:04	57.18893	-162.43074	53	0	0	1	1	0	0	0	0	
18	1	18-Jul	19:09:48	57.16169	-162.82989	57	0	1	1	0	0	0	0	0	
19	1	19-Jul	6:19:54	57.30222	-162.88745	57	1	0	0	1	0	0	0	0	
20	1	19-Jul	7:01:26	57.16325	-162.91261	57	1	1	1	0	0	0	0	0	
21	1	19-Jul	8:36:45	57.25595	-163.3629	58	1	1	1	0	0	0	1	0	
22	1	19-Jul	10:07:04	57.29214	-163.9216	54	1	0	1	1	0	0	0	0	
23	1	19-Jul	11:19:04	57.32031	-164.43756	56	0	0	0	0	0	0	0	0	
24	1	19-Jul	12:53:22	57.34486	-165.01962	64	0	0	0	1	0	0	0	0	
25	1	19-Jul	14:02:50	57.37069	-165.44314	67	0	0	0	0	0	0	0	0	
26	1	19-Jul	15:27:38	57.39604	-165.9592	70	0	0	0	0	0	0	0	1	unknown
27	1	19-Jul	16:36:40	57.41577	-166.38302	70	0	1	0	0	0	0	0	0	
28	1	19-Jul	18:00:50	57.44122	-166.89642	70	0	0	0	0	0	0	0	0	
29	0	19-Jul	21:13:38	57.88806	-167.29669	68	0	0	0	0	0	0	0	0	
30	1	20-Jul	7:40:48	58.00012	-167.29101	64	0	0	0	2	0	0	0	0	
31	1	20-Jul	10:08:06	58.48542	-167.39447	47	0	0	0	0	0	0	0	0	
32	1	20-Jul	16:43:28	59.10418	-167.54073	46	0	0	0	0	0	0	0	0	
33	1	20-Jul	18:59:04	59.53484	-167.69746	35	0	0	0	0	0	0	0	0	
34	1	21-Jul	7:08:42	61.84658	-168.13808	30	0	0	0	0	0	0	0	0	
35	1	21-Jul	9:35:48	62.31479	-168.25555	33	0	0	0	0	0	0	0	0	
36	1	21-Jul	12:33:00	62.88464	-168.40204	40	0	0	0	0	0	0	0	0	
37	1	21-Jul	16:32:40	63.73734	-168.59788	34	0	0	0	0	0	0	0	0	
38	1	21-Jul	18:30:34	64.14258	-168.69381	40	0	0	0	0	0	0	0	0	
39	1	22-Jul	6:39:50	64.40493	-168.62195	43	1	0	1	1	1	0	1	0	
40	1	22-Jul	7:43:48	64.40012	-168.82497	43	0	1	1	0	1	0	0	0	
41	0	23-Jul	6:35:20	64.43581	-168.94878	43	0	0	0	0	0	0	0	0	
42	1	23-Jul	6:41:20	64.41981	-168.95242	42	0	1	0	2	1	0	0	0	
43	1	24-Jul	10:25:12	64.37241	-169.20644	42	0	0	0	0	1	0	0	0	
44	1	24-Jul	12:56:02	64.33019	-170.26833	40	0	0	0	0	0	0	0	0	
45	1	24-Jul	17:57:10	64.32186	-171.19888	45	0	0	1	0	1	0	0	0	

Station #	Success?	Date	Time (ADT)	Latitude °N	Longitude ° W	Water depth (m)	NPRW	Humpback	Fin	Orca	Gray	Sperm	Fish	Other	Notes
46	1	25-Jul	7:34:17	64.2974	-171.12736	45	0	0	0	0	1	0	0	0	
47	1	25-Jul	13:58:02	64.00896	-171.58113	30	0	0	0	1	1	0	0	0	
48	1	26-Jul	7:33:56	63.95695	-171.39142	30	1	0	0	0	1	0	0	0	
49	1	26-Jul	20:57:06	63.21082	-171.21646	42	1	0	0	0	0	0	0	0	
