

North Pacific right whale (*Eubalaena japonica*) sightings in the Gulf of Alaska and the Bering Sea during IWC-Pacific Ocean Whale and Ecosystem Research (IWC-POWER) surveys

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KEYWORDS: Bering Sea, *Eubalaena japonica*, Gulf of Alaska, gunshot call, line-transect, North Pacific right whale, passive acoustics

Matsuoka, K., Crance, J.L., Taylor, J.K., Yoshimura, I., James, A., An, Y.-R., 2021. North Pacific right whale (*Eubalaena japonica*) sightings in the Gulf of Alaska and the Bering Sea during IWC - Pacific Ocean Whale and Ecosystem Research (IWC - POWER) surveys. Marine Mammal Science, 1-13. <https://doi.org/10.1111/mms.12889>

The North Pacific right whale (hereafter NPRW), *Eubalaena japonica*, is currently divided into two populations, eastern and western (Brownell et al., 2001). Although once widely distributed throughout the Bering Sea and Gulf of Alaska (hereafter GoA), both populations were targeted by extensive whaling in the 19th and early 20th centuries, with an estimated 27,000-35,000 whales taken in two decades (1840-1860) (Clapham et al., 2004; Josephson et al., 2008; Omura, 1958; Scarff, 2001). Despite being internationally protected starting in 1935, both populations became the target of illegal Soviet whaling in the 1960s, with over 700 whales estimated to have been taken in the eastern North Pacific between 1962 and 1968 (Ivashchenko & Clapham 2012; Ivashchenko et al., 2017). North Pacific right whales have been listed as endangered under the U.S. Endangered Species Act since its inception in 1973 (U.S. Government, 1983).

Consequently, NOAA established federally designated areas of Critical Habitat for the eastern population in the southeastern Bering Sea and northern GoA (south of Kodiak Island) in 2006 (Figure 1). Today, the eastern population, which is listed as critically endangered by the IUCN (Cooke and Clapham, 2018), is estimated at approximately 30 individuals, with an estimated 2:1 male-to-female sex ratio (Wade et al., 2011b).

NOAA surveys in the eastern Bering Sea have shown that NPRW are typically found in the Critical Habitat in summer months (e.g., Clapham et al., 2012; Wade et al., 2006). However, there has been little effort outside of this region, and the full extent of their summer distribution remains unknown. Recent acoustic studies suggest that they may be more widely distributed throughout the entire eastern Bering Sea, rather than only in their Critical Habitat, with NPRW detections near St. Lawrence Island (Wright et al., 2019). Sightings are rare in the GoA, despite it being the location of the majority of catches in the 1800s (Scarff, 1991, 2001; Townsend, 1935). Most of the few sightings in recent decades have occurred in shallow waters in or near the

GoA Critical Habitat (Wade et al., 2011a). NOAA conducted three full-scale vessel-based marine mammal surveys in the GoA in 2009, 2013, and 2015 (Rone et al., 2010, 2014, 2015); however, despite a handful of acoustic detections near Barnabas Trough (2013 and 2015 only), no NPRW were seen.

While NPRW are thought to migrate from their known summer feeding grounds in the Bering Sea to lower latitude winter breeding grounds, their migration routes and breeding grounds are unknown. There have been a number of sightings of NPRW in southern latitudes over the past few decades, ranging from Baja California up the west coast of the United States (e.g., Brownell et al., 2001; Ford et al., 2016; Kennedy et al., 2011). However, these isolated events are most often single animals, and as such have not provided any insight into breeding grounds. Despite this lack of knowledge, there has been very little funding in recent years to study this population, and the lack of information has hindered conservation efforts.

The International Whaling Commission's Pacific Ocean Whale and Ecosystem Research (IWC-POWER¹) cruises in the North Pacific follow the series of International Decade of Cetacean Research - Southern Ocean Whale and Ecosystem Research (IWC/IDCR-SOWER²) cruises that were conducted in the Antarctic annually from 1978 to 2009. These visual line transect surveys were implemented as a means of obtaining information on cetacean distribution, abundance, and density estimates in poorly studied areas. The IWC-POWER cruises have taken place every summer from July to September since 2010 and have systematically surveyed the North Pacific from 20° N to the Aleutian Islands. The 2017 and 2018 cruises systematically surveyed the eastern and central Bering Sea, respectively (IWC 2017). Because these cruises were conducted in NPRW habitat, passive acoustics were included for the first time in 2017 to

¹ <https://iwc.int/power>

² <https://iwc.int/sower>

assist in detecting and locating NPRW. Here we present the results of all NPRW sightings that occurred during the IWC-POWER cruises and discuss how these results contribute to our knowledge of this critically endangered population.

Data presented here include results from three IWC-POWER cruises (2012, 2017, 2018; Figure 1) conducted by two Japanese research vessels (2012: *Yūshin-Maru No. 3*; 2017 and 2018: *Yūshin-Maru No. 2*). Cruise plans were endorsed at the IWC/Scientific Committee (IWC/SC) meetings prior to sailing (e.g., IWC, 2017). The 2012 cruise occurred between July 13 and September 10 in the northern GoA, the 2017 cruise occurred from July 3 to September 25 in the eastern Bering Sea, and the 2018 cruise occurred from July 3 to September 25 in the central Bering Sea (Figure 1). A randomized start point for survey tracklines was determined based on the IWC/SC survey guidelines (IWC, 2012).

Research hours during the cruise were set at a maximum of 12 hr per day. Sighting effort was conducted by the boatswain and topmen from the barrel (i.e., crow's nest, 19.5 m above the waterline) and the upper bridge (11.5 m above the waterline) where the helmsman, captain or officer-on-watch, international researchers, and the chief engineer or deputy were also present. Primary search effort was conducted only in acceptable weather conditions: visibility greater than 2.0 nautical miles (nmi), wind speed < 21 knots (kts), and sea state < Beaufort 6. Surveys were conducted at an average vessel speed of 11.5 kts. When marine mammals were sighted, the date, time, and position were automatically recorded from a GPS. Sea surface temperature (SST) was automatically recorded from the underway water sampling system. The vessel would then break from the trackline to confirm species identification and begin off-effort activities, time permitting. Identification photographs were collected from the bow of the vessel as well as the barrel as the animal was approached. Side-on photographs of the left and right side of the head

were the priority, but photos taken from above the animal during approach were also collected when possible. Using photo-ID, NPRW were inter-matched within and between sightings in situ to detect duplication. Post hoc photo-ID analysis was conducted by cross-referencing the images against the Alaska Fisheries Science Center Marine Mammal Laboratory (AFSC/MML) catalog of known individuals. Biopsy samples were collected from the bow using the Larsen sampling system (Larsen, 1998), approximately 7 m above sea level, and analyzed post hoc using extracted DNA and qPCR following the protocol in Morin et al. (2005). After the whale was approached for biopsy sample collection, the boatswain (over 25 years of experience) estimated body length to the nearest 0.1 m by visual observation and comparison to the ship's length.

Passive acoustic monitoring for marine mammals using sonobuoys occurred during the 2017 and 2018 surveys. Sonobuoys are free-floating, expendable passive listening devices that transmit audio signals via VHF radio waves in real time to a receiver on a vessel or aircraft (Crance et al., 2017). Sonobuoys used during the current study include AN/SSQ 53F and 77C sonobuoys. All sonobuoys were deployed in Directional Frequency Analysis and Recording (DiFAR) mode. Two antennas, a Morad³ VHF 156HD omnidirectional and a YA150-9-5 directional Yagi were installed in the crow's nest (25 m above the waterline). The acoustic signal (sampled at 48 kHz, with an audio frequency range up to 2.5 kHz) was transmitted to up to three G39WSBe WinRadio receivers and input into a MOTU Ultralite mk3 multichannel soundcard. This was then input to a laptop computer where the recordings were monitored in real time using ISHMAEL (Mellinger, 2001) acoustic software. Directional bearing information of calls was obtained using DiFAR demultiplexing software and a custom MATLAB interface (Greeneridge Sciences, Inc. and Mark McDonald, Whale Acoustics), as well as a custom tracking and plotting

³ Reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.

program implemented in MATLAB. A GPS feed into the computer provided the ship's position (updated every minute) and the deployment position of the sonobuoys. Sonobuoys were deployed every 2-3 hr during daylight hours to monitor for marine mammals. When in or near the NPRW Critical Habitat, sonobuoys were deployed continuously. When NPRW vocalizations were detected, multiple sonobuoys were deployed simultaneously to localize on the calling animal and obtain location and distance estimates. For full details, see Crance et al. (2017).

A total of 16 NPRW were sighted during the three surveys: one in 2012, 12 in 2017, and 3 in 2018 (Figure 2, Table 1). Nine were known individuals matched to the AFSC/MML catalog, and seven were new individuals (five confirmed new and two potentially new, but this could not be confirmed due to the poor quality of some older photos in the catalog). Biopsy samples were collected from six individuals, all of which sex was previously unknown. Specific sighting details and notes are presented in Table 1. Whale identification, sighting history, and estimated body length for each individual NPRW are included.

