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NORTH PACIFIC RIGHT WHALE (*Eubalaena japonica*): Eastern North Pacific Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Once distributed widely across the North Pacific from North America to the Far East, North Pacific right whales (*Eubalaena japonica*) are today among the world's rarest marine mammals (Wade et al. 2011). A distinct geographic distribution, different catch and recovery histories, and recent genetic analysis have led to the generally accepted belief that the species comprises eastern and western populations that are largely or wholly discrete (Brownell et al. 2001, LeDuc et al. 2012). The summer range of the eastern stock includes the Gulf of Alaska and the Bering Sea, while the western stock is believed to feed in the Okhotsk Sea and in pelagic waters of the northwestern North Pacific. The winter calving grounds of both stocks remain unknown.

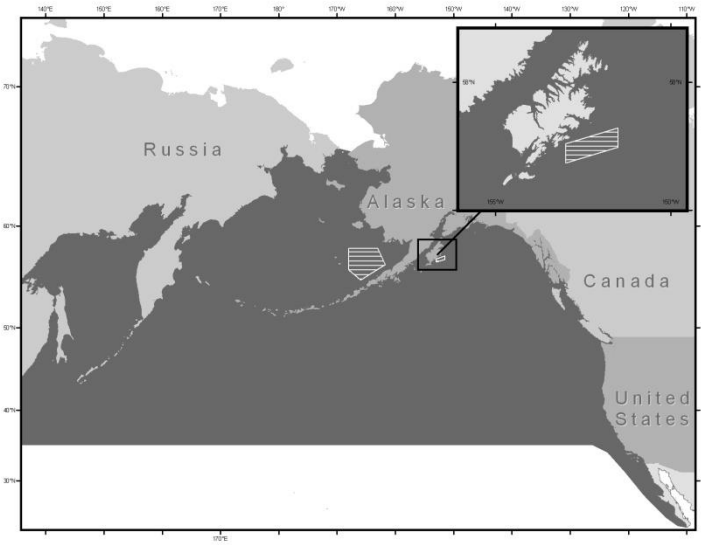

Figure 1. Approximate historical distribution of North Pacific right whales in the North Pacific (dark shaded area). Striped areas indicate North Pacific right whale critical habitat (73 FR 19000, 8 April 2008).

Right whales were the subject of intensive commercial exploitation, beginning in the Gulf of Alaska in 1835, and by 1849 were already seriously depleted in the eastern Pacific (Scarff 1986, 1991; Josephson et al. 2008). Additional hunting in the 1850s reduced the population in the western Pacific, and by 1900 the species was effectively considered commercially extinct throughout its range. Although there were sporadic opportunistic catches in the early 20th century, the stock was likely undergoing a modest recovery by about 1960; however, this was entirely negated by large illegal catches by the U.S.S.R. in the 1960s, which likely wiped out the bulk of the eastern population (Ivashchenko and Clapham 2012, Ivashchenko et al. 2017).

Analysis of whaling records from the 19th century, together with the more recent Soviet catches, has shown that right whales were broadly distributed across the eastern North Pacific (Scarff 1986, Brownell et al. 2001, Ivashchenko and Clapham 2012). There are sporadic records from below 20°N, but the bulk of the data show right whales concentrated north of 35°N. This includes coastal and offshore waters ranging from Washington State and British Columbia through the Gulf of Alaska, Alaska Peninsula, Aleutian Islands, and Bering Sea.

Modern information on the summer and autumn distribution of right whales has been derived from dedicated vessel and aerial surveys, bottom-mounted acoustic recorders, and vessel surveys for fisheries ecology and management that have also included dedicated marine mammal observers. Aerial and vessel surveys for right whales (LeDuc et al. 2001, Wade et al. 2006, Clapham et al. 2013) have occurred in a portion of the southeastern Bering Sea (Fig. 1) where right whales have been observed or acoustically detected in most summers since 1996 (Goddard and Rugh 1998, Munger et al. 2008, Rone et al. 2012, Wright 2017). North Pacific right whales have been observed consistently in this area, although it is clear from historical and Japanese sighting survey data (Fig. 2) that right whales often range outside this area and occur elsewhere in the Bering Sea (Scarff 1986, Moore et al. 2000, 2002; LeDuc et al. 2001; Clapham et al. 2004). Because of the paucity of right whales in the eastern North Pacific, sightings today are relatively rare and are often of single individuals (Fig. 2). In the summer of 2017, however, the International Whaling Commission's (IWC) Pacific Ocean Whale and Ecosystem Research (POWER) survey used a combination of passive acoustic monitoring and visual sightings to find 15 right whales in the southeastern Bering Sea (Matsuoka et al. 2017). The majority of these sightings (10 of 15 animals) were in Bristol Bay approximately 60 nmi east of the North Pacific right whale critical habitat, with others in the critical habitat itself. Three additional right whales were sighted during the 2018 IWC POWER survey (Matsuoka et al. 2018). Two were within the critical habitat, while the third was sighted approximately 5 nmi south of St. Lawrence Island, in the northern Bering Sea.

Bottom-mounted acoustic recorders were deployed in the southeastern Bering Sea (2000-present) and the northern Gulf of Alaska (1999-2001) to document the seasonal distribution of right whale calls. Analysis of the data from those recorders supports the survey data and shows that right whales remain in the southeastern Bering Sea from May through December with peak call detection in September (Mellinger et al. 2004, Munger et al. 2008, Stafford and Mellinger 2009, Stafford et al. 2010, Clapham et al. 2013, Wright 2017, Wright et al. 2019). Recorders deployed by the Alaska Fisheries Science Center's Marine Mammal Laboratory indicated that North Pacific right whales occurred in two passes of the eastern Aleutian Islands (Umnak and Unimak Pass) (Wright 2017, Wright et al. 2018). No North Pacific right whale calls were detected from January to April in the southeastern Bering Sea, which supports the theory that North Pacific right whales migrate out of the Bering Sea during winter months (Wright 2017).

There continues to be debate regarding the northern extent of the right whale's range, specifically whether they once commonly occurred in the northern Bering Sea and north of the Bering Strait. Records from historical whaling in such areas are often compromised by uncertainty regarding whether these could have been bowhead whales; the extent of overlap between the two species remains unclear. In recent years, there have been a few reliable records of right whales in this region: an individual right whale was visually identified north of St. Lawrence Island in November 2012, an individual was sighted on 26 June 2018 by hunters off of St. Lawrence Island on the northeast side of Sivuqaq mountain (G. Sheffield, University of Alaska Fairbanks, Nome, AK), and the IWC POWER cruise recorded a single right whale just south of St. Lawrence in July 2018 (Matsuoka et al. 2018). This latter individual was subsequently observed and photographed by an ecotourism cruise in Pengkingney Fjord in Russian waters just south of the Bering Strait (D. Brown, Heritage Expeditions). Passive acoustic monitoring from 2008 to 2016 of the northern Bering Sea detected calls matching the North Pacific right whale up-call criterion in late fall through spring only in 2016 (Wright et al. 2019). It remains unknown whether these recent northern detections and sightings represent a reoccupation of their historical distribution or a northward shift in their distribution.

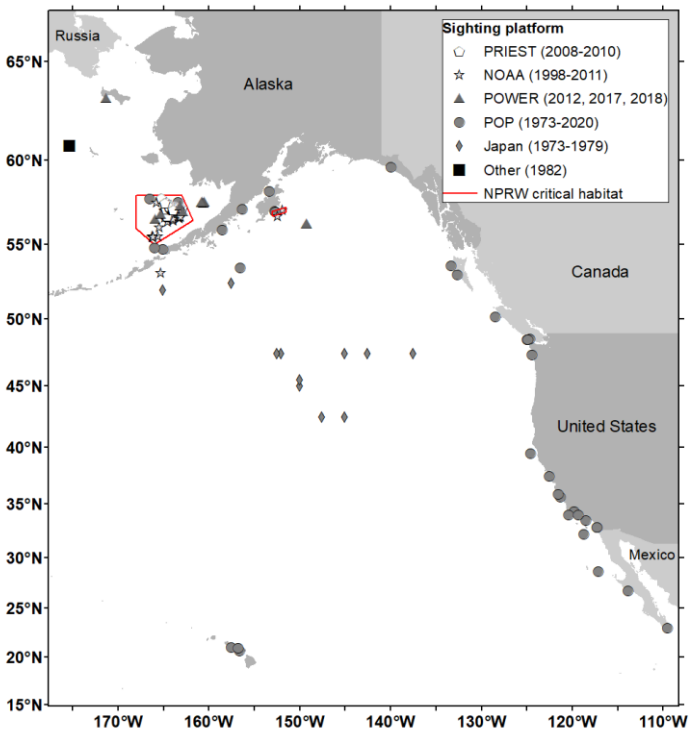

Figure 2. Location of all Eastern North Pacific right whale sightings in the North Pacific by platform since 1970. PRIEST = BOEM-NOAA (Pacific RIght whale Ecology STudy) survey; NOAA = other NOAA surveys; POWER = IWC's Pacific Ocean Whale and Ecosystem Research survey; POP = opportunistic sