North Pacific Right Whale

(Eubalaena japonica)

Five-Year Review:

Summary and Evaluation

Photo: NOAA Fisheries, taken by Adam Ü under NMFS permit 20465 during the 2021 PacMAPPS. Two North Pacific right whales sighted in Barnabas Trough, Gulf of Alaska, 21 August 2021. The animal on the left was sighted off Haida Gwaii, British Columbia, Canada by the Department of Fisheries Canada on 12 June 2021. The animal on the right was confirmed as a new animal and has been added to the North Pacific right whale catalog.

National Marine Fisheries Service
Alaska Regional Office
Protected Resources Division
Anchorage, Alaska

February 2024

5-YEAR REVIEW
Species reviewed: North Pacific Right Whale (*Eubalaena japonica*)

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1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional or Headquarters Office: Alaska Regional Office – Jenna Malek, North Pacific Right Whale Recovery Coordinator, 907-271-1332

Cooperating Science Center: Alaska Fisheries Science Center, Marine Mammal Laboratory – Catherine Berchok (206-526-6331), Jessica Crance (206-526-4063), Robyn Angliss (206-526-4032)

1.2 Methodology used to complete the review:

The review was completed by Jenna Malek, Kathleen Leonard, Catherine Berchok, and Jessica Crance and relied on research conducted by NOAA's Marine Mammal Laboratory and recent publications.

1.3 Background:

Section 4(c)(2) of the Endangered Species Act (ESA) requires, at least once every five years, a review of all threatened and endangered species to determine if they should be removed from the list of threatened or endangered species or changed in their listing status. The five-year review is also used to help track the recovery of a species.

The following information identifies previous documentation of recovery actions, listing decisions, and status updates required under the ESA, and thus provides the foundation for analysis and incorporation of any relevant new information related to the recovery, listing status, and classification of North Pacific right whales.

1.3.1 FR Notice citation announcing initiation of this review:

87 FR 17991, March 29, 2022

1.3.2 Listing history

<u>Original Listing</u>
FR notice: 35 FR 18319
Date listed: December 2, 1970
Entity listed: Right Whales (*Eubalaena* spp.)
Classification: Endangered

Revised Listing
FR notice: 73 FR 12024
Date listed: March 6, 2008
Entity listed: North Pacific Right Whale (*Eubalaena japonica*)
Classification: Endangered

1.3.3 Associated rulemakings

Critical habitat in the North Pacific Ocean was designated for the Northern right whale on July 6, 2006 (71 FR 38277).

Critical habitat was designated for the North Pacific right whale on April 8, 2008 (73 FR 19000).

90-Day Finding on a petition to revise North Pacific right whale critical habitat on July 12, 2022 (87 FR 41271).

12-Month Finding on a petition to revise North Pacific right whale critical habitat on September 26, 2023 (88 FR 65940).

1.3.4 Review history

Perry, S.L., DeMaster, D.P., and G.K. Silber. 1999. The Great Whales: History and Status of Six Species Listed as Endangered Under the U.S. Endangered Species Act of 1973. Marine Fisheries Review 61(1):44-51. https://spo.nmfs.noaa.gov//mfr611/mfr6111.pdf

National Marine Fisheries Service. 2006. Review of the Status of the Right Whales in the North Atlantic and North Pacific Oceans. U.S. Department of Commerce NOAA Technical Memorandum. http://www.nmfs.noaa.gov/pr/pdfs/statusreviews/rightwhale2006.pdf

National Marine Fisheries Service. 2012. North Pacific Right Whale. Five-Year Review: Status and Evaluation. National Marine Fisheries Service, Office of Protected Resources, Silver Spring, MD. http://www.nmfs.noaa.gov/pr/pdfs/species/northpacificrightwhale_5yearreview.pdf

National Marine Fisheries Service. 2017. North Pacific Right Whale. Five-Year Review: Status and Evaluation. National Marine Fisheries Service, Office of Protected Resources, Alaska Region.

https://media.fisheries.noaa.gov/dam-migration/2018northpacificrightwhale5yrreview.pdf

1.3.5 Species' Recovery Priority Number at start of 5-year review

This species had a recovery priority number of 4C assigned in 2022.

1.3.6 Recovery Plan or Outline

Name of plan or outline: Recovery Plan for the North Pacific Right Whale (*Eubalaena japonica*)

Date issued: June 2013

Dates of previous revisions, if applicable: Final Recovery Plan for the Northern Right Whale, *Eubalaena glacialis*, 1991

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate?

Yes

2.1.2 Is the species under review listed as a DPS?

No

2.1.3 Was the DPS listed prior to 1996?

No

2.1.4 Is there relevant new information for this species regarding the application of the DPS policy?

No

2.2 Recovery criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measureable criteria?

Yes

2.2.2 Adequacy of recovery criteria

2.2.2.1 Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat?

Yes

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and is there no new information to consider regarding existing or new threats)? See following section, under Objective 2 for the listing factors.

Yes

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information:

Downlisting Objectives and Criteria

North Pacific right whales will be considered for reclassifying from endangered to threatened when all of the following objectives are met:

Objective 1: Achieve sufficient and viable populations in all ocean basins

Criterion: Given current and projected threats and environmental conditions, each North Pacific right whale population (eastern and western) satisfies the risk analysis standard for threatened status (has no more than a 1% chance of extinction in 100 years) and there are at least 1,000 mature, reproductive individuals (consisting of at least 250 mature females and at least 250 mature males in each population). Mature is defined as individuals known, estimated, or inferred to be capable of reproduction.

Status: Two populations of North Pacific right whales are currently recognized – the eastern population which ranges along the west coast of North America and Canada, from the Bering Sea to waters off Mexico and Hawaii, and the western population which inhabits water from Russia to Japan, including the Sea of Okhotsk. The most recent estimate of the eastern population size is 31 individuals, with a minimum estimate of 26 whales (Wade et al. 2011, Muto et al. 2022). While the low population size alone would prevent this recovery criterion from being met, the sex ratio of the eastern population is >3:1 male to female (Pastene et al. 2022), well below the identified 1:1 ratio set forth in the Recovery Plan. Therefore, the criterion has not been met for the eastern population.

The western population does not have a reliable estimate, though it is likely higher than the eastern population, numbering in the hundreds compared to tens of individuals. Without a reliable population estimate, or any indication of a sex ratio, we conclude that the recovery criterion has not been met for the western population of North Pacific right whales. Please see section 2.3.1.2 of this review for additional information on population abundance and trends.

Objective 2: Ensure significant threats are addressed

Criteria: Factors that may limit population growth, i.e., those that are identified in the threats analysis under relative impact to recovery as high or medium or unknown, have been identified and are being, or have been, addressed to the extent that they allow for continued growth of populations. Any factors or circumstances that are thought to substantially contribute to a real risk of extinction that cannot be incorporated into a Population Viability Analysis will be carefully considered before downlisting takes place. Specifically, the factors in section 4(a)(l) of the ESA are being or have been addressed as follows:

Factor A: The present or threatened destruction, modification, or curtailment of a species' habitat or range.

A1: Effects of anthropogenic noise continue to be investigated and actions taken to minimize effects, as appropriate

Status: Efforts to meet this criterion are ongoing, but are minimal due to a lack of resources. Anthropogenic noise is increasing in the marine environment as a result of oil and gas exploration, shipping, construction, and naval exercises. Possible negative impacts to North Pacific right whales include changes in foraging, socialization, vocalization, and transitory movements.

This criterion has not been met. Please see section 2.3.2.1 of this review for additional information on anthropogenic noise.

A2. Effects of contaminants and pollutants are determined to not affect the potential for continued growth or maintenance of North Pacific right whale populations.

Status: Efforts to understand the effects of contaminants and pollutants on the growth and maintenance of North Pacific right whale populations cannot occur due to a lack of resources. The long-term impacts of exposure to these threats are currently unknown.

This criterion has not been met. Please see section 2.3.2.1 of this review for additional information on contaminants and pollutants.

A3. Effects of marine debris and commercial fishing continue to be investigated and actions taken to minimize potential effects, as appropriate.

Status: Efforts to understand the effects of marine debris and commercial fishing on North Pacific right whale population are ongoing.

This criterion has not been met. Please see sections 2.3.2.1 and 2.3.2.5 of this review for additional information on the effects of marine debris (plastics) and commercial fishing.

A4. Effects of reduced prey abundance due to climate change continue to be investigated and action is being taken to address the issue, as appropriate.

Status: The impacts of climate change on North Pacific right whale prey abundance, and potential impacts of reduced prey on the species, continue to be explored using data collected for other purposes; novel studies cannot be pursued due to a lack of resources.

This criterion has not been met. Please see section 2.3.2.1 of this review for additional information on the impacts of climate change.

Factor B: Overutilization for commercial, recreational, scientific, or educational purposes.

B1. Where possible within legal authority, management measures restrict any hunting that may over utilize the species (whether for commercial, subsistence, or scientific purposes).

Status: Right whales have been protected by the International Whaling Commission (IWC) since 1946 from any commercial use, though illegal Soviet hunting of North Pacific right whales occurred until the early 1970s (Ivashchenko, Clapham and Brownell Jr 2017). This species is not utilized for recreational or educational purposes, as it is not often found in locations conducive to whale watching or educational excursions. A limited amount of harassment is allowed for scientific purposes including photographs, biopsy, satellite telemetry, scat, environmental DNA, and prey collection in close vicinity to individuals.

This criterion has been met. Please see section 2.3.2.2 of this review for additional information.

Factor C: Disease or Predation.

C1. Effects of disease and predation do not limit the potential for continued growth or maintenance of North Pacific right whale populations.

Status: At this time, there are no data to indicate whether disease or predation are limiting North Pacific right whale recovery. Resources are not available to improve our understanding of these effects.

This criterion has not been met. Please see section 2.3.2.3 of this review for additional information on disease and predation.

Factor D: The inadequacy of existing regulatory mechanisms.

Status: As discussed in section 2.3.2.4, North Pacific right whales are protected broadly under the ESA as a listed-species. They are also protected broadly under the Marine Mammal Protection Act (MMPA). However, with the exception of hunting, as described under Factor B, there are no regulations in place specifically for North Pacific right whales as there are for North Atlantic right whales. There are regulations in place to reduce or eliminate the threat of ship strikes and fishing gear entanglement for North

Atlantic right whales on the east coast of the United States, but not in the North Pacific. Based on similarities between North Atlantic and North Pacific right whales, the presence of a major shipping route through North Pacific right whale habitat, and similarities in types of fishing gear used, it is likely that ship strikes and fishing gear entanglement pose the greatest direct anthropogenic risk to North Pacific right whales. While there is little direct evidence of injuries or mortalities caused by these factors, the lack of such evidence is likely due to the very small size of the eastern population and the scarcity of observations in their vast and dynamic habitat. Therefore, reducing these threats may require implementation of regulations in the future to protect North Pacific right whales.

This criterion has not been met. Please see section 2.3.2.4 of this review for additional information.

Factor E: Other natural or manmade factors affecting its continued existence.

North Pacific right whales occur in very low densities and both the population and the anthropogenic threats that may affect their continued existence occur in very remote areas. For North Atlantic right whales, which occur along the densely populated U.S. and Canadian Atlantic coast, observed carcasses accounted for only 36% of the estimated mortalities (Pace III et al. 2021). Given the remoteness of the Gulf of Alaska and Bering Sea, it is highly unlikely that a mortality caused by a ship strike or an entanglement would be observed or reported to NMFS. The lack of a confirmed mortality due to either of these sources does not imply that these anthropogenic factors do not directly threaten the continued existence of this population.

E1. Ship strikes continue to be investigated and actions taken to minimize potential effects, as appropriate.

Status: There are currently no data on the frequency of ship strikes of North Pacific right whales. Though right whales have been acoustically detected in high traffic areas, such as Unimak Pass (Wright et al. 2018), no ship strikes of this species have been reported.

This criterion has not been met. Please see section 2.3.2.5 of this review for additional information about ship strikes.

E2. Entanglement with fishing gear continues to be investigated and actions taken to minimize potential effects, as appropriate.

Status: The frequency and impacts of North Pacific right whale entanglement in fishing continues to be researched. Fishing activities continue to be extensive in the Bering Sea and Gulf of Alaska, with considerable overlap with North Pacific right whales. There is at least one individual in the eastern North Pacific Right Whale Catalog that shows signs of entanglement scars (Ford et al. 2016) and video footage of three western North Pacific right whales in 2022 off the coast of Russia shows entanglement scars similar to those documented on North Atlantic right whales (Cetal Fauna 2022).

This criterion has not been met. Please see section 2.3.2.5 of this review for additional information.

Delisting Objectives and Criteria

Because the downlisting objectives and criteria have not been met (discussed above and see Section 3.1 Recommended Classification) for the North Pacific right whale, an analysis is not required of the delisting objectives and criteria, which, if met, would indicate the species is recovered and delisting is warranted (50 CFR 424.11(e)(2)). The criteria for delisting the North Pacific right whale are specified in the 2013 final recovery plan, which is available at: https://repository.library.noaa.gov/view/noaa/15978.

2.3 Updated Information and Current Species Status

Where available, new information on North Pacific right whale biology, abundance, and habitat use since the 2017 status review (NMFS 2017) is summarized below, followed by an analysis of any relevant changes in the threats that factor into the listing status determination. Research on the North Pacific right whale distribution has included dedicated visual surveys, opportunistic watches, and underway passive acoustic monitoring, long term passive acoustic recorder moorings, new genetic data collection and analyses, and sightings from platforms of opportunity (Muto et al. 2022).

2.3.1 Biology and Habitat

2.3.1.1 New information on the species' biology and life history:

Little new information exists on the biology and life history of North Pacific right whales. Adult right whales are generally between 45 and 55 feet in length and weigh up to 100 tons, with females growing larger than males. The distinguishing features of right whales include a large head, strongly-arched and narrow upper jaw and bowed lower jaw, callosities on the head region, no dorsal fin, a deeply notched tail, and a stocky body mostly black in color (NMFS 2006).

The North Pacific right whale is the first right whale species documented to produce song and it is hypothesized that these songs are reproductive displays (Crance et al. 2019). The singers whose sex could be determined were all males but it is unknown if females also sing. Four distinct song types were recorded at five distinct locations in the southeastern Bering Sea from 2009-2017. The songs have a hierarchical structure of units and phrases, and the song types remained constant over eight years with multiple song types occurring within a season and across years (Crance et al. 2019).

2.3.1.2 Abundance, population trends (e.g., increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

The North Pacific right whale is considered one of the most endangered large whale species in the world, likely numbering fewer than 1,000 individuals total in the eastern and western populations. Scarce sightings of the eastern population, as well as extremely limited funding to conduct vessel or aerial surveys, make it difficult to estimate basic population parameters.

Abundance

The last population abundance estimates for the eastern population of North Pacific right whales were developed by Wade et al. (2011) for individuals in the Bering Sea using mark-recapture data and genetic identification techniques, and Marques et al. (2011) using acoustic cue counting. Both estimates by Wade et al. (2011) were similar, with a slightly higher estimate for mark-recapture (31 individuals, 95% confidence interval 23-54 individuals) than for genetic identification (28 individuals, 95% confidence interval 24-42 individuals). Marques et al. (2011) used call-counts from passive acoustic recordings of North Pacific right whales to estimate their density as a proof-of-concept study. As part of this work, they also obtained an abundance estimate of 25 individuals, 95% confidence interval of 13-47 individuals. While these 95% confidence intervals overlap with both of the Wade et al. (2011) mark-recapture estimates, Marques et al. (2011) noted that their '…estimate is based on an untested assumption about animal distribution over time and space.'

There is no reliable population estimate for the western population. Though this population is assumed to be larger than the eastern population, and perhaps even increasing since the 1990s (Matsuoka, Hakamada and Miyashita 2021), the last estimate of population size was generated based on data collected during minke whale surveys conducted between 1989 and 1992. Miyashita and Kato (1998) estimated that the population contained approximately 900 individuals, but the confidence intervals ranged from 404 to 2,108 individuals. Though surveys have regularly been conducted in the western North Pacific for large cetaceans, including right whales, no other population abundance estimates are available that do not have substantial caveats (see Hakamada and Matsuoka 2016).


Photo Credit: Josh Trosvig

Sex Ratio

Determining the sex ratio for a small, elusive population is challenging. The most commonly cited sex ratio for the eastern population of North Pacific right whales comes fromWade et al. (2011), who used photographic and genotypic survey data collected from 1997-2008 to identify 20 males and eight females, for a sex ratio of 5:2. Most recently, biopsies were collected during the 2017 and 2018 IWC's Pacific Ocean Whale and Ecosystem Research (IWC-POWER) surveys from six North Pacific right whales for which the sex was previously unknown or that were newly identified individuals (Matsuoka et al. 2022). Analysis of the biopsy samples indicated a male to female ratio of 5:1, which suggests even fewer females compared to Wade et al. (2011), but is also based on a much smaller sample size (n=6 vs. n=28). Matsuoka et al. (2022) cautioned that due to their small sample size, the results may not accurately represent the entire population.

Pastene et al. (2022) reanalyzed all available North Pacific right whale genetic samples, including those used by Rosenbaum et al. (2000) and LeDuc et al. (2012), as well as new samples collected between 1997 and 2018. For the eastern population, this also included 3 historical samples (from baleen plates collected 1956-1968) and 29 contemporary biopsy samples (1997-2018). They found the ratio of males to females in the eastern population to be approximately 3:1(Pastene et al. 2022). Two of the three historical samples were from the Gulf of Alaska, and both samples were males; the third historical sample was from the Aleutian Islands and was a female. All contemporary samples were from the southeastern Bering Sea. One of the 2017 IWC-POWER cruise samples collected from a juvenile male had a haplotype that had not previously been identified for the eastern population (Haplotype 15; Pastene et al. 2022). This suggests that there may be at least one reproductive female in the eastern population that has not yet been genetically sampled. Most recently, a biopsy sample was obtained from the animal sighted by Department of Fisheries and Oceans Canada (DFO) off Haida Gwaii in June 2021; analysis of that sample indicated that the individual was a female that had been previously sighted but the sex was unknown (T. Doniol-Valcroze, pers. comm).

It is unknown whether the sampled sex ratio of males to females in the eastern population is accurate. Given the very low effort directed at studying North Pacific right whales, we cannot rule out the possibility that there is sex segregation in the population and we are not sampling areas where females and calves are located.

For the western North Pacific right whale population, Pastene et al. (2022) analyzed 32 samples, including 2 historical baleen samples. They found a male to female sex ratio of 9:16 for this population (n=25); seven samples failed to sex (Pastene et al. 2022).

Reproduction

Studies of other right whale species have shown that right whale calving success is tightly linked to maternal energy reserves, which is influenced by oceanographic oscillations that govern whales' abilities to locate prey (Kenney 1998, Fujiwara and Caswell 2001, Greene et al. 2003, Angell 2005, Miller et al. 2011). Klanjscek et al. (2007) modeled and compared energetic models between Southern and North Atlantic right whales and found that calving intervals and time of first parturition depended heavily on energy availability and feeding rate. Furthermore, modeled seasonal oceanographic variability had a significantly larger impact on reproductive success when feeding was presumed to be low, or when females were energy-limited(Klanjscek et al. 2007). These principles likely also apply to North Pacific right whales, where prevailing oceanographic conditions impact energy reserves and therefore reproductive output.

Right whale reproduction rate varies across the different species. Southern right whales off the coasts of Australia and New Zealand calve approximately every 3.3-3.5 years (Davidson et al. 2018, Watson, Stamation and Charlton 2021, Charlton et al. 2022). North Atlantic right whales previously calved every three to five years (Knowlton, Kraus and Kenney 1994, Kraus, Pace III and Frasier 2007), but Pettis, Pace III and Hamilton (2022) reported the calving interval was 9.2 years in 2021 (individual intervals ranged from 5 to 11 years), with a five year average of 8.5 years from 2017 to 2021 (no calves were counted in 2018).

For the eastern population of North Pacific right whales, no calves have been sighted, and very few individuals have been observed that would be classified as juveniles or subadults. One of the two right whales observed in 2013 by Ford et al. (2016) off Haida Gwaii was deemed to be a subadult female based on size, though exact age is unknown. During the 2017 IWC-POWER survey, a new individual was sighted in the Bering Sea and identified as a possible juvenile based on length (13.3 m), head to body ratio, and distance between callosities (Matsuoka et al. 2022). Biopsy results from this individual indicate it was a male, and scientists estimate that it was 1.5 to 4 years old at the time of sighting. He was named "Phoenix" as a sign of hope for recovery of the species (NMFS 2021). There was also an opportunistic sighting of a possible cow-calf pair off the coast of Gambell, St Lawrence Island, Alaska in 2018 (Table 2). No photographs or videos were collected to confirm individual identity, size of animals, or calf status. It is unknown whether the absence of calves and low numbers of juveniles is because no calves have been born in recent years, or if there is geographic segregation of mother/calf pairs and we are not sampling those areas.

Though the calving interval for the western population is also unknown, there has been evidence of successful reproduction. Between 1994 and 2016, surveys by the Institute of Cetacean Research documented ten right whale calves, with multiple calves observed in 1998, 2005, and 2011 (Matsuoka, Hakamada and Miyashita 2021). More recently, a cow-calf pair were sighted near Choshi, Japan in 2020 by the Choshi Marine Research Institute (Table 2; Cetal Fauna posting, 2020).

Mortality

Similar to other life history characteristics, small population sizes and limited sampling opportunities have led to little new information on mortality rates within the eastern and western North Pacific right whale populations. Several decades ago, Kraus (1990) calculated that North Atlantic right whales experienced 17 and 3 percent mortality in yearling and subadult whales, respectively. However, much of the observed mortality for North Atlantic right whales in recent years has been the result of anthropogenic sources, primarily entanglement and ship strikes. While these threats may also lead to mortality in the North Pacific populations, the mortality rates for the North Atlantic are likely not an appropriate proxy in this case. See Section 2.3.2.3 below for more information on impacts of disease and predation.

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

As described in previous status reviews (NMFS 2013, 2017), commercial whaling left small, remnant populations vulnerable to low genetic variability due to genetic drift and inbreeding. Low diversity potentially affects individuals by depressing fitness, lowering resistance to disease and parasites, and diminishing the whales' ability to adapt to environmental changes. At the population level, low genetic diversity can lead to slower growth rates, lower resilience, and poorer long-term fitness (Lacy 1997). Marine mammals with an effective population size of a few dozen individuals likely can resist most of the deleterious consequences of inbreeding (Lande 1991, Taylor and Rojas-Bracho 1999). However, it has also been suggested that if the effective population size is fewer than 50 individuals, the potential for impacts associated with inbreeding increases substantially and increases the risk of extinction (Franklin 1980). Based on an analysis from LeDuc et al. (2012), an effective population size for eastern North Pacific right whales was calculated to be 11.6 (95% CI: 2.9-75.0). From a dataset that included historical and contemporary samples, Rosenbaum et al. (2000) found haplotype and nucleotide diversity in North Pacific right whales (12 samples) to be higher compared to North Atlantic right whales (269 samples). However, a small number of samples from surviving North Pacific right whales suggested lower genetic diversity when compared to the historical samples for the North Pacific, which was confirmed by LeDuc et al. (2012). Nevertheless, this loss of diversity over time appears to be considerably less than that documented for the North Atlantic right whale. More recently, Pastene et al. (2022) reanalyzed all

North Pacific right whale samples to look at genetic diversity within the eastern and western populations. Both nucleotide and haplotype diversity indices indicated relatively high diversity for both populations, although the eastern population levels were slightly lower (Pastene et al. 2022). These diversity levels were intermediate between the less diverse North Atlantic right whale and the more diverse southern right whale (*Eubalaena australis*)(Pastene et al. 2022).

Pastene et al. (2022) also performed analyses to determine if the eastern and western populations of North Pacific right whales differ genetically using mitochondrial DNA (mtDNA) control region sequences. Though two separate populations have been hypothesized for decades based on historical catch data and patterns in strandings and sightings (Omura 1958, Omura et al. 1969, Brownell et al. 2001, Clapham et al. 2004), there had been no evaluation of genetics between the populations, save for LeDuc et al. (2012) which included only one sample from a western population individual. Using samples from previous studies (Rosenbaum et al. 2000, LeDuc et al. 2012), as well as new samples available from the IWC-POWER surveys (reported in Matsuoka et al. 2022) and Japanese dedicated sighting surveys for the eastern and western populations, respectively, Pastene et al. (2022) expanded their data set to 30 individuals from each population. Results from all samples combined showed that there is a significant difference in the mtDNA between the two North Pacific right whale populations, and that the western population has a higher number of haplotypes specific to that population (eight) compared to the eastern population (four), with only four haplotypes shared between the two populations. Based on results from heterogeneity tests, Pastene et al. (2022) concluded that there was a striking genetic differentiation between the eastern and western North Pacific right whale populations that suggests they are not interbreeding, which supports the current separation into two stocks under the MMPA.

Alternatively, it is possible that these genetic results stem from a single North Pacific right whale population that interbreeds and is genetically structured by matrilineally driven seasonal site fidelity, but there are currently not enough data available (i.e., nuclear data analysis) to further test this hypothesis (Pastene et al. 2022).

There have been no genetic matches between North Pacific right whales found in the Bering Sea and Gulf of Alaska, although the sample size for the latter is small (n = 2; Pastene et al. 2022). However, photo-identification data also indicate a lack of visual matches of individuals between these two regions. There has been one match where the same individual was first sighted in British Columbia and then in the Gulf of Alaska off Kodiak Island two months later (Crance, Goetz and Angliss 2022), and another match between the Bering Sea and Hawaii (Kennedy, Salden and Clapham 2012). The lack of genetic and photographic matches has led to the working hypothesis that there may be two subgroups within the eastern stock. Additional sampling of Gulf of Alaska animals is warranted to investigate this hypothesis.

2.3.1.4 Taxonomic classification or changes in nomenclature:

There has been no new genetic information relevant to taxonomic classification or nomenclature since the definitive separation of right whales into three species: Southern, North Atlantic, and North Pacific right whales (NMFS 2006; 73 FR 12024, March 6, 2008). This classification was based on the analysis of mtDNA control sequences taken from skin tissue biopsies, stranded animals, and historical whaling samples and showed that these whale lineages are genetically distinct and demonstrate a relatively strong historical separation, with no shared haplotypes among the three right whale species (Rosenbaum et al. 2000). Gaines et al. (2005) examined both mtDNA and nuclear (nuDNA) introns containing single nucleotide polymorphisms and confirmed the reclassification of the Northern right whale in the North Pacific as a separate species (*Eubalaena japonica*).

2.3.1.5 Spatial distribution, trends in spatial distribution (e.g., increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g., corrections to the historical range, change in distribution of the species within its historic range, etc.):

Much remains unknown about how right whales live, breed, migrate, and feed in the North Pacific. Information on the historical range, known distribution, and potential migratory routes and seasonal patterns are discussed below (also see (NMFS 2017) for additional information).

Historical Range

Historically, right whales are thought to have ranged across the entire North Pacific Ocean from the western coast of North America to the Russian Far East and down to Baja California and the Yellow Sea (Brueggeman, Newby and Grotefendt 1986, Scarff 1986, Goddard and Rugh 1998, Gendron, Lanham and Carwardine 1999, Brownell et al. 2001, Clapham et al. 2004, Shelden et al. 2005). However, Josephson, Smith and Reeves (2008) compared charts and abstracts from whaling logbooks of Matthew Fontaine Maury from the early 1850s and found that right whales had a longitudinally bimodal distribution across the North Pacific, with few encounters of right whales by whalers in the central-northern North Pacific. In the eastern North Pacific, right whales were caught and sighted frequently in areas such as the Gulf of Alaska (Ivashchenko and Clapham 2012, Ivashchenko, Clapham and Brownell Jr 2017), but the lack of recent sightings suggests that the species range has most likely contracted compared to the peak period of whaling in the 19th century (Clapham et al. 2004).

Current Distribution

Surveys

Limited sighting data make it difficult to determine what areas may no longer be utilized or not yet reinhabited by the current populations (Clapham et al. 2004). The following surveys were conducted since the 2017 status review: IWC conducted surveys from 2018 to 2022, NOAA's Pacific Marine Assessment Program for Protected Species (PacMAPPS) survey occurred in 2022, and opportunistic visual watches and/or acoustic monitoring (via sonobuoys) were conducted on oceanographic cruises from 2018 to 2022.

The IWC-POWER cruises are visual line transect surveys conducted in different areas of the North Pacific to obtain information on cetacean distribution, abundance, and density estimates in poorly studied areas. The cruises have taken place every summer from July to September since 2010, and passive acoustics were included for the first time in 2017 to assist in detecting and locating right whales.

The 2018 IWC-POWER cruise research area encompassed a swath of the central Bering Sea extending from the western Aleutian Islands north to the Bering Strait (Matsuoka et al. 2018). Three male right whales were visually observed; one was matched to the Alaska Fisheries Science Center Marine Mammal Laboratory (MML) right whale catalog and two were confirmed new animals. One individual was observed near St. Lawrence Island and re-sighted by a Russian charter organization 24 days later, 106 nautical miles away in the Penkigney Fjord of Chukotka (Filatova et al. 2019). Acoustic detections by sonobuoys were concentrated within or near the critical habitat; however, there were several gunshot calls detected before and after the sighting near St. Lawrence Island, and upcalls were detected in the southern portion of the research area almost 300 nautical miles west of the critical habitat in the Bering basin waters >1000 meters in depth (Figure 1)(Matsuoka et al. 2022).

In 2019, the IWC-POWER cruise surveyed the northern Gulf of Alaska, between 170°W and 135°W (Matsuoka et al. 2019). There were no sightings of North Pacific right whales, and infrequent gunshot calls were only detected by sonobuoys during the last few days of the cruise within or near the critical habitat (Matsuoka et al. 2022).

The 2020 and 2021 IWC-POWER cruise research areas both occurred in the High-Sea, in the Central North Pacific between 160°E and 180° (2020), and the northeast Pacific from 155° W to 135° W, from the US EEZ border to the north down to 40° N (2021) (Murase et al. 2020, Murase et al. 2022). Right whales were not observed during either cruise (Murase et al. 2020, Murase et al. 2022). Acoustic surveys were not conducted on either cruise due to the COVID-19 pandemic and associated restrictions (2020), and difficulties importing the sonobuoys into Japan (2021).

The 2022 IWC-POWER cruise occurred in the northwest Pacific, from 168° E to 170° W, from the Aleutian Islands chain down to the US EEZ border (Morse et al.

2022). Acoustic surveys were again conducted, although due to shipping issues only a limited number of sonobuoys were deployed. No right whales were sighted or acoustically detected.

The PacMAPPS survey was conducted from August 1-26, 2021. The goal of the survey was to collect visual and acoustic information on protected species along the shelf and slope waters off Kodiak, AK, and east/southeast of Prince William Sound. Two pairs of North Pacific right whales were sighted during the survey on August 21 and 24, 2021 (Table 1; Crance, Goetz and Angliss 2022). One of the individuals in the first pair, sighted in Barnabas Trough, was identified as the same individual sighted by DFO in June 2022, making it the first North Pacific right whale from Haida Gwaii to be resighted (Towers, pers comm.; Crance, Goetz and Angliss 2022). The second pair of North Pacific right whales was acoustically detected by sonobuoys and then visually sighted to the southwest of the first pair, with one known individual that was resighted for the first time since 2006, where it was sighted 80 nm away in Barnabas Trough (Crance, Goetz and Angliss 2022).

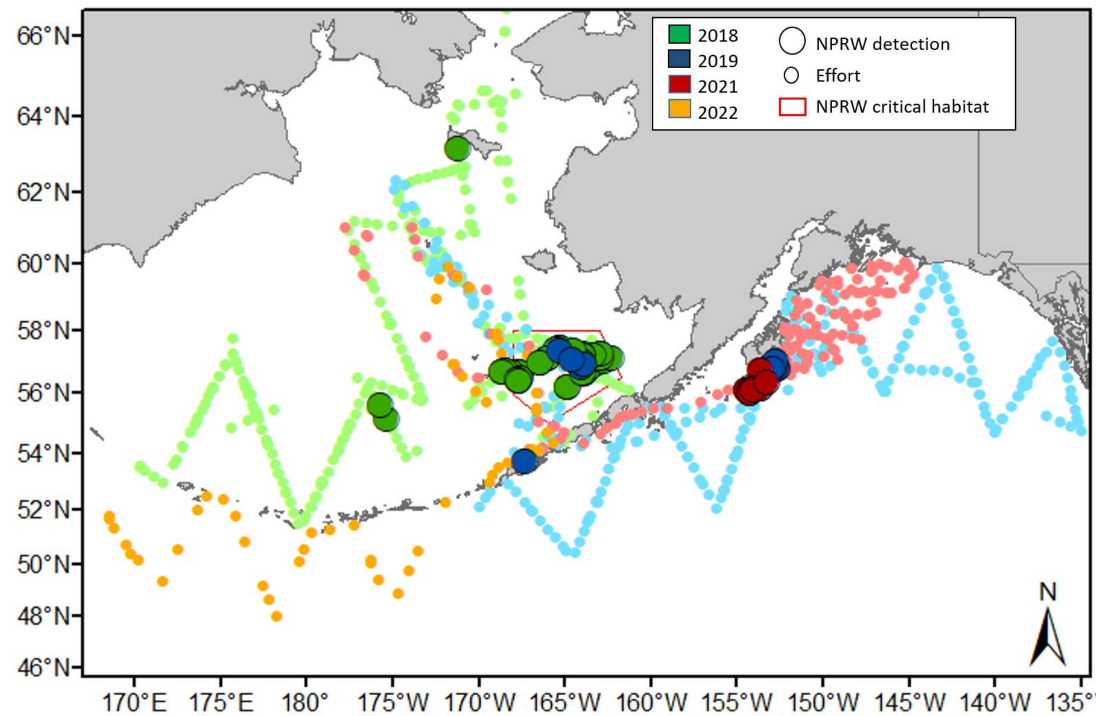

Figure 1. Sonobuoy effort (smaller, lighter colored circles) and North Pacific right whale detections (larger, darker colored circles) on research cruises between 2018 and 2022. No sonobuoys were used on cruises in 2020 (J. Crance, pers. comm, 5/16/2023).

Opportunistic Sightings


Photo Credit: Daniel Bianchetta)

Details on reported opportunistic sightings of North Pacific right whales can be found in Table 1 and Table 2. A February 2022 sighting of two North Pacific right whales feeding north of Unimak Pass in the Aleutian Islands was reported by cod fishers. This sighting is of particular interest as it is the first time right whales have been visually sighted in the area during that time of year (previous detections have been through acoustic moorings (Wright et al. 2018). Additionally, video footage confirmed that the whales were feeding, an activity not expected during the winter months when their prey is not as plentiful. There have also been two sightings of North Pacific right whales off California, one seen skim feeding 6 nautical miles off Ano Nuevo, CA, in April 2022 (Cetal Fauna 2022), and one off Monterey Bay in March of 2023 (Monterey Bay Whale Watch, pers. comm, 03/2023). Interestingly, the Monterey Bay animal had numerous barnacles on the side of the head, which is unusual for this species (photo by Daniel Bianchetta).

Sightings of western North Pacific right whales are listed in Table 2.

Table 1. Reported sightings of eastern North Pacific right whales 2018-2023.

Date	# of individuals	Location	Sighting type (opportunistic or scientific survey)	Sighting source	Species ID confirmed with photo/video	Notes
June 2018	1	Haida Gwaii (off coast of British Columbia)	Opportunistic	Canadian Coast Guard	Yes	Unable to make an individual ID from photos
June 2018	2	North point of Gambell, AK (St. Lawrence Island)	Opportunistic	Residents of the Native Village of Gambell	No	There were two right whales in a larger pod of whales; One right whale was much larger than the other, suggesting a cow/calf pair
July 2018	2	Southeastern Bering Sea	Scientific survey	IWC POWER survey	Yes	One known male; One new male. Biopsy samples collected from both
July 2018	1	St Lawrence Island, Northern Bering Sea	Scientific survey	IWC POWER survey	Yes	One new male, biopsy sample collected
August 2018	1	Penkigney Fjord, Chukotka	Opportunistic	Heritage Charter Expeditions	Yes	Same individual as sighted off St Lawrence Island in July 2018

Date	# of individuals	Location	Sighting type (opportunistic or scientific survey)	Sighting source	Species ID confirmed with photo/video	Notes
August 2018	1	Northeast Gulf of Alaska	Opportunistic	Previous captain of NPRW surveys	No	
May 2019	1	37 miles Northwest of Savoonga, AK (St. Lawrence Island)	Opportunistic	Residents of the Native Village of Savoonga	No	Individual was observed during subsistence whaling activities
May 2020	1	Off Vancouver Island (British Columbia)	Opportunistic	Ship passenger	Yes	Unable to make an individual ID from video; Animal had a large scar on the left side of its back
June 2021	1	Off Haida Gwaii (British Columbia)	Scientific survey	DFO survey	Yes	Confirmed new individual; Biopsy, prey, and scat samples collected (analyses ongoing)
July 2021	2	Haida Gwaii	Scientific survey	Protected Species Observer on a seismic survey vessel	Yes	Unable to make an individual ID from photos; Seismic operations shutdown when whales were present

Date	# of individuals	Location	Sighting type (opportunistic or scientific survey)	Sighting source	Species ID confirmed with photo/video	Notes
August 2021	2	Barnabas Trough (Gulf of Alaska)	Scientific survey	PacMAPPS survey	Yes	One known individual (same as June 2021 DFO sighting); One confirmed new individual
August 2021	2	Trinity Islands, western Kodiak Island (Gulf of Alaska)	Scientific survey	PacMAPPS survey	Yes	One known individual (unknown sex); One confirmed new individual
November 2021	1	Savoonga, AK (St. Lawrence Island)	Opportunistic	Residents of the Native Village of Savoonga	No	Details of sighting are unknown
February 2022	2	North of the west end of Unimak Island (Aleutian Islands)	Opportunistic	Commercial cod fisherman	Yes	Unable to make an individual ID from photos
April 2022	1	6 nautical miles off Año Nuevo, CA	Opportunistic	Fisherman	Yes	Unable to make an individual ID from photos
March 2023	1	Monterey Bay, CA	Opportunistic	Whale watching vessel, Monterey Bay Whale Watch	Yes	Photos collected
September 2023	4	South side of Aleutian Islands, west of Chirikof Island	Scientific survey	IWC POWER survey	Yes	Photos collected; One confirmed new individual

Table 2. Reported sightings of western North Pacific right whales 2018-2023.

Date	# of individuals	Location	Sighting type (opportunistic or survey/cruise)	Sighting source	Species ID confirmed with photo/video	Notes
June 2018	1	Shiretoko, Japan	Opportunistic	Whale watching vessel, Aurora	Yes	
September 2018	1	Off north island of Hokkaido, Japan	Opportunistic	Whale watching vessel, Aurora	Yes	
June 2019	1	Medney Island, off Commander Islands, Russia	Opportunistic	Wild Discovery	Yes	
Summer 2019	3	Off Paramushir, Russia	Opportunistic	Finval Research Center	Yes	There were three individuals engaged in a surface active group, which is rare behavior for the species
2020	2	Choshi, Japan	Opportunistic (???)	Choshi Marine Research Institute	Yes	Cow/calf pair
2020	1	Izu Islands, Japan	Opportunistic	Reported on Cetal Fauna August 2020	Yes	One individual observed breaching; Location was a sub-tropical region, considered more of a wintering ground

Date	# of individuals	Location	Sighting type (opportunistic or survey/cruise)	Sighting source	Species ID confirmed with photo/video	Notes
February 2021	1	Off Iwaki, Japan	Scientific survey	Japanese marine mammal survey on Yushin Maru 3	Yes	Biopsy sample collected (analyses ongoing)
March 2022	1	Hokkaido, Japan	Scientific survey	Japanese marine mammal survey on Yushin Maru 1	Yes	Biopsy sample collected (analyses ongoing)
August 2022	3	Off Onekotan Island, northern Kuril Islands, Russia	Opportunistic	Reported on Cetal Fauna October 2022	Yes	Video collected via drone

Long term passive acoustic moorings

Year-round passive acoustic recorders located in the Bering Sea and at Unimak Pass in the Aleutian Islands detected right whales in the Bering Sea in most months of the year, with a peak in occurrence in known foraging habitats during summer (Wright 2016, Wright et al. 2018, Crance et al. 2019). Detections were made at Unimak Pass during most months of the year, supporting the idea that right whales may use this area as more than just a migratory corridor to enter and leave the Bering Sea (Wright et al. 2018). Numerous right whale detections occurred in the critical habitat area of the southeastern Bering Sea, consistent with satellite tagging results and sightings (Zerbini et al. 2015, Crance, Berchok and Keating 2017, Crance et al. 2019). Detections were also made in the northern Bering Sea, including in the vicinity of St. Lawrence Island (Wright et al. 2019, Matsuoka et al. 2022). These detections have been increasing in frequency in recent years (Wright et al. 2019); it remains unknown whether this is a return to historical distribution grounds or an expansion north to new habitat as sea temperatures increase. Whaling records do show North Pacific right whales occurring in the northern Bering Sea, although the validity of these records (and whether they may have been bowhead whales) remains in question (Scarff 1986).

Seasonal Migration

Historical sighting and catch records provide the only information on possible migration patterns for North Pacific right whales (Omura 1958, Scarff 1986). Whalers did not report winter calving areas, and calving locations in the North Pacific remain unknown (Brownell et al. 2001, Scarff 2001, Clapham et al. 2004, Shelden et al. 2005). Good and Johnston (2010) conducted likelihood modeling of the North Pacific right whale based on habitat preferences of North Atlantic right whales to identify potential calving grounds. Based on depth, sea surface temperature, and surface roughness, potential calving areas included southern California, the Northwest Hawaiian Islands, the southern coast of China, and the northern coast of Vietnam. The model identified suitable coastal calving habitat between 23º N and 36º N in the eastern North Pacific and between 15º N and 38º N in the western North Pacific (Good and Johnston 2010).

There have been 16 North Pacific right whale sightings along the coasts of California and Mexico between 23º N and ~37º N between the 1970s and present. Though this North Pacific right whale habitat may serve as viable calving grounds (Good and Johnston 2010), there has been no evidence that calving (or breeding) was taking place when these sightings occurred. Of the three North Pacific right whales sighted off Hawaii since the 1970s, one has provided a low to high latitude migratory match (Kennedy, Salden and Clapham 2012). In April 1996, a North Pacific right whale was sighted off the western coast of Maui, Hawaii (Salden and Mickelsen 1999), and then again by fishermen in the southeastern Bering Sea in July of that same year (Goddard and Rugh 1998). This same whale has been sighted four more times in the Bering Sea (2000, 2008-2010), but never again in Hawaii (Kennedy, Salden and Clapham 2012).

There have been sightings of North Pacific right whales between the 1970s and present at intermediate latitudes (i.e., between Alaska and areas predicted to be suitable calving grounds (Good and Johnston 2010)), including northern California (1 sighting; Scarff 1986), Washington (three sightings; Brownell et al. 2001), and British Columbia (seven sightings; Brownell et al. 2001, Canadian Coast Guard, pers. comm, 2018; R. Goings, pers. comm, 2020; DFO pers. comm, 2020; Ford et al. 2016). From these sightings, one individual was identified in both British Columbia and the Gulf of Alaska in 2022 (Table 1; Crance, Goetz and Angliss 2022) which could suggest seasonal movement from at least intermediate to high latitudes.

In the western North Pacific, there have been sightings of North Pacific right whales during fall, winter, and spring at lower latitudes within habitat that could be suitable for calving grounds (between 15º N and 38º N; Good and Johnston 2010). Since the 1950s, there have been two sightings in the Ryuku Islands, Japan (near Okinawa), four sightings in the Bonin Islands (Ogasawara, Japan), and six sightings on the Pacific side of Honshu, the main island of Japan (Brownell et al. 2001, Hakamada and Matsuoka 2016, Matsuoka et al. 2021). It is unknown if any of these individuals have also been sighted off the coast of Russia where right whales are known to feed in summer months.

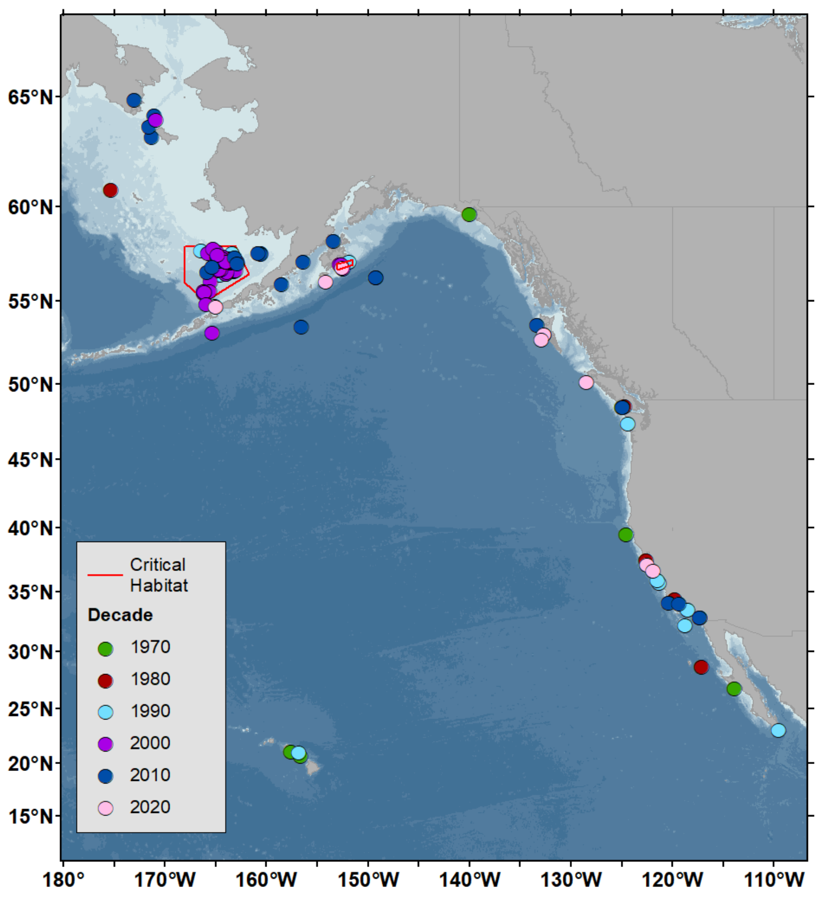

Figure 2. North Pacific right whale sightings along the west coast of the United States and the Pacific Islands.

More is known about where North Pacific right whales migrate to feed than about where they migrate to calve. Based on recorded historical concentrations and recent survey sightings, the Gulf of Alaska, Bering Sea, and Okhotsk Sea and adjacent waters along the coasts of Kamchatka and the Kuril Islands are important summer feeding habitats for North Pacific right whales (Scarff 1986, Goddard and Rugh 1998, Brownell et al. 2001, IWC 2001, Clapham et al. 2004, Shelden et al. 2005, Matsuoka et al. 2022). Ninety percent of Japanese and Russian encounters (1940s–

1960s) occurred between 170° W and 150° W south to 52° N, and between 173° W and 161° W south from 58° N (Clapham et al. 2004), indicating the western Gulf of Alaska and the southeastern Bering Sea were both frequently used areas.

As noted in the 2017 Status Review, fall and spring distributions appear to be the most widely dispersed. There is a general northward migration in the spring and summer for feeding; however, there is uncertainty as to whether some or all of the whales follow this seasonal movement (Clapham et al. 2004). How these seasonal distribution patterns have changed in response to changes in prey resources or anthropogenic factors is unknown.

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

In 2008, NMFS designated two areas as North Pacific right whale critical habitat totaling ~95,325 square kilometers between the southeastern Bering Sea and the Gulf of Alaska (73 FR 19000, April 8, 2008; Figure 3). As described in the designation, identification of habitat that contains the essential features required for North Pacific right whale recovery, mainly large copepods and euphausiids, is complicated due to the challenge of detecting zooplankton patches at densities sufficient for right whale feeding. As such, critical habitat was designated using consistent sightings of right whales, in a specific area during spring and summer over a long period of time, as a proxy for suitably dense zooplankton patches (73 FR 19005, April 8, 2008).

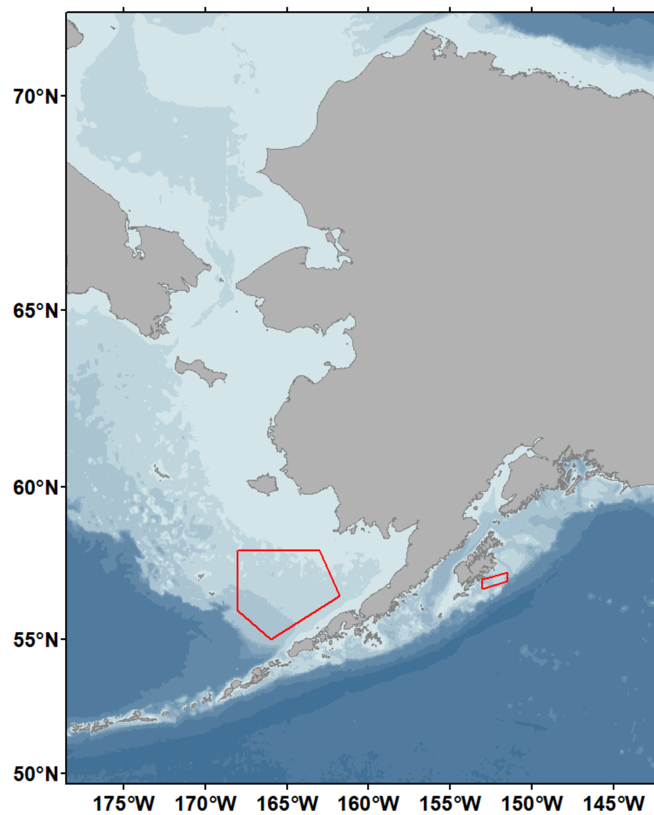

Figure 3. North Pacific right whale critical habitat.

On March 10, 2022, NOAA Fisheries received a petition from the Center for Biological Diversity and Save the North Pacific Right Whale to revise critical habitat for North Pacific right whales(CBD and SNPRW 2022). We published a positive 90-day finding on July 12, 2022, stating the petition presented substantial scientific information indicating that the petitioned action may be warranted (87 FR 41271, July 12, 2022). The 90-day finding initiated a review of currently designated critical habitat and solicited public comment to inform the review process. We completed a review of currently designated critical habitat for North Pacific right whales using the best scientific data available from when critical habitat was originally designated in 2008 until when we received the petition in March 2022. Given the acoustic detections and sightings supporting North Pacific right whales' use of areas outside of the currently designated critical habitat and the recent shifts in the essential feature for critical habitat (i.e., certain zooplankton species), we found that a revision of critical habitat is warranted (88 FR 65940; September 26, 2023). We will proceed by developing a proposed rule with a public comment period, followed by a final rule, to revise critical habitat for North Pacific right whales.

The primary physical or biological feature used to determine critical habitat is densities of zooplankton capable of supporting feeding North Pacific right whales. Zooplankton abundance and density in the Bering Sea is highly variable and affected by sea ice and oceanographic factors including water temperature. Recent surveys and analyses have shown that in the northern Bering Sea, where right whales have been sighted and detected acoustically (Filatova et al. 2019, Wright et al. 2019, Matsuoka et al. 2022), large copepods tend to be more prevalent in colder years (Siddon 2021) and positively correlated to ice area and cold pool area (Kimmel, Eisner and Pinchuk 2023). Similarly, in the southeastern Bering Sea, surveys have indicated that during warmer summers, smaller copepods are in higher abundance than larger copepods (Eisner et al. 2014, Kimmel et al. 2018), and Duffy-Anderson et al. (2019) suggest that lower abundances of large copepods could result from reduced ice cover, elevated water temperatures, and changes in timing of the spring bloom in this area. Thus, the suitability of North Pacific right whale habitat throughout the Bering Sea, based on prey availability, is likely to fluctuate with local oceanographic and sea ice conditions.

Behavior of North Pacific right whales tagged by Zerbini et al. (2015) lends support to the idea that suitable habitat, or at least suitable feeding areas, can be variable and dependent on local conditions in the Bering Sea. Right whales tagged in the southeastern Bering Sea in 2008-2009 (n=4), which were cold water temperature years, remained in the middle shelf domain, travelled at a slower rate, and showed more restricted habitat use when compared to a single whale that was tagged in 2004, a warm water temperature year (Zerbini et al. 2015). The results of this study suggest that right whales remained in and around the cold pool during cold years, likely due to higher, more concentrated abundance of larger copepods, while warmer years (such as 2004) may lead to whales traveling farther to find sufficient prey resources. This, given that larger, more lipid rich copepods tend to be in colder waters (Kimmel et al. 2018, Kimmel, Eisner and Pinchuk 2023), would suggest that right whales would move farther north in the Bering Sea during warm years. The warming of the Bering Sea in recent years suggests that right whales should be more broadly distributed, particularly toward the north and colder temperatures; the increase in the number of days with right whale detections at a mooring site in the northern Bering Sea (Wright et al. 2019) supports this hypothesis.

In the western Gulf of Alaska, warmer years have also been associated with higher abundances of smaller sized copepods, with notable declines of large copepods in this region in 2015, 2019, and 2021, all of which were during marine heat waves (Siddon 2021). In 2021, large copepods were most abundant southwest of Kodiak Island and in Shelikof Strait (Siddon 2021). Similarly, in 2021, four North Pacific right whales were seen south and southwest of Kodiak Island, with evidence of feeding (feces)(Crance, Goetz and Angliss 2022). As oceanographic conditions continue to change in the Gulf of Alaska, it is highly likely that the abundance and distribution of habitat features required by North Pacific right whales will also shift, affecting the location and amount of suitable habitat for this species.

Several sightings from the coast of British Columbia in 2013 (Ford et al. 2016) and 2021 (Little 2021) indicate that areas off the Canadian coast may have environmental conditions that are conducive to supporting the densities of zooplankton required for successful right whale feeding. As mentioned previously, a subadult female North Pacific right whale was sighted by DFO scientists in June 2013 off Haida Gwaii and was observed to be actively feeding over the course of several days on dense aggregations of what were identified as copepods (Ford et al. 2016). In 2021, a previously unknown right whale was sighted, again in June, feeding in the same area as the subadult female in 2013 (J. Towers, pers. comm, 2021). Prey, scat, and skin samples were collected and recent analysis indicated that the individual was a female. Several other North Pacific right whales have been sighted in the vicinity of Haida Gwaii in the last 5 years; however, due to either the lack of photographs altogether, or lack of photographs of high enough quality to determine behavior, it is unknown if these individuals were feeding.

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory measures, and regulatory mechanisms)

Below is an analysis of the five factors that determine listing status per section 4(a)(1) of the ESA, as applied to North Pacific right whales.

2.3.2.1 Present or threatened destruction, modification, or curtailment of its habitat or range:

Threats to North Pacific right whales and their habitat remain largely unknown and unquantified. Climate change, anthropogenic noise, oil and gas activities, chemical contaminants, plastics, and harmful algal blooms all potentially affect the quantity and quality of available habitat as well as impact individual health. Even if these impacts are minimal individually, they may have cumulative impacts over time.

Climate Change

The impacts of climate change are pronounced at high latitudes, and the Arctic especially has been warming at more than two times the rate of lower latitudes since 2000. This is primarily due to "Arctic amplification," a characteristic of the global climate system influenced by changes in sea ice extent, atmospheric and oceanic heat transports, cloud cover, albedo, black carbon, and many other factors (Serreze and Barry 2011, Overland and 22 coauthors 2017). Higher air temperatures have led to higher ocean temperatures, which in turn affects sea ice formation and melt in the waters off Alaska, particularly with respect to multi-year ice. Changes in winter sea ice and subsequent water temperatures have led to the near loss of the cold-water pool in the eastern Bering Sea in recent years, leading to a shift in the boundary between Arctic and subarctic seafloor and fish communities and affecting all levels of the food chain from plankton to large predators (Grebmeier et al. 2006, Duffy-Anderson et al. 2019, Fedewa et al. 2020).

Increased water temperature and/or decreased sea ice could have several impacts on North Pacific right whales. First, as mentioned in Section 2.3.1.6, there have been changes in the abundance of large copepods, the preferred prey of North Pacific right whales, which has been linked to the timing of the sea ice retreat (Duffy-Anderson et al. 2019, Siddon 2021). Kimmel et al. (2018) found that cold years with positive sea ice cover indices on the southeastern Bering Sea shelf, i.e., years where the sea ice lasted longer, had a higher abundance of *Calanus* spp., particularly in later life stages that provide more energetic value for predators. Additionally, colder water years tended to have higher numbers of *Calanus* spp. later in the year (July and September) compared to warmer water years which had high numbers of *Calanus* spp. in May(Kimmel et al. 2018). These changes in the abundance, quality, and availability of prey may affect where and when North Pacific right whales can feed, and if there is sufficient prey to sustain the energetic needs of the population.

Second, in addition to altering zooplankton communities, changes in water temperature and sea ice, and the resultant loss of the cold pool in the eastern Bering Sea has led to a shift in species distribution that could impact where fishing will occur. For example, Eisner et al. (2020) found that Alaska pollock (*Gadus chalcogrammus*) distributions in the Bering Sea moved farther north in 2017-2019, which were warmer water temperature years. In 2021, Pacific cod (*Gadus macrocephalus*) were tracked north into the Chukchi Sea, which is considerably farther than fish that were tagged in 2019 migrated, and went as far north at St Lawrence Island (Barbeaux et al. 2022). Expansion of fishing areas presents an increased threat of entanglement in fishing gear for North Pacific right whales, especially if they continue to utilize habitats farther north in the Bering Sea, as has been documented by visual sightings and acoustic detections (Filatova et al. 2019, Wright et al. 2019, Matsuoka et al. 2022). As will be discussed in section 2.3.2.5, fisheries interactions are a threat to both North Atlantic and North Pacific right whales, and a significant threat to North Atlantic right whales (Knowlton et al. 2012, Moore et al. 2021). As such, gear modifications, like weak ropes or weak links, are required off the east coast of the U.S. to help mitigate whale entanglement (86 FR 51970, October 18, 2021). In contrast, Bering Sea fisheries have no gear modification requirements, albeit fishing gear in the Bering Sea may not be as abundant as off the east coast. However, pot gear in the Bering Sea has already proven to be an entanglement hazard for the closely related bowhead whale, of which 12% of live bowheads observed showed evidence of entanglement scars (George et al. 2019).

Third, decreasing sea ice is greatly expanding the ability for vessels to travel through Arctic waters, leading to increased vessel traffic in North Pacific right whale habitat. This is another threat that has taken a significant toll on the North Atlantic right whale (Sharp et al. 2019, Moore et al. 2021), and though the Bering Sea does not provide access to a comparable number of high-traffic ports as the east coast of the United States, North Pacific right whales are often sighted or detected in areas along the Great Circle Route that runs through Unimak Pass and along the Aleutian Islands. Additionally, much of the vessel traffic moving through this area would be tanker or carrier vessels traveling at speeds high enough to seriously injure, or more likely, kill a North Pacific right whale.

Lastly, while the impact of predators such as killer whales on North Pacific right whales is unknown (see section 2.3.2.3), the increased use of Arctic waters by killer whales linked to decreases in sea ice (Kimber et al. 2021) indicates that predator regimes in right whale habitat may shift as a result of climate change, potentially altering predator dynamics in the northern Bering Sea.

Anthropogenic Noise

Projected increases in vessel traffic in the U.S. Arctic will likely result in additional noise and stress for right whales. Right whales communicate over large distances using low-frequency, long-wavelength sounds, which are subject to masking by human activities (Rolland et al. 2012, Rice et al. 2014). Background ocean noise levels at 100 Hz have been increasing by about 1.5–3 dB per decade since the advent of propeller-driven vessels (Andrew, Howe and Mercer 2002, McDonald, Hildebrand and Wiggins 2006, McDonald, Hildebrand and Wiggins 2008). Whales may respond to increased noise by leaving certain habitats, changing behavior, and changing vocalization patterns (Nowacek et al. 2007, Weilgart 2007, Rolland et al. 2012).

Ocean noise is one of many chronic stressors that may be limiting right whale recovery. Noise pollution has been correlated to an increase in stress-related fecal hormone metabolites in North Atlantic right whales (Rolland et al. 2012), and chronic elevations of these metabolites have been shown to negatively affect growth, immune system response, and reproduction in a variety of vertebrate species (Sapolsky, Romero and Munck 2000, Romero and Wikelski 2001, Pride 2005, Romero and Butler 2007).

Oil and Gas Activities

Federal offshore oil and gas lease sales have occurred in 8 of the 15 Alaska Region planning areas (BOEM 2022). North Pacific right whale critical habitat overlaps both the St. George Basin and the North Aleutian Basin planning areas in the Bering Sea, and the Kodiak planning area in the Gulf of Alaska. Existing Federal leases are present only in the Beaufort Sea and Cook Inlet planning areas, and there is little, if any, existing oil and gas infrastructure and activity in other planning areas offshore of Alaska (BOEM 2022). The 2023-2028 National Outer Continental Shelf Oil and Gas Leasing Proposed Program includes one potential lease sale in the Cook Inlet Planning Area in 2026. Oil and gas exploration activity is currently occurring in both state and federal waters, as well as off Sakhalin Island, Russia. The Sakhalin-1 project produced 227,000 barrels per day (bpd) and Sakhalin-2 produced 81,000 bpd on average in 2021. Sakhalin-2 supplies about four percent of the world's current liquefied natural gas (LNG) market, with Japan, South Korea, and China being the main customers for oil and LNG exports.

Although no existing or potential lease sales occur directly in North Pacific right whale habitat, there have been right whale sightings within modeled oil spill trajectories for the Cook Inlet planning area. All cetaceans are at high risk of adverse effects from oil exposures, and these effects have importance at both the individual and population level. Potential effects of oil pollution include ingestion of contaminated prey, irritation of skin and eyes, inhalation or aspiration, change in distribution to lower quality habitat, and compromised immune function (Geraci and Aubin 1980, Geraci 1990, Loughlin 1994, Takeshita et al. 2017). In addition to ingestion of contaminated prey, spills can also impact cetaceans by removing prey from the ecosystem (i.e., mortality of prey from exposure).

Oil spill response in Alaska can be very challenging due to remote locations that are difficult to access and extreme variations in weather, tides, and hours of daylight. In order to better prepare for responding to and assessing the impacts of oil spills, NMFS has developed or contributed to regional guidelines and a statewide plan for Alaska, specific for marine mammals and other wildlife (ARRT 2020). Fortunately, relatively few spills have occurred in the northern North Pacific Ocean to date, but the extent to which these activities may impact right whales is unknown.

Chemical Contaminants

Chemical contaminants such as persistent organic pollutants (POPs) are another potential source of habitat degradation. The manner in which pollutants negatively impact animals is complex and difficult to study, particularly in animals for which many of the key variables and physiological pathways are unknown (Aguilar 1987, O'Shea and R. L. Brownell 1994). However, individuals with higher contaminant levels in tissues show increased susceptibility to infections, lesions, impairments, and even reproductive failure (De Guise et al. 1995, Moore et al. 1998, Jenssen et al. 2003).

Higher POP concentrations have been reported near anthropogenic sources as well as higher latitudes due to atmospheric transport (Coulter 2022). POPs bioaccumulate and biomagnify along the marine food web, and moderate to relatively high concentrations of POPs have been found in the tissues of gray and bowhead whales in the North Pacific Ocean (Chukmasov et al. 2019). Most POPs measured in Arctic biota reached peak concentrations between about 1985 and 2005 (Bolton et al. 2020).

The production of many POPs has been regulated and their use has either ceased or is strongly restricted. Concentrations of POPs have significantly declined since control measures were introduced in the 1980s and 1990s (AMAP 2016). For example, levels of POPs in bowhead blubber and muscle are approximately one half to one quarter what they were in the 1990s (Bolton et al. 2020). Many POPs have shown decreasing trends of approximately 2-10 percent per year in Arctic air and biota (Bolton et al. 2020), but we have no evidence to assess if these contaminants may be a threat North Pacific right whales.

Plastics

A growing source of contaminants in all oceans including the Arctic comes from plastics. It is estimated that each year globally, 19-23 million metric tons of mismanaged plastic is transferred from land to water (Borrelle et al. 2020). It is estimated that between 62,000 to 105,000 tons of plastic are transported to the Arctic Ocean each year through Fram Strait (connecting the Atlantic Ocean to the Arctic) and the Bering Strait (connecting the Pacific Ocean to the Arctic) (Zarfl and Matthies 2010). Ingestion of plastics, including fishing lines, plastic filaments, pieces of fishing nets, and Styrofoam particles by baleen whales (e.g., humpback (*Megaptera novaeangliae*) and fin whale (*Balaenoptera physalus*)) has been documented (Besseling et al. 2015, Im et al. 2020). Entanglement of large whales with debris, such as with North Atlantic right whales (Cassoff et al. 2011, van der Hoop et al. 2016), is well documented (see Fisheries Interactions in Section 2.3.2.5 below; Knowlton et al. 2012, Moore et al. 2021, Knowlton et al. 2022).

Microplastics, defined as particles less than 5 mm in size, occur due to the release of manufactured plastic particles in various products (primary microplastics) and the fragmentation of larger plastic pieces (secondary microplastics) (Cole et al. 2011), are distributed globally. The types of microplastics found in the Arctic include polystyrene, acrylic, polyethylene, polypropylene, nylon, polyester, and rayon (Obbard et al. 2014, Peeken et al. 2018). Microplastics and the persistent bioaccumulative toxins they carry, such as polychlorinated biphenyls and metals, have been documented in filter feeders including zooplankton, mussels, planktivorous fish, and humpback whales (Besseling et al. 2014, Besseling et al. 2015, Fang et al. 2021), and benthic invertebrates from the shelf of the Bering and Chukchi seas (Fang et al. 2018). Large filter-feeders like humpback and fin whales seem to be particularly prone to microplastic ingestion and likely contamination by plastic-associated toxins due to the large volumes of water they process during feeding, as well as trophic transfer (Fossi et al. 2014, Fossi et al. 2016, Alava 2020). It is likely that North Pacific right whales are similarly prone to microplastic ingestion and contamination due to their similar feeding behaviors. Overall, because of their rarity and use of remote habitats, it is very difficult to assess the extent to which plastic debris, including microplastics, is a threat to North Pacific right whales.

Harmful Algal Blooms (HABS)

Toxic algal blooms have been increasing in the warming Arctic (Anderson et al. 2021) and other areas where conditions were previously unfavorable to support such algal activities. While natural toxins produced during blooms have led to impacts such as mass mortalities of many pinnipeds and cetaceans (see Broadwater, Van Dolah and Fire 2018 for an overview), there is currently no evidence linking algal toxins to deaths or chronic health problems in North Pacific right whales. However, there have been several studies on domoic acid and other neurotoxins in related right whale species.

North Atlantic right whales, through testing of fecal samples, were shown to be exposed to both paralytic shellfish toxins and domoic acid on an almost annual basis in multiple habitats between 2001-2006 (Doucette et al. 2012). Males and females exhibited similar exposure rates to both toxins and 22% of all fecal samples tested (n=140) showed concurrent exposure to the two toxins (Doucette et al. 2012). It is unclear if or how exposure to these toxins may affect North Atlantic right whales, or what interactive effects may occur in individuals that are exposed to both toxins.

More recently, fecal samples from live and dead stranded Southern right whales off Argentina were analyzed for domoic acid presence and glucocorticoid metabolite levels (D'Agostino et al. 2022). Of the 16 whales sampled, three had detectable amounts of domoic acid and corresponding glucocorticoid metabolite levels that were significantly lower compared to the 13 whales with no detectable domoic acid. One of the domoic acid positive whales was a lactating female that had low glucocorticoid levels compared to other lactating females in the study. Despite the small sample size, D'Agostino et al. (2022) suggest that domoic acid exposure may be linked to adrenal alterations; this topic requires further study.

In addition to other right whale species, bowhead whales, which overlap with North Pacific right whales in parts of their ranges, have also been exposed to emerging toxic algal blooms. Lefebvre et al. (2016) documented domoic acid (68%) and saxitoxin (32%) in bowhead whales (n=25) analyzed from the Arctic between 2006 and 2011, yielding the highest prevalence of domoic acid in the 13 marine mammal species examined. In a follow-up study, based on samples collected from harvested bowheads in spring and fall 2019 (n=9), Lefebvre et al. (2022) found that 64% of the samples were positive for saxitoxin (similar to what had been reported previously). Zooplankton and other lower trophic levels were also tested for saxitoxin, revealing that several species of copepods, a favorite prey of North Pacific right whales, contained saxitoxin (Lefebvre et al. 2022), though it is unknown if the concentrations detected would be harmful to right whales. Overall, based on evidence from the other right whale species, bowhead whales that coexist in some of the same habitat, and the likelihood of increasing occurrences of toxic blooms with changing ocean conditions, it is entirely possible that such blooms may occur in North Pacific right whale habitat and impact right whales in the future, though the significance of such impacts is unknown.

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes.

As discussed in previous status reviews, commercial whalers hunted North Pacific right whales heavily during the 19th and 20th centuries. The IWC estimates that 15,451 right whales were taken in the North Pacific in the 19th century, with 741 additional catches recorded in the early 20th century (Best 1987, Brownell et al. 2001, Josephson, Smith and Reeves 2008). Scarff (2001) adjusted that previous analysis to account for whales that were struck and lost and estimated that between 26,500 and 37,000 North Pacific right whales were killed between 1839 and 1909.

Despite right whales receiving protection from whaling in 1935, extensive illegal catches of right whales continued by the USSR between 1935 and 1971, with many of the whales taken during the 1960s (Figure 4) (Ivashchenko and Clapham 2012, Ivashchenko, Clapham and Brownell Jr 2017). In total, Ivashchenko, Clapham and Brownell Jr (2017) estimates that during this time, 771 North Pacific right whales were killed, most of which were in the eastern Pacific, though some whales were also taken in the Okhotsk Sea. As whaling tended to target larger individuals that were sexually mature, it is likely that the period of illegal whaling, particularly in the eastern North Pacific, targeted mature females - greatly affecting the recovery potential of the species by creating a heavily skewed sex ratio. More details on when and where right whales were killed during the whaling and post-whaling eras can be found in the previous review (NMFS 2017) and in the literature (Townsend 1935, Josephson, Smith and Reeves 2008, Ivashchenko and Clapham 2012, Ivashchenko, Clapham and Brownell Jr 2017).

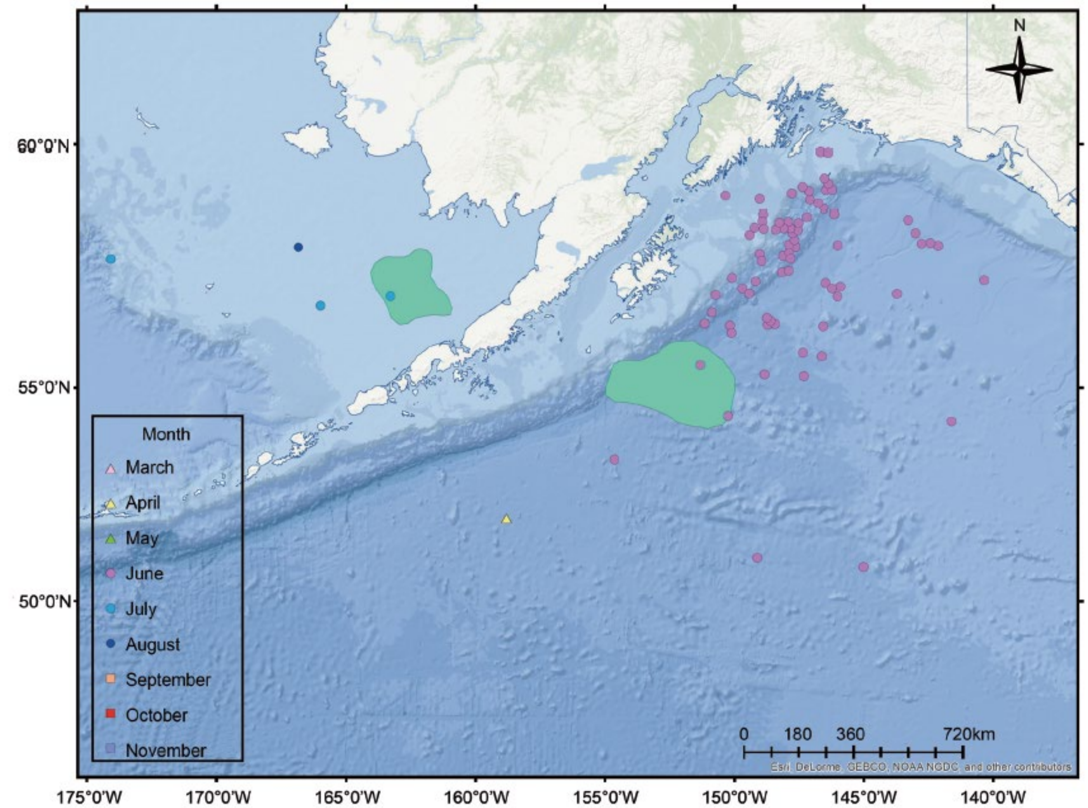

Figure 4. Locations of known illegal Soviet catches of North Pacific right whales in the 1960s off Alaska (Figure 5 from Ivashchenko, Clapham and Brownell Jr 2017). The green shaded areas are areas identified as catch areas in the 1960s by Doroshenko (2000).

Right whales were historically hunted for subsistence by native peoples along the Northwest Pacific coast and in the Aleutian Islands, although the level of such take was likely insignificant. Muto et al. (2022) calculated that based on the minimum population estimate of 26 individuals, the potential biological removal (PBR) level for the eastern population would be one take every 20 years. No additional information on aboriginal catches in the western North Pacific has arisen since the last review, but given the current status of this species and the calculated PBR, the eastern North Pacific right whale population could not withstand even a very low level of commercial or aboriginal hunting.

Scientific research activities such as obtaining photographs, genetic samples, or deploying satellite tags can greatly increase knowledge about this species, but may cause stress to individuals. These research activities therefore require permits, which are closely monitored in the United States and Canada. The potential for disturbance or harassment through approaching whales for research activities is likely minimal and is far-outweighed by the value of the information that it provides for use in managing and recovering the species.

North Pacific right whales are not used for recreational or educational purposes. However, if a right whale is observed in a highly accessible area, there is the potential for an enthusiastic response from vessel operators, which may increase disturbance and harassment of right whales. NMFS continues to expand their outreach efforts to better inform the public about North Pacific right whales and their critically endangered status.

2.3.2.3 Disease or Predation:

To date, there are no data that quantify the impact of predation and disease on North Pacific right whales, and if or how these factors may affect recovery. No recorded evidence exists of epizootics occurring in baleen whales (i.e., an outbreak of disease simultaneously affecting many animals of one kind). Captive cetaceans have been observed to suffer from stress-induced bacterial infections, but it is unclear whether right whales experience similar infections (Buck, Shepard and Spotte 1987). The occurrence of skin lesions on North Atlantic right whales has been documented, but their origin and significance remain unknown (Pettis et al. 2004). From 1980-2009, the pattern in body and skin (i.e., significant skin lesions, severe sloughing) condition was almost identical, but after 2009, they diverged, with increased proportion of whales with compromised body condition and decreased proportion with compromised skin condition until 2017-2018, when the pattern appeared to switch (Pettis 2019). Additionally, in the Gulf of St. Lawrence, researchers anecdotally noted that skin lesions have been developing as the summer and fall season progress (Pettis 2019). The system developed by Pettis et al. (2004) to assess health and body condition of North Atlantic right whales is currently being investigated as to whether it can be applied by MML to photographs of North Pacific right whales.

Evidence of scars on North Pacific right whales suggest that predation attempts from killer whales or larger shark species may occur (Shelden and Clapham 2006), though there have been no first-hand observations of such encounters. However, bowhead and gray whales could be used as conservative proxies for predation from killer whales. Bowhead whales, which are closely affiliated with sea ice (and thus likely more protected from killer whales compared to right whales), have been shown to experience attempted and successful predation by killer whales. Recorded scarring on bowhead whales harvested for subsistence purposes from 1990-2012 showed that about 8% of whales with scars (521 total) were identified as killer-whale-related scars (George et al. 2017). Such scars (e.g., rake marks on the flukes or pectoral fins) were frequent on very large adult bowhead whales (>17 m) and larger whales may have more scars due to longer exposure to predation attempts while smaller, younger whales may be more often killed during killer whale attacks (George et al. 2017).

Willoughby et al. (2020) reported eighteen bowhead whale carcasses that had injuries consistent with possible killer whale predation in the eastern Chukchi and western Beaufort seas during the Aerial Surveys of Arctic Marine Mammals (ASAMM) between 2009 and 2018. Of these, eight were considered to be calves or yearlings based on their smaller size. Killer whale predation was identified using evaluation of bites, frayed tissue, missing skin/blubber, and other indicators. The observed increase in killer whale-related injuries in bowheads over the last decade is consistent with observations from bowheads of the Eastern Canada-West Greenland population (Higdon, Hauser and Ferguson 2012, Young et al. 2019). As right whale calves and subadults are similarly sized to bowheads of the same age, it is possible that killer whale attacks are a threat to younger right whales as well, which could be devastating for a population with very low calf production.

Gray whales were also observed to have suffered killer whale attacks during the Arctic Whale Ecology Study (ARCWEST) surveys (Vate Brattström et al. 2017) as well as the ASAMM from 2009-2019 (Willoughby et al. 2022). In 2013 during the ARCWEST survey, killer whales were observed attacking an abandoned gray whale calf off Wainwright, Alaska, for several hours. Of the 56 gray whale carcasses photographed during ASAMM, 41 had injuries consistent with probable killer whale predation, identified by features such as missing, broken, or disarticulated jaw bones or a missing tongue. Similar to North Pacific right whales, gray whales do not utilize sea ice for protection, and therefore killer whale predation patterns in gray whales may be more representative than in bowhead whales of what could occur for North Pacific right whales (Willoughby et al. 2020, Willoughby et al. 2022).

2.3.2.4 Inadequacy of existing regulatory mechanisms:

Right whales are protected domestically under both U.S. (ESA and MMPA) and Canadian law and internationally by the International Whaling Commission (IWC). Although the IWC has set the catch quota at zero for all signatory nations and given all right whale stocks a "Protected" designation (IWC 1995), no regulatory mechanisms have been implemented to specifically protect North Pacific right whales. Due to the scarcity of this species and persistent data gaps, there is not sufficient information at this time to indicate what regulatory mechanisms should be implemented to hasten the recovery of this species. However, without regulatory mechanisms in place, it is likely that anthropogenic activities will have adverse effects on North Pacific right whales. If additional studies reveal that significant impacts are occurring or are likely to occur, it may be necessary to enhance existing laws or promulgate new regulations to reduce or eliminate arising threats.

North Atlantic right whales are well known to suffer from vessel ship strikes, with this threat resulting in 86 right whale mortalities and series injuries between 2000 and 2017 in U.S. and Canadian waters combined (Hayes et al. 2019). Due to the frequency and severe impact of vessel strikes, caused in part by North Atlantic right whale habitat overlapping with the extensive network of busy shipping corridors along the east coast, NMFS implemented a mandatory vessel speed reduction rule in 2008 (73 FR 60173, October 10, 2008). NMFS (2020) found that after the first 10 years of implementation, there was a decrease in vessel strikes to North Atlantic right whales (from 12 over 10 years prior to the rule, to 8 over 10 years after the rule), though a direct causality between the implementation of the rule and the reduction in vessel strikes cannot be definitively concluded. In 2022, NMFS published a proposed rule outlining several changes to the vessel speed regulations such as modifying the boundaries of the Seasonal Management Areas and including most vessels greater than 35 ft in length (87 FR 46921, August 1, 2022). The public comment period for the proposed changes closed on October 31, 2022 and the final rule is still in progress. If it is determined that vessel strikes are likely to impact North Pacific right whale recovery, the North Atlantic model could help shape potential regulations in portions of North Pacific right whale habitat with heavy vessel traffic.

Shipping lanes off Los Angeles/Long Beach and San Francisco, California, were modified in 2013 to reduce the probability of colliding with large whales, which overlaps with the southern portion of the North Pacific right whale range and may be part of a migratory route. While these measures were designed to protect mainly humpback, blue, and fin whales, they are expected to also reduce the risk of vessel strikes to other marine mammals, including North Pacific right whales. In April 2022, a feeding North Pacific right whale was sighted by fishermen between San Francisco and Santa Cruz, approximately 4.5 nmi off shore, in line with potential shipping traffic traversing the California coast. In March 2023, another North Pacific right whale was sighted by a whale watching vessel in Monterey Bay, CA, which is in close proximity to major shipping lanes.

Voluntary vessel speed reductions are also in place through the Air Pollution Control District for Santa Barbara County and the Protecting Blue Whales and Blue Skies partnership, which provides incentives for vessels to slow their speeds to reduce air pollution and whale collisions. In 2020, the program estimated a 61% and 30% reduction in whale collisions in the San Francisco Bay Area and the Southern California Region, respectively (PBWBK 2020 Fact Sheet).

Through section 7 of the Endangered Species Act (ESA), federal agencies are required to consult with NMFS and the USFWS on any action with a federal nexus that may affect listed species or designated critical habitat. NMFS has mitigation measures specific to North Pacific right whales and their critical habitat that are strongly recommended for inclusion by action agencies (e.g., U.S. Army Corps, U.S. Coast Guard) in their project designs. These measures include reporting observations of North Pacific right whales to NMFS within 24 hours with details such as date, time, coordinates, number of whales observed, and the environmental conditions. There are also measures for vessels traveling within North Pacific right whale critical habitat, including the use of Protected Species Observers (PSOs) when traveling at speeds greater than 5 knots, and PSOs collecting information and photos of North Pacific right whales and other observed marine mammals.

Current U.S. and global regulations are inadequate to stop or reverse the effects of global climate change, and total net anthropogenic greenhouse gases (GHG) continue to rise (IPCC 2022). Per capita, North America is the highest emitter of anthropogenic greenhouse gases globally by a wide margin (IPCC 2022, Figure SPM.2). Policies that were implemented by the end of 2020 are projected to result in global GHG emissions that make it likely that warming will exceed 1.5°C during the 21st century. Limiting warming to below 2°C would then likely rely on a rapid acceleration of mitigation efforts after 2030 (IPCC 2022). While the current U.S. administration is moving forward on efforts to curb GHG emissions[1], policy and regulations that persist across changing administrations have failed to be developed and implemented. As described elsewhere in this review, changes related to climate change will likely lead to increased vessel traffic, changes in prey base, increased exposure to HABs, contaminants, and pollutants, and potentially increased exposure to predators such as killer whales.

2.3.2.5 Other natural or manmade factors affecting its continued existence:

Human-caused mortality, specifically vessel strikes and fishing gear entanglements, are the most common known causes of right whale mortality in the North Atlantic (Corkeron et al. 2018, Sharp et al. 2019), but little is known of the nature or extent of these problems in the North Pacific. However, a lack of evidence of vessel strikes or entanglements does not necessarily indicate that these factors are not affecting North Pacific right whales. Even for closely studied species, such as North Atlantic right whales, cryptic mortality may account for a large percentage of deaths that are not observed (Pace III et al. 2021). In Alaska, the chances of sighting a North Pacific right whale carcass that can be attributed to any cause of death are very low, especially given the sparse human population density of the remote areas where these whales may be found. Thus, the lack of confirmed evidence of anthropogenic impacts should not be interpreted as a lack of occurrence of these impacts.

Vessel strikes

A significant intercontinental trade route exists in a portion of the Bering Sea connecting Asian and North American ports along the Great Circle Route atop the North Pacific Ocean. Between 2015-2017, bulk carriers and container ships made 15,359 trips in the Bering Sea (Silber and Adams 2019). With the potential increases in north-south vessel traffic through the Bering Strait due to the reductions in sea ice, the International Maritime Organization's Maritime Safety Committee adopted routing measures in 2018 to increase navigational safety in the region. Six "two-way routes" and six precautionary areas (for all ships >400 gt, excluding fishing vessels) were established in the Bering Strait and Bering Sea between the Chukotskiy Peninsula and Alaskan coast, and north-south vessel traffic is funneled through North Pacific right whale critical habitat. Areas to be Avoided (ATBA) were designated

[1] https://www.epa.gov/climate-change/climate-change-regulatory-actions-and-initiatives

around St. Lawrence Island, King Island, and Nunivak Island, but do not overlap with critical habitat.

Increased shipping through the Bering Sea and Arctic waters may increase the vessel strike risk to North Pacific right whales. Due to their rare occurrence and scattered distribution, it is impossible to assess the threat of vessel strikes to the eastern North Pacific stock of right whales (Muto et al. 2021). However, the impact to the species from even low levels of interaction could be significant. Additionally, a recent study investigated the risk to gray whales in the entire North Pacific (Silber et al. 2020). Throughout the North Pacific and Bering Sea (Aleutian Islands to Bering Strait), they found a high to extremely high risk to individual gray whales from vessels in summer and fall. Given the considerable overlap in distribution between these two species (e.g., Aleutian Passes and west coast of British Columbia during presumed migratory periods), this indicates that the risk level to North Pacific right whales could likewise be quite high.

Fisheries Interactions

Entanglement in fishing gear is a threat to right whales around the world. Knowlton et al. (2012) estimate that more than 82 percent of North Atlantic right whales have been entangled in fishing gear at least once, with about 60 percent of whales experiencing multiple entanglements throughout their lifetime. Entanglements can have a wide range of effects on right whales, especially in reproductive females, including impacts to energy budgets and extended calving intervals (van der Hoop et al. 2016). The eastern Bering Sea supports extensive fisheries throughout the year, and the potential exists for fisheries-caused mortality or serious injury of North Pacific right whales. Mortality and serious injury of humpback (Helker, Allen and Jemison 2015) and fin whales (Freed et al. 2022) in trawl gear and humpback (Freed et al. 2022) and bowhead whales in pot gear (George et al. 2017) have been documented for fisheries in this region.

Although there are no historical reports of fisheries-caused mortality or serious injury of eastern North Pacific right whales, there have been observations of scarring indicative of fisheries interactions (Brownell et al. 2001, Burdin, Nikulin and R. L. Brownell 2004, Ford et al. 2016). Two photographs from the North Pacific Right Whale Photo-identification Catalog show either fishing gear entanglement or entanglement scars (A. Kennedy, NMFS-AFSC-MML, pers. comm., 21 September 2011; Ford et al. 2016). The right whale photographed on 25 October 2013 off British Columbia and northern Washington State showed evidence of probable fishing gear entanglement (Ford et al. 2016). Due to the risk of serious injury and mortality that pot and trawl gear pose for other large baleen whales in Alaska and elsewhere, interactions with Pacific cod and pollock fisheries in the Gulf of Alaska could also be a threat to North Pacific right whales. Given the very small estimate of abundance, any mortality or serious injury incidental to commercial fisheries would be considered significantly detrimental to the population.

Right whales from the western North Pacific population have suffered fisheries-caused mortality or serious injury. Entanglements were documented off the Kamchatka Peninsula in 1989, Oita Prefecture on Kyūshū Island in Japan 2011, South Korea in 2015, Volcano Bay, Hokkaido, Japan in 2016, and in the Sea of Okhotsk in 2018 (Muto et al. 2021). Gillnet, aquaculture, and crab pot gear were identified in three of these entanglements. There was an attempt by fishermen to disentangle the whale in crab pot gear in the Sea of Okhotsk, but it is unclear if the effort was successful before the whale swam away (Cetal Fauna 2018). Three North Pacific right whales seen off Onekotan Island in the northern Kuril Islands in 2022 (Table 2) had evidence of entanglement scars around the peduncle and on the back (Figure 5), consistent with those from entangled North Atlantic right whales (e.g., Hamilton et al. 2020). Most recently, a western North Pacific right whale was observed entangled in fishing gear in Okinoshima, Tateyama, Japan in March 2023 (Cetal Fauna 2023). The outcome of that entanglement is unknown.

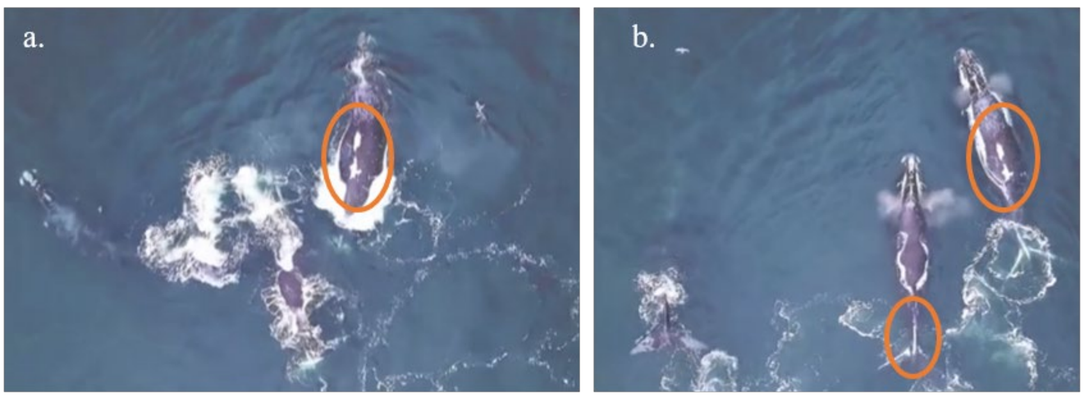

Figure 5. Screen shots from drone footage captured of three western North Pacific right whales off Onekotan Island in 2022 (posted on Cetal Fauna on October 16, 2022, from Instagram user pima4ok on August 4, 2022). Orange circles highlight entanglement scars.

2.4 Synthesis

Recovery of the North Pacific right whale is not anticipated in the foreseeable future (i.e., several decades to a century or more). The eastern population remains extremely small, and though the western population may be growing, the species overall remains below the levels considered sufficient for recovery.

There are still substantial gaps in our understanding of basic life history parameters of this species, including trends in population abundance, location and frequency of calving, age structure, natural and anthropogenic mortality rates, and distribution, including the distribution of females, location of feeding areas, and migratory routes. In order to adequately evaluate the risk of extinction through use of quantitative analysis or predictive modeling, more data are needed to inform our understanding of the species biology and ecology to aid managers in making informed decisions for addressing survival and recovery.

Similar to other large whale species, North Pacific right whales exhibit life history characteristics such as low reproductive rates, delayed sexual maturity, and reliance on high juvenile survivorship – all of which make these species vulnerable to the impacts of anthropogenic threats and sources of mortality. The impacts of historic whaling, as well as the illegal Soviet whaling in the 1960s, have taken a large toll on these right whales, particularly the eastern population.

After considering the best scientific and commercial data available, NMFS concludes that downlisting or delisting the North Pacific right whale is not warranted at this time. As outlined in this review, delisting is not warranted because the North Pacific right whale still has high demographic risk, with the eastern population being extremely rare, and little is known about the major threats to the species and whether management actions would be effective at addressing these threats. Therefore, based on the limited available new information and existing conservation and management measures, the North Pacific right whale should retain its status as endangered.

3.0 RESULTS

3.1 Recommended Classification:

___ Downlist to Threatened

___ Uplist to Endangered

___ Delist *(indicate reason for delisting per 50 CFR 424.11)*

___*The species is extinct*
___*The species does not meet the definition of an endangered or a threatened species*
___*The listed entity does not meet the statutory definition of a species*

_X__ No change is needed

3.2 New Recovery Priority Number: 5C

Brief Rationale: The new recovery priority number (previously 4C) is largely based on the high demographic risk to the species (due to the small size of eastern population) and a low understanding of major threats to the species and thus how effective management actions may be in addressing these threats. There is also potential conflict (5C) for this species due to overlap major shipping routes and oil and gas activities in Alaskan waters.

3.3 Listing and Reclassification Priority Number: N/A

Reclassification (from Threatened to Endangered) Priority Number: ____
Reclassification (from Endangered to Threatened) Priority Number: ____
Delisting (Removal from list) Priority Number: ____

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

As there is still so much unknown about the eastern North Pacific right whale population, the most urgent need is better information on basic distribution and phenology, including identification of wintering areas, spatio-temporal overlap with and impacts of the shipping and fishing industries, and identification and management of emerging threats to the population. In order to be able to inform management and conservation of this extremely rare and endangered stock, we recommend the following actions be taken or initiated over the next five years:

- Conduct a risk analysis to understand what geographic areas and activities post a particularly high risk of further impeding recovery of North Pacific right whales.
- Use of autonomous underwater recording devices should be continued and expanded, with additional passive acoustic moorings deployed in the eastern Gulf of Alaska, in Aleutian Island passes, in Bristol Bay, and in the Northern Bering Sea to provide more extensive coverage of areas known to be used by North Pacific right whales, possible migratory pathways, and northward expansions of habitat.
- Biopsy sampling should continue to be a priority; data from these samples can inform sex ratios, abundance estimates, stress hormone levels, reproductive status, and feeding strategies through stable isotope analysis.
- Conduct annual vessel-based surveys, augmented by passive acoustic techniques, to assess North Pacific right whale distribution in key areas. This action will enable the following 3 actions below.
- Deploy satellite tags on North Pacific right whales to improve understanding of movements, habitat use, and migration.
- Conduct biopsy sampling to understand genetics and stock structure, reproductive status, sex, feeding strategies, and facilitate estimation of abundance.
- Collect data on prey availability and quality to enable synthesis of prey data with acoustic and visual sighting information to better understand the impacts of shifting prey regimes on habitat quality and location.
- Develop the use of satellite imagery to understand North Pacific right whales occurrence.

- Develop other advanced technologies such as ‘omics, AI/ML, and UxS (both underwater and aerial) to understand North Pacific right whale distribution and abundance.
- Raise awareness about North Pacific right whales throughout their range (e.g., Alaska, British Columbia, west coast of the United States, Baja Mexico, Pacific Islands), to increase reporting of opportunistic sightings and encourage public stewardship.

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NATIONAL MARINE FISHERIES SERVICE
5-YEAR REVIEW
North Pacific right whale

Current Classification: Endangered

Recommendation resulting from the 5-Year Review

- ☐ Downlist to Threatened
- ☐ Uplist to Endangered
- ☐ Delist
- ☒ No change is needed

Review Conducted By (Name and Office):

Jenna Malek
NOAA Fisheries, Alaska Regional Office

REGIONAL OFFICE APPROVAL:

Lead Regional Administrator, NOAA Fisheries

Approve____ Date: 2/2/24

Cooperating Regional Administrator, NOAA Fisheries

☐ Concur ☐ Do Not Concur ☒ N/A

Signature____ Date: _______

HEADQUARTERS APPROVAL:

Assistant Administrator, NOAA Fisheries

☒ Concur ☐ Do Not Concur

Signature RAUCH.SAMUEL.DEAN.1365850948 Digitally signed by RAUCH.SAMUEL.DEAN.1365850948 Date: 2024.02.08 14:37:42 -05'00' Date: _______