On July 24, 2012, a solitary NPRW was visually sighted approximately 120 nmi southeast of Kodiak Island, and approximately 85 nmi southeast of the GoA Critical Habitat in a water depth of approximately 4,500 m (Figure 2). Identification photographs and video footage were obtained, and estimated body length was 14.3 m. Surface skim-feeding and subsurface feeding was observed and documented. A comparison with the AFSC/MML NPRW catalog confirmed that this was a newly documented individual. Biopsy sampling was not conducted in 2012 due to permitting issues. Passive acoustics were not employed during this cruise.

In 2017, 9 sightings of 12 NPRW were observed, including two duplicate sightings, and with a possible 3 additional unphotographed individuals (Table 1; Figure 2). Of these 9 sightings, 5 were the result of acoustic localization (maximum detection distance approx. 40 nmi). The

majority of NPRW (7 of 12 individuals) were sighted at the western edge of Bristol Bay, approximately 50 nmi east of the Critical Habitat; five NPRW were sighted in the Critical Habitat (Figure 2).

Eight of the 12 individuals were matched to individuals in the AFSC/MML catalog. Of these, the sex was previously known for three of the individuals, all of which were males. Two of the four unmatched individuals were confirmed as newly documented animals. The other two were potentially new, but either poor photo quality or photos of only one side of the head prevented confirmation. Biopsy samples (skin and blubber) were obtained from three animals, all of previously unknown sex (Table 1). Of the three biopsied individuals, two were collected from known individuals (i.e., matched to the AFSC/MML catalog), while one was from a potentially new individual. This individual (sighting 082 on August 9, 2017; Table 1) was identified in the field as a possible juvenile (estimated body length approx. 13.3 m), based on the size and ratio of the head relative to the body, as well as the distance between coaming and bonnet callosities (Figure 3). Post hoc photo analysis and review supported the initial assessment as a juvenile. Three of the animals (NMML⁴ 24, 27, 28) had small divots on their back, most likely from previous satellite tag deployments (Table 1). In all cases the sites were well healed (e.g., no discoloration, no swelling; evidenced in photographs) and the whale appeared in good physical condition.

Biopsy sample analysis resulted in two males and one female. The males were NMML 28, which has only been sighted once prior to this in 2004 when he was satellite-tagged; and the potentially new individual confirmed to be a juvenile. The female was NMML 84, which has only been sighted once prior to this in 2009.

⁴ NMML is the former name of the Marine Mammal Laboratory. NMML numbers refer to the ID number of the NPRW within the AFSC/MML catalog.

Probable or assumed feeding was observed during five of the seven sightings (Table 1). Indicators of feeding included close proximity to large flocks of feeding birds and/or other baleen whales, mud on rostrum, mouth closing on surfacing or nodding on surfacing (Table 1). Four sightings (sighting #017 on August 6, and all three sightings on August 8) were associated with large numbers of shearwaters and other baleen whales (humpback (*Megaptera novaeangliae*), fin (*Balaenoptera physalus*), and minke (*Balaenoptera acutorostrata*) whales) in close proximity. Feeding behaviors were observed in two of the seven NPRW in these highly productive areas; they were documented closing their mouth and expelling water on surfacing. These four sightings (August 6 and 8) all occurred to the east of the Critical Habitat in Bristol Bay (Table 1; Figure 2).

A brief back-to-belly Surface Active Group (SAG) was observed in one sighting on September 8 between two known individuals: NMML 09 (unknown sex), first sighted in 1996; and NMML 24 (male), first sighted in 2004 (Table 1). Both were satellite-tagged in 2009.

There was a total of three sightings of three individuals during the 2018 survey (Figure 2, Table 1). Two individuals (two sightings) were sighted in the NPRW Critical Habitat on July 18, and one individual was sighted south of St. Lawrence Island on July 26.

The first two sightings (sightings 022 and 023 on July 18) were detected by acoustics and were in close proximity to one another (740 m apart) in the NPRW Critical Habitat. The third whale (sighting 018 on July 26) was sighted near the southwest cape of St. Lawrence Island, approximately 7 nmi from the coast and was detected visually. No right whale acoustic detections occurred prior to the sighting despite consistent monitoring, although one solitary gunshot sound was detected 4 days prior near the northwest cape of St. Lawrence Island. Identification photographs and biopsy samples were collected from all three individuals. One of

the three individuals (sighting 022) was matched to the AFSC/MML catalog: NMML 25, first sighted in 1999. The other two NPRW were confirmed as new individuals. Sex was previously unknown for all three animals; all three were confirmed as males from biopsy sample analysis.

Feeding behavior was directly observed in two of the three sightings, indicated by mouth closing on surfacing and red feces (sighting 022 on July 18), and head nodding to flush baleen (sighting 018 on July 26). Humpback and fin whales were sighted in close proximity to the two sightings in the NPRW Critical Habitat (sightings 022 and 023 on July 18), and large, dense flocks of birds were observed feeding in the area of all three sightings.

The whale sighted on July 26 (sighting 018) was re-sighted on August 7, 2018 by a Russian charter vessel, actively feeding with humpbacks in Penkigney Bay near the Bering Strait (64.85°N, 172.95°W), approximately 100 nmi north of the original sighting location (Filatova, et al., 2019).

In total, 16 unique NPRW were sighted; there were no matches of individuals between the three surveys. The 12 individuals sighted during the 2017 cruise represent the largest number of NPRW seen in one survey since 2004 (Wade et al., 2006). Of the 16 NPRW, 9 were matched to the NPRW catalog, 5 were confirmed new individuals, and two were possible new individuals. Three known individuals were re-sighted for the first time during the POWER cruises (NMML 28, 78, 84; first seen in 2004, 2008, and 2009, respectively; Table 1). Whales with the longest sighting histories were NMML 09, 27 (both sighted on 2017 cruise), and 25 (sighted on 2018 cruise), which were first sighted in 1996, 1997, and 1999, respectively.

Analyses from the six biopsy samples collected resulted in five males and one female. Wade et al. (2011b) suggested the male to female sex ratio within this population was roughly

2:1 male-biased. However, the results presented here suggest this ratio may be more skewed toward males than previously thought. Unfortunately, the extremely low re-sight rate and even lower biopsy sampling rate for this population make it difficult to accurately estimate the sex ratio. While these biopsy results are disheartening, the juvenile sighted during the 2017 cruise was the first juvenile seen in the Bering Sea since 2005. Additionally, in 2013, a NPRW was sighted off Haida Gwaii (British Columbia, Canada) that was estimated to be 10-11 m in length, indicating it was a subadult (Ford et al., 2016). Altogether this suggests at least some portion of the population is reproducing.

Half of the total NPRW sighted in the southeastern Bering Sea (7 of 14) occurred 50 nmi east of the designated Critical Habitat in Bristol Bay. These individuals also demonstrated feeding-associated behavior (e.g., expelling water from the mouth), or were associated with large flocks of shearwaters in the general vicinity, suggesting that this area may be important for feeding. There are no published sightings reported east of 161°W since historic whaling records (Ivashchenko & Clapham, 2012; Shelden et al., 2005). However, there has been very little survey effort in this area in recent years. In the 2008 and 2009 summer seasons, the AFSC/MML conducted aerial surveys for NPRW, with tracklines in 2008 covering Bristol Bay (Clapham et al., 2012). Despite thorough coverage of Bristol Bay, no right whales were seen east of the Critical Habitat during those aerial surveys. While the relatively large number of right whales seen in 2017 and the evidence of feeding in Bristol Bay may suggest that this area is important habitat for this population, additional effort is needed to confirm whether their presence in Bristol Bay occurs regularly or if 2017 was an anomalous year.

Two NPRW have been sighted in the middle Bering Sea shelf in the past few decades, although sightings in the northern Bering Sea postwhaling are rare (Shelden et al., 2005). During

the 2018 IWC-POWER cruise, a single NPRW was sighted approximately 7 nmi south of St. Lawrence Island. This animal was re-sighted 12 days later actively feeding with humpback whales in Penkigney Bay, approximately 100 nmi north of the original sighting. Genetic analysis confirms that this animal is part of the eastern population (Filatova et al., 2019). NPRW distribution within the Bering Sea is hypothesized to be influenced by oceanographic conditions; in years with cold water regimes, tagged animals showed a more restricted habitat preference, and remained in the middle shelf (Zerbini et al., 2015). However, in years with warm water regimes, tagged whales traveled farther distances and had larger habitat ranges (Zerbini et al., 2015). The Bering Sea has been in a warm water regime the past few years, with 2018 reporting record warm temperatures⁵. It is unknown whether this northern sighting is a result of oceanographic conditions and its influence on prey distribution, or whether it is indicative of NPRW beginning to re-occupy their historic distribution grounds. Whaling records show limited catches north of St. Matthew Island (Shelden et al., 2005), although questions remain regarding the validity of these sightings and whether they were bowhead whales (*Balaena mysticetus*) or the result of transcription errors.

However, there are also occasional reports of NPRW sighted by Alaska Native whalers around St. Lawrence Island, although details and photographs of these sightings are not available. Altogether these indicate that NPRW may have occupied the northern Bering Sea. Passive acoustic monitoring along the Bering Sea shelf has indicated NPRW presence north of St. Matthews Island in recent years (Wright et al., 2019). Gunshot and upcalls recorded in summer 2016 in the northern Bering Sea occurred over numerous days from late July to

⁵<https://www.climate.gov/news-features/event-tracker/alaska%E2%80%99s-2018-early-fall-extremes>, accessed 10 September 2021

<https://uaf-iarc.org/2019/04/11/bering-strait-sea-ice-conditions-winter-2019/>, accessed 10 September 2021

September, the same time frame as the NPRW sighting in 2018 (Wright et al., 2019). However, the limited sighting and acoustic recordings make interpretation of these data difficult. It remains unknown whether these recent sightings and detections are the result of changing climatic conditions or a re-occupation of historical distribution grounds. In either case, these data suggest that the summering range of NPRW may be greater than previously thought, warranting additional surveys and expanded passive acoustic monitoring throughout the eastern Bering Sea.

Sightings of NPRW in the GoA postwhaling are rare, and to date there have been no matches of a NPRW between the GoA and the Bering Sea. Only a few sightings ($n = 8$ confirmed) have been reported in recent decades, and most have occurred in shallow (<200 m) waters, often in or near the Critical Habitat (Wade et al., 2011a). Historical catch data, however, show a wide-spread distribution throughout the GoA (Ivashchenko & Clapham, 2012; Omura, 1958; Scarff, 1991, 2001; Townsend, 1935). Sightings and catch records show that NPRW were present in all summer months throughout the entire Gulf of Alaska (Shelden et al., 2005). The 2012 IWC-POWER cruise sighting occurred in July at 56° N, approximately 85 nmi southeast of the Critical Habitat in deep (4,500 m) water. This individual was not matched to the NPRW catalog and was confirmed a new individual. While the sighting location was outside the Critical Habitat, it was well within the range of their historic prewhaling distribution (Ivashchenko & Clapham, 2012; Omura, 1958; Scarff, 1991, 2001; Shelden et al., 2005).

While not the first survey to use passive acoustics to detect vocalizing animals, these results highlight the utility of such methods for detecting and locating animals. Similar methods have been successful in other areas, both for congeneric right whales and other species (e.g., Jackson et al., 2020; Miller et al., 2014; Noad & Cato, 2001). These results also illustrate the importance of long-term monitoring and collecting photographs of animals previously known to

have been satellite tagged. Although collected opportunistically, the images of tag sites collected during this survey can be included in a study analyzing the long-term site healing from implantable tags, as has been done in other studies (e.g., Best et al., 2015; Norman et al., 2018).

The data presented here provide new, valuable information on the distribution and population status of critically endangered North Pacific right whales and further highlight the need for additional research. Sixteen identified right whales were seen during three separate cruises with five confirmed new animals added to the catalog. Biopsy samples collected during these surveys have provided crucial information regarding the previously unknown sex of six NPRW. Results (five males, one female) support the suspected male-bias sex ratio and suggest that it could be even stronger than previously thought, although the sample size is too small to be conclusive. The detection of a juvenile in 2017 does indicate that at least one successful reproductive female exists in the population. Further analyses will be conducted for a revised abundance estimate, photo-ID matching to other catalogs, and further genetic analyses. For a population numbering in the tens of animals, sighting 12 individuals and documenting a new juvenile in one year provides hope that this critically endangered population may yet have the ability to recover.

ACKNOWLEDGMENTS

We acknowledge the Government of Japan (Fisheries Agency of Japan) and the United States government for their assistance in the research permit and funding for these cruises. We thank Greg Donovan and the Secretariat of the IWC for their support and funding for IWC-POWER cruises. We also acknowledge the IWC steering group and the Technical Advisory Group for their scientific and logistical support. We also thank the captains, their officers and crew of the *Yūshin-Maru No.2* and *Yūshin-Maru No.3* for their hard work and dedication. Thank

you to Sally Mizroch, Amy Kennedy, and Brenda Rone (NOAA/NMFS/AFSC) for matching the North Pacific right whale images to the MML catalog, and to Kelly Robertson (NOAA/NMFS/SWFSC) for analysing the biopsy samples. Hideyoshi Yoshida, the National Research Institute of Far Seas Fisheries (NRIFSF, Yokohama) arranged biopsy CITES permit issues. Thanks to Theresa Yost (Naval Operational Logistics Support Center), Jeffrey Leonhard, Todd Mequet, and Edward Rainey (Naval Surface Warfare Center, Crane Division), and Anurag Kumar (Program Manager, U.S. Navy Living Marine Resources Program) for providing sonobuoys. The authors also thank the anonymous reviewers, whose comments greatly improved this manuscript. Work was conducted under the National Marine Fisheries Service Endangered Species Act/Marine Mammal Protection Act Permit no. 20465 issued by the U.S. Government, and all applicable guidelines for the care and use of animals were followed. The scientific results and conclusions, as well as any views or opinions expressed herein, are those of the author(s) and do not necessarily reflect those of NOAA or the Department of Commerce.

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TABLES

Table 1. Summary of North Pacific right whale sightings, and life history information for the 16 right whales photographed during the 2012, 2017, and 2018 IWC-POWER cruises. Whale ID corresponds to Alaska Fisheries Science Center's Marine Mammal Laboratory North Pacific right whale catalog number. SST = Sea surface temperature at sighting location. Unk. = unknown.

Sighting Info								Individual Info								
Date Y/M/D	Sighting Number	Group Size		No. Individuals Photographed	Latitude °N	Longitude °W	SST °C	Water depth (m)	Notes	AFSC/MML Catalog Number	Sex	Biopsy Sample Collected	Est. Body Length (m)	Year first sighted	Previous sighting years	Notes
2012-07-24	008	1	1	56	149	10.1	4,500	No acoustic monitoring on the cruise. Sighted 120 nmi southeast of Kodiak Island. Skim feeding. Video footage obtained.	NMML 89	Unk.	N	14.3	2012	-	Confirmed new individual	
2017-08-06	017	2	2	58	161	12.0	61	Found by acoustics. Probable feeding - dense flocks of shearwaters in surrounding waters.	NMML 28	Male	Y	15.3	2004	-	Satellite tagged in 2004. Divot - likely from previous tagging	
									NMML 27	Male	N	16.0	1997	1998, 2000, 2001, 2004, 2008, 2009	Satellite tagged in 2004. Divot - likely from previous tagging	
2017-08-08	015	6	3	58	160	11.6	59	6 whales initially grouped within 0.1 nmi, but dispersed at start of observations. Probable feeding - many humpbacks, fin and minke whales and dense flocks of shearwaters in close proximity.	NMML 78	Unk.	N	14.0	2008	-	Feeding - mouth closing.	
									NMML 84	Female	Y	14.6	2009	-	Feeding - mouth closing.	
									NMML 85	Male	N	17.0	2009	2011		
2017-08-08	021	1	1	58	161	12.1	64	Possible relocation of one of the 3 not photographed in sighting 015 based on time elapsed and positions of first / last photos. Humpback within 0.1 nmi. Probable feeding - many shearwaters in surrounding waters.	NMML 95	Unk.	N	14.3	2017	-	Confirmed new individual	

Sighting Info									Individual Info						
Date Y/M/D	Sighting Number	Group Size	No. Individuals Photographed	Latitude °N	Longitude °W	SST °C	Water depth (m)	Notes	AFSC/MML Catalog Number	Sex	Biopsy Sample Collected	Est. Body Length (m)	Year first sighted	Previous sighting years	Notes
2017-08-08	047	1	1	58	161	12	62	Probable feeding - many humpbacks, fin and minke whales and dense flocks of shearwaters in close proximity. Humpback within 0.1 nmi. Possible feeding close to bottom - mud on head. Animal was not vocalizing.	NMML 96	Unk.	N	14.3	2017	-	Confirmed new individual
2017-08-09	082	1	1	57	163	11.9	53	Feeding - nodding to flush baleen. Not fluking, close to surface for duration of sighting (Figure 3)	NMML 97	Male	Y	13.3	2017	-	Possible new individual*. Juvenile; first juvenile seen in Bering Sea since 2004.
2017-09-08	001	2	2	57	166	10.1	83	Found by acoustics. Brief surface active group (SAG) activity.	NMML 09	Unk.	N	14.8	1996	2000, 2008, 2009, 2010	Satellite tagged in 2009.
									NMML 24	Male	N	14.3	2004	2009	Satellite tagged in 2009. Divot.
2017-09-09	001	2	2	57	165	9.5	77	Found by acoustics.	NMML 15	Unk.	N	16.1	2000	2004, 2008, 2009	Satellite tagged in 2009. Whale re-sighted on 2017-09-10 sighting no. 004+005
									NMML 98	Unk.	N	14.7	2017	-	Possible new individual*. Whale re-sighted on 2017-09-10 sighting no. 005
2018-07-18	022	1	1	57	162	9.6	63	Found by acoustics. Red feces. Feeding - mouth closing. Humpbacks and fin whales in close proximity. Dense flocks of birds feeding in the area. Video footage obtained.	NMML 25	Male	Y	13.6	1999	2001, 2002, 2004	Seen in close proximity (740 m apart) to sighting no. 023 on 2018-07-18.

Sighting Info									Individual Info							
Date Y/M/D	Sighting Number	Group Size		No. Individuals Photographed	Latitude °N	Longitude °W	SST °C	Water depth (m)	Notes	AFSC/MML Catalog Number	Sex	Biopsy Sample Collected	Est. Body Length (m)	Year first sighted	Previous sighting years	Notes
2018-07-18	023	1	1	57	162	9.7	60	Found by acoustics. Humpbacks and Fin whales in close proximity. Dense flocks of birds feeding in the area.	NMML 101	Male	Y	12.3	2018	-	Confirmed new individual. Seen in close proximity (740 m apart) to sighting no. 022 on 2018-07-18.	
2018-07-26	018	1	1	63	171	8.9	40	Probable feeding - head nodding, possible subsurface feeding. Dense flocks of shearwaters feeding in the area. Photographic documentation of tooth rake marks on the fluke tips (Figure 4).	NMML 102	Male	Y	13.1	2018	-	Confirmed new individual. Whale re-sighted 24 days later on 2018-08-18 in Penkigney Bay near Bering Strait.	

* Animals could not be confirmed new due to either poor photo quality or only having photos of one side of the head.

FIGURES

Figure 1. Visual survey effort (thin black lines) and the sighting positions of North Pacific right whales (NPRW; red square) during 2010 to 2018 IWC-POWER cruises. Bold black lines delineate research areas for different years. Blue polygons indicate NPRW federally designated Critical Habitats.

Figure 2. Visual survey effort (blue line) and sighting and acoustic detection positions of the 16 North Pacific right whales (NPRW) sighted during the 2012, 2017, and 2018 POWER cruises, where yellow = 2012, red = 2017, and blue = 2018. Squares = sightings; squares with dots = biopsied animals; small dots = sonobuoys that detected NPRW. Red polygons delineate the NPRW federally designated Critical Habitats.

Figure 3. Photograph of a juvenile eastern North Pacific right whale (possible new individual), determined based on relative size of head and distance from coaming to bonnet callosities. Sighting no. 082 on August 9, 2017 (see Table 1).

Figure 4. Photographic documentation of tooth rake marks on the fluke tips. Sighting no. 018 on July 26, 2018.

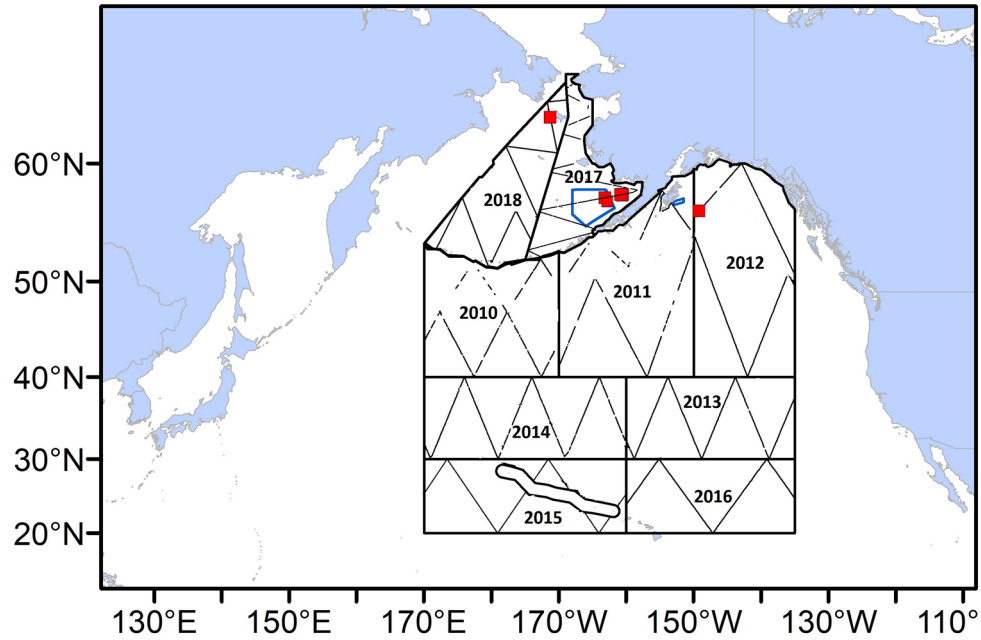


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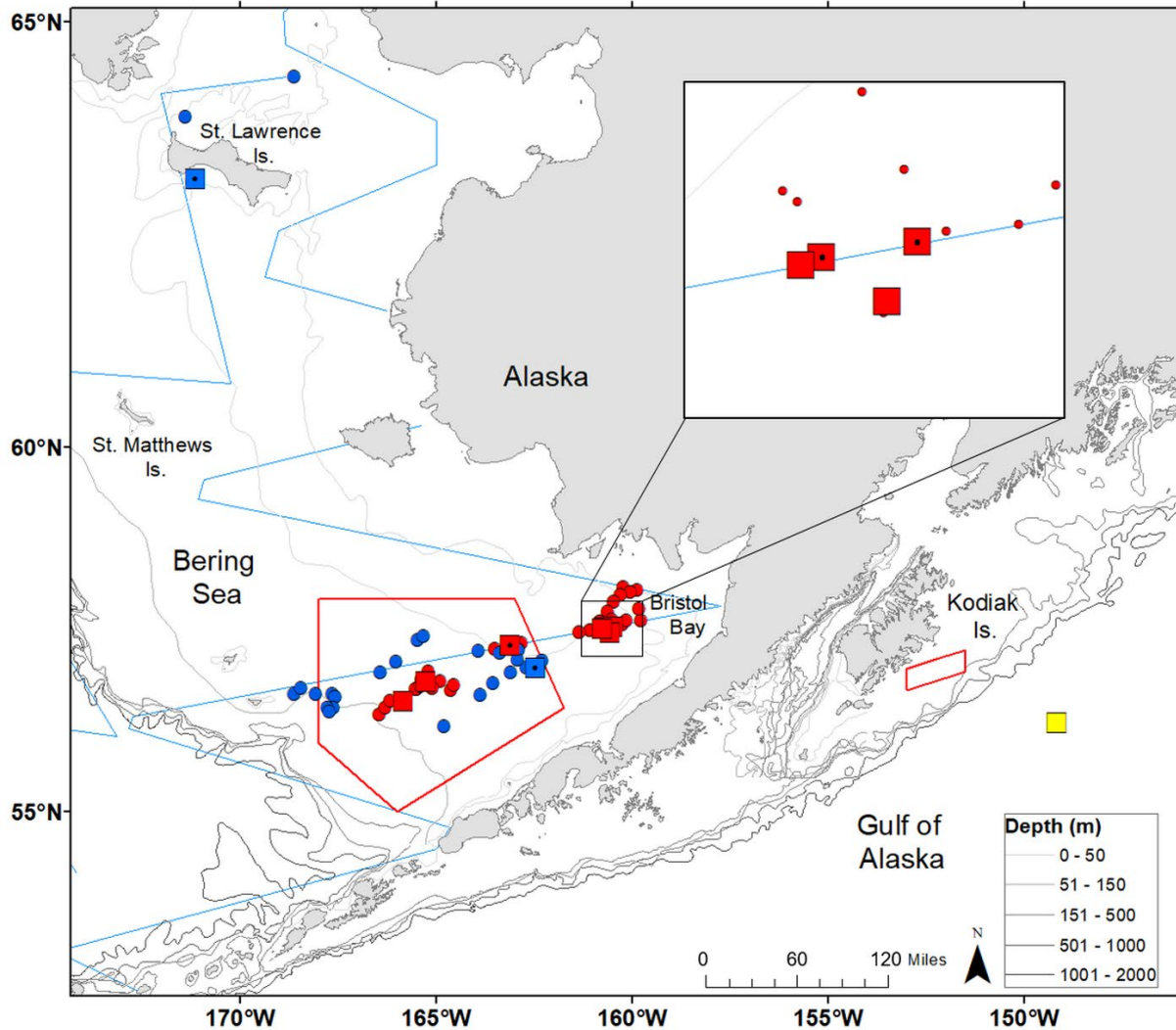


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