50	1	27-Jul	7:36:32	63.2208	-171.08363	38	0	0	0	0	1	0	0	0	
51	1	27-Jul	15:47:42	62.98378	-171.12729	42	0	0	0	0	0	0	0	0	
52	1	27-Jul	19:31:52	62.56093	-170.94641	45	0	0	0	1	0	0	0	0	
53	1	28-Jul	8:02:34	62.48984	-170.91274	45	0	0	0	0	0	0	0	0	
54	1	28-Jul	10:48:59	62.08705	-170.73937	50	0	0	0	0	0	0	0	0	
55	1	28-Jul	14:02:06	61.54799	-170.5127	49	0	0	0	0	0	0	0	0	
56	1	28-Jul	18:10:02	61.12828	-170.42521	50	0	0	0	0	0	0	0	0	
57	1	29-Jul	7:47:56	61.15243	-170.42833	52	0	0	0	0	0	0	0	0	
58	1	29-Jul	18:16:36	61.14196	-170.49389	52	0	0	0	0	0	0	0	0	
59	1	30-Jul	9:00:00	61.13905	-170.49107	52	0	0	0	0	0	0	0	0	
60	1	31-Jul	17:01:04	60.96912	-170.27533	53	0	2	1	0	0	0	0	0	
61	1	1-Aug	9:02:06	60.93043	-170.25607	53	0	0	0	0	0	0	0	0	
62	1	1-Aug	11:48:26	60.8328	-171.01196	58	0	0	0	0	1	0	0	0	
63	1	1-Aug	14:56:42	60.91444	-172.30213	68	0	0	0	0	0	0	0	0	
64	1	1-Aug	18:22:20	60.94482	-172.78715	67	0	0	0	0	0	0	0	0	
65	1	2-Aug	9:02:18	60.97271	-173.26679	72	0	2	0	0	0	0	0	0	
66	1	2-Aug	10:33:12	61.01795	-173.94633	82	0	0	1	0	0	0	0	0	
67	1	2-Aug	14:27:46	61.08215	-175.02993	97	0	0	1	0	0	0	0	0	
68	1	2-Aug	17:49:10	61.13578	-175.87238	107	0	0	0	0	0	0	0	0	
69	1	2-Aug	19:16:42	61.17176	-176.49338	115	0	0	0	0	0	0	0	0	
70	1	3-Aug	9:01:54	61.21749	-177.18985	172	0	0	0	0	0	0	0	0	
71	1	3-Aug	10:59:52	60.98067	-177.59045	170	0	0	0	0	0	0	0	0	
72	1	3-Aug	16:59:00	60.56688	-177.21089	150	0	0	0	0	0	0	0	0	
73	1	3-Aug	19:46:30	60.29105	-176.9618	147	0	0	0	0	0	0	0	0	
74	1	4-Aug	9:16:52	60.20195	-176.87924	142	0	0	0	0	0	0	1	0	
75	1	4-Aug	14:46:18	59.91961	-176.63274	145	0	2	1	0	0	0	0	0	
76	1	4-Aug	18:31:56	59.49047	-176.24366	138	0	0	1	0	0	0	0	0	
77	1	5-Aug	9:02:00	59.31482	-176.08479	140	0	0	0	1	0	0	0	0	
78	1	5-Aug	14:36:02	58.86593	-175.69654	133	0	2	0	0	0	0	0	0	
79	1	5-Aug	16:59:32	58.45644	-175.34729	164	0	0	0	0	0	0	0	0	
80	0	5-Aug	20:15:08	58.22162	-175.12402	1150	0	0	0	0	0	0	0	0	
81	1	5-Aug	20:24:32	58.20165	-175.1531	1150	0	0	1	0	0	1	0	0	
82	1	6-Aug	9:02:32	58.20074	-175.12222	1100	0	0	1	1	0	0	0	0	
83	1	6-Aug	11:30:24	57.7669	-174.75993	1100	0	0	1	1	0	0	0	0	
84	1	6-Aug	14:26:24	57.43236	-174.47615	1001	0	0	1	1	0	1	0	0	
85	1	6-Aug	18:17:20	57.10614	-174.21544	1670	0	1	1	1	0	1	0	0	
86	1	6-Aug	20:49:28	56.92438	-174.06408	>1000	0	0	1	1	0	1	0	0	
87	1	7-Aug	10:02:06	56.84331	-173.99252	>1000	0	0	1	1	0	0	0	0	
88	1	7-Aug	17:15:34	56.5772	-173.77429	2880	0	0	1	1	0	1	0	0	
89	0	7-Aug	21:26:02	56.23121	-173.49934	>1000	0	0	0	0	0	0	0	0	
90	1	7-Aug	21:29:54	56.22084	-173.48962	>1000	0	0	1	0	0	1	0	0	
91	1	8-Aug	10:02:04	56.13226	-173.4169	>1000	0	0	1	1	0	1	0	0	
92	1	8-Aug	19:01:50	55.85329	-173.19872	>1000	0	0	1	0	0	1	0	0	
93	1	8-Aug	22:05:24	55.78756	-173.32445	>1000	0	0	1	0	0	1	0	0	
94	1	9-Aug	10:02:06	55.83871	-173.63088	>1000	0	0	1	0	0	0	0	0	
95	1	10-Aug	10:02:34	56.00201	-174.41969	>1000	0	0	1	0	0	1	0	0	
96	1	10-Aug	10:10:12	56.00906	-174.45448	>1000	0	0	1	0	0	1	0	0	
97	1	10-Aug	11:47:08	56.11238	-174.98424	>1000	0	0	1	0	0	1	0	0	
98	1	10-Aug	16:26:06	56.24655	-175.64241	>1000	0	0	1	0	0	0	0	0	
99	1	10-Aug	19:09:38	56.3686	-176.2511	>1000	0	0	1	0	0	1	0	0	
101	1	11-Aug	12:01:36	55.47783	178.05991	>1000	0	0	1	0	0	1	0	0	
102	1	11-Aug	16:12:42	55.1347	176.59083	>1000	0	0	0	0	0	0	0	0	
103	1	11-Aug	19:03:40	54.88866	175.64462	>1000	0	0	0	0	0	1	0	0	
104	0	12-Aug	11:23:07	53.54641	170.29378	>1000	0	0	0	0	0	0	0	0	
105	1	12-Aug	11:28:11	53.53596	170.31617	>1000	0	0	0	1	0	1	0	0	
106	1	12-Aug	13:18:52	53.39917	170.61175	957	0	0	0	1	0	1	0	0	
107	1	12-Aug	15:14:08	53.18542	171.08066	>1000	0	0	0	1	0	1	0	0	
108	1	12-Aug	18:45:06	53.00302	171.60752	940	0	0	1	1	0	1	0	0	
109	1	12-Aug	22:44:34	53.63191	172.31353	>1000	0	0	0	0	0	1	0	0	
110	1	13-Aug	11:01:48	53.78093	172.43845	>1000	0	0	0	0	0	0	0	0	
111	0	13-Aug	13:25:22	54.20535	172.80729	>1000	0	0	0	0	0	0	0	0	
112	1	13-Aug	13:33:56	54.23113	172.82797	>1000	0	0	1	0	0	1	0	0	
113	0	13-Aug	17:04:04	54.70168	173.23977	>1000	0	0	0	0	0	1	0	0	
114	0	13-Aug	20:00:54	54.98732	173.48631	>1000	0	0	0	0	0	1	0	0	
115	1	13-Aug	20:20:22	55.05103	173.54831	>1000	0	1	1	1	0	1	0	0	
116	0	14-Aug	11:01:50	55.08544	173.58008	>1000	0	0	0	0	0	0	0	0	
117	0	14-Aug	11:08:38	55.10558	173.59832	>1000	0	1	1	1	0	1	0	0	
118	1	14-Aug	13:43:50	55.24283	173.71923	>1000	0	1	0	0	0	1	0	0	
119	1	14-Aug	16:25:44	55.4571	173.91243	>1000	0	1	1	1	0	1	0	0	
120	1	15-Aug	11:01:48	55.69947	174.13145	>1000	0	1	0	0	0	1	0	0	
121	1	15-Aug	14:06:26	55.9084	174.31733	>1000	0	1	0	0	0	0	0	0	

Station #	Success?	Date	Time (ADT)	Latitude °N	Longitude ° W	Water depth (m)	NPRW	Humpback	Fin	Orca	Gray	Sperm	Fish	Other	Notes
122	0	15-Aug	16:41:16	56.13227	174.52056	>1000	0	0	0	0	0	0	0	0	
123	1	15-Aug	16:47:58	56.15232	174.53973	>1000	0	0	0	0	0	1	0	0	
124	1	16-Aug	11:01:48	56.20387	174.58396	>1000	0	0	0	0	0	0	0	0	
142	1	21-Aug	16:55:35	55.62735	176.87728	>1000	0	0	0	0	0	1	0	0	
143	0	22-Aug	11:01:21	55.46988	176.9878	>1000	0	0	0	0	0	0	0	0	
144	0	22-Aug	11:07:55	55.4504	177.00195	>1000	0	0	0	0	0	0	0	0	
145	1	22-Aug	11:11:26	55.43983	177.00931	>1000	0	0	0	0	0	1	0	0	
146	0	22-Aug	22:12:54	55.33719	177.15596	>1000	0	0	0	0	0	0	0	0	
147	1	22-Aug	22:17:08	55.33769	177.14811	>1000	0	0	0	0	0	1	0	0	
148	0	23-Aug	11:01:46	55.32433	177.08292	>1000	0	0	0	0	0	0	0	0	
149	1	23-Aug	11:06:08	55.3107	177.09266	>1000	0	0	0	0	0	1	0	0	
150	1	23-Aug	13:19:58	55.16722	177.20853	>1000	0	0	0	0	0	0	0	1	Baird's beaked whale
151	0	23-Aug	15:24:42	54.82214	177.41835	>1000	0	0	0	0	0	0	0	0	
152	1	23-Aug	15:28:10	54.81146	177.42578	>1000	0	0	0	0	0	0	0	0	
153	1	23-Aug	18:25:33	54.47007	177.64566	>1000	0	0	0	0	0	1	0	0	
154	1	23-Aug	22:26:30	54.32154	177.77672	>1000	0	0	0	0	0	0	0	0	
155	1	24-Aug	11:03:34	54.32044	177.74629	>1000	0	0	0	0	0	0	0	0	
156	1	24-Aug	13:47:48	53.98604	177.96598	>1000	0	0	0	0	0	0	0	0	
157	1	24-Aug	17:25:14	53.63325	178.19257	>1000	0	0	0	1	0	0	0	0	
158	1	24-Aug	22:15:46	53.31785	178.39305	>1000	0	0	1	0	0	0	0	0	
159	1	25-Aug	11:01:44	53.31991	178.39086	>1000	0	0	0	0	0	0	1	0	
160	1	25-Aug	15:48:14	52.98824	178.62276	>1000	0	0	0	0	0	0	0	0	
161	1	25-Aug	20:09:00	52.68221	178.79568	>1000	0	0	1	1	0	1	0	0	
162	1	26-Aug	10:06:59	52.60778	178.84646	>1000	0	0	0	1	0	1	0	0	
163	1	26-Aug	12:55:00	52.26608	179.05956	>1000	0	0	0	1	0	1	0	0	
164	1	26-Aug	16:00:46	51.89928	179.28434	485	0	0	1	1	0	1	0	0	
165	1	26-Aug	18:53:02	51.52422	179.51862	500	0	0	0	1	0	1	0	0	
166	1	26-Aug	21:49:17	51.63968	179.90468	>1000	0	0	0	1	0	1	0	0	
167	1	27-Aug	10:06:50	51.77573	-179.99744	>1000	0	0	1	1	0	1	0	0	
168	0	27-Aug	12:02:36	52.12174	-179.7363	252	0	0	0	0	0	0	0	0	
169	1	27-Aug	12:11:56	52.1497	-179.71336	277	0	0	1	0	0	1	0	0	
170	0	27-Aug	14:51:02	52.473	-179.46552	>1000	0	0	0	0	0	0	0	0	
171	1	27-Aug	15:01:24	52.50444	-179.44086	>1000	0	0	1	0	0	1	0	0	
172	1	27-Aug	17:46:24	52.91484	-179.1206	>1000	0	0	1	0	0	1	0	0	
173	1	28-Aug	9:43:29	52.98438	-179.19482	>1000	0	0	1	1	0	1	0	0	
174	1	30-Aug	21:22:14	53.01866	-179.02986	>1000	0	0	0	0	0	1	0	0	
175	0	31-Aug	10:07:12	52.98631	-179.06697	>1000	0	0	0	0	0	0	0	0	
176	1	31-Aug	10:16:34	53.01487	-179.04505	>1000	0	1	1	0	0	1	0	0	
177	1	31-Aug	12:15:12	53.3715	-178.76341	>1000	0	0	0	0	0	1	0	0	
178	1	31-Aug	14:29:14	53.77569	-178.44394	>1000	0	0	1	0	0	1	0	0	
179	0	31-Aug	18:55:56	54.0657	-178.21549	>1000	0	0	1	0	0	1	0	0	
180	1	31-Aug	19:24:06	54.14887	-178.14399	>1000	0	0	1	2	0	1	0	0	
181	1	1-Sep	10:02:20	54.19105	-178.11443	>1000	0	0	1	1	0	1	0	0	
182	0	1-Sep	13:53:11	54.48356	-177.88137	>1000	0	0	0	0	0	0	0	0	
183	1	1-Sep	14:00:03	54.50396	-177.86649	>1000	0	0	1	0	0	1	0	0	
184	1	1-Sep	17:42:54	54.76776	-177.64684	>1000	0	0	1	2	0	1	0	0	
185	1	1-Sep	19:46:26	54.94559	-177.50399	>1000	0	0	1	0	0	1	0	0	
186	0	2-Sep	10:02:16	54.9936	-177.46463	>1000	0	0	0	0	0	0	0	0	
187	0	2-Sep	10:08:30	55.02166	-177.44976	>1000	0	0	1	0	0	1	0	0	
188	1	2-Sep	12:02:15	55.35016	-177.17162	>1000	0	0	1	1	0	1	0	0	
192	1	3-Sep	12:35:28	55.95408	-176.04215	>1000	0	0	1	0	0	0	0	0	
193	1	3-Sep	14:47:54	55.61857	-175.74284	>1000	1	0	1	0	0	0	0	0	
194	1	3-Sep	15:21:42	55.51919	-175.65189	>1000	0	0	1	0	0	0	0	0	
195	1	3-Sep	17:27:26	55.19246	-175.35825	>1000	1	2	1	0	0	0	0	0	
196	1	3-Sep	19:23:56	55.17741	-175.4539	>1000	0	0	1	0	0	0	0	0	
197	0	3-Sep	20:25:22	55.31756	-175.72991	>1000	0	0	0	0	0	0	0	0	
198	1	3-Sep	20:37:30	55.37188	-175.74511	>1000	0	0	1	0	0	0	0	0	
199	1	4-Sep	10:02:52	55.46068	-176.20075	>1000	0	0	1	0	0	0	0	0	
200	1	4-Sep	21:30:03	55.07741	-175.44994	>1000	0	0	1	0	0	0	0	0	
201	0	5-Sep	10:01:12	55.03894	-175.22585	>1000	0	0	0	0	0	0	0	0	
202	1	5-Sep	10:06:56	55.02207	-175.21122	>1000	0	0	1	0	0	0	0	1	rumble - earthquake?
203	0	5-Sep	21:01:04	54.93901	-175.13358	>1000	0	0	0	0	0	0	0	0	
204	1	5-Sep	21:09:28	54.92754	-175.1254	>1000	0	0	1	0	0	0	0	0	
205	1	6-Sep	10:01:10	54.92588	-175.1239	>1000	0	0	1	0	0	0	0	0	
206	1	6-Sep	14:53:16	54.80955	-175.01818	>1000	0	0	1	1	0	1	0	0	
207	1	6-Sep	16:31:04	54.51179	-174.75795	>1000	0	0	1	0	0	0	0	0	
208	1	6-Sep	18:07:58	54.19537	-174.48212	>1000	0	0	1	1	0	1	0	0	
209	1	6-Sep	20:17:18	53.88781	-174.21617	>1000	0	0	1	0	0	0	0	0	
210	1	6-Sep	23:07:36	54.08751	-173.54959	>1000	0	0	1	0	0	0	0	0	
211	1	7-Sep	9:42:04	55.64929	-170.62082	>1000	0	0	1	1	0	0	0	0	
212	1	7-Sep	11:04:09	55.85163	-170.23846	>1000	0	0	1	1	0	0	0	0	
213	1	7-Sep	12:34:34	56.06682	-169.81991	190	0	0	1	1	0	0	0	0	
214	1	7-Sep	14:31:54	56.34534	-169.28417	130	0	0	1	1	0	0	0	0	
215	1	7-Sep	15:48:00	56.53054	-168.91976	100	0	0	1	1	0	0	0	0	
216	1	7-Sep	16:55:40	56.686	-168.61622	110	1	0	1	1	0	0	0	0	

Station #	Success?	Date	Time (ADT)	Latitude °N	Longitude °W	Water depth (m)	NPRW	Humpback	Fin	Orca	Gray	Sperm	Fish	Other	Notes
217	1	7-Sep	17:33:42	56.77175	-168.44561	100	1	0	1	0	0	0	0	0	
218	1	7-Sep	18:33:22	56.69371	-168.07298	108	1	0	1	0	0	0	0	0	
219	1	7-Sep	19:26:02	56.68814	-167.63793	100	1	0	1	0	0	0	0	0	
220	1	7-Sep	19:38:34	56.64276	-167.57633	100	1	0	1	0	0	0	0	0	
221	1	8-Sep	9:17:30	56.49571	-167.61334	113	1	0	1	0	0	0	0	0	
222	1	8-Sep	9:42:58	56.49175	-167.77917	113	1	0	1	0	0	0	0	0	
223	1	8-Sep	11:23:12	56.43604	-167.71074	113	1	0	0	0	0	0	0	0	
224	1	8-Sep	12:44:58	56.58188	-167.3488	107	0	0	1	0	0	0	1	0	
225	1	8-Sep	13:53:00	56.72714	-167.02828	97	0	0	1	0	0	0	0	0	
226	1	8-Sep	14:52:22	56.85104	-166.74698	80	0	0	0	0	0	0	0	0	
227	1	8-Sep	16:00:54	56.98772	-166.40949	80	1	0	0	1	0	0	0	0	
228	0	8-Sep	17:10:55	57.1311	-166.0633	73	0	0	0	0	0	0	0	0	
229	1	8-Sep	17:17:30	57.14466	-166.03081	73	1	0	0	0	0	0	0	0	
230	1	8-Sep	19:56:49	57.43724	-165.46468	66	1	1	1	1	0	0	0	0	
231	1	8-Sep	20:53:18	57.49075	-165.3114	67	1	1	1	0	0	0	0	0	
232	1	9-Sep	8:30:26	57.44268	-165.38336	68	0	1	1	0	0	0	0	0	
233	1	9-Sep	8:58:10	57.35531	-165.37759	70	0	1	1	0	0	0	0	0	
234	0	9-Sep	10:45:56	57.38173	-164.90965	70	0	0	0	0	0	0	0	0	
235	1	9-Sep	10:55:46	57.37958	-164.85036	67	0	0	0	0	0	0	0	0	
236	1	9-Sep	12:09:40	57.33108	-164.40999	65	2	0	0	0	0	0	0	0	
237	0	9-Sep	13:41:04	57.28371	-163.85762	63	0	0	0	0	0	0	0	0	
238	1	9-Sep	13:46:54	57.28094	-163.82246	63	0	1	0	0	0	0	0	0	
239	1	9-Sep	15:36:28	57.21798	-163.46123	62	0	0	0	0	0	0	1	0	
240	1	9-Sep	16:38:50	57.2013	-163.0824	57	2	0	0	0	0	0	0	0	
241	1	9-Sep	17:45:04	57.18303	-162.67507	57	0	0	0	0	0	0	0	0	
242	0	9-Sep	19:31:18	57.32332	-162.62783	53	0	0	0	0	0	0	0	0	
243	1	9-Sep	20:02:18	57.3952	-162.76604	52	0	0	0	0	0	0	0	0	
244	1	10-Sep	7:59:58	57.32507	-162.57736	54	0	0	0	0	0	0	0	0	
245	1	10-Sep	8:29:18	57.28222	-162.7098	55	0	2	0	0	0	0	0	0	
246	1	10-Sep	10:33:18	57.45582	-162.88859	50	0	0	0	0	0	0	1	0	
247	1	10-Sep	11:26:05	57.57238	-163.13276	52	0	0	0	0	0	0	1	0	
248	1	10-Sep	12:31:19	57.72949	-163.44512	47	0	0	0	0	0	0	0	0	
249	1	10-Sep	14:40:40	57.45382	-163.87649	52	0	0	0	0	0	0	0	0	
250	1	10-Sep	16:02:30	57.16684	-164.0974	68	0	2	0	0	0	0	0	0	
251	1	11-Sep	7:02:10	56.86322	-164.1177	73	2	1	0	0	0	0	0	0	
252	1	11-Sep	8:34:54	56.57361	-164.41721	79	0	0	0	0	0	0	0	0	
253	1	11-Sep	10:23:10	56.23365	-164.79695	93	1	1	0	0	0	0	0	0	

6. Marine Debris

A total of 17 objects of marine debris were recorded during surveys in the US EEZ (Appendix Table D8).

Appendix Table D8. Summary of all marine debris observations in the US EEZ.

IWC code	Item	Remarks	Number
134	Single fishing float	White color buoy, 0.5m	1
134	Single fishing float	Orange color buoy, 0.6m	1
134	Single fishing float	white color float, 0.7m	1
136	Wood plank	Single, natural, length 10m	2
136	Wood plank	Single, white and brown color, 0.4m × 0.3m	1
162	Plastic, less than 1 square meter	Plastic sheet, whit color, 0.3m × 0.3m	1
163	Plastic, 1-3 square meters	Plastic sheet, whit color, 1m × 1m	1
163	Plastic, 1-3 square meters	Plastic sheet, pink color, 0.5m × 0.5m	1
163	Plastic, 1-3 square meters	Plastic sheet, whit color with 3-4 blue lines, 0.5m × 0.5m	1
199	Other	Plastic bottle, clear color, 2.0 liters	3
199	Other	Plastic bottle, white color, 2.0 liters	1
199	Other	Plastic bottle, blue color with white label, 2.0 liters	1
199	Other	Plastic jug/bottle, clear color, 4.0 liters	1
199	Other	Electric light-bulb (broken), red color, 0.5m	1
Total			17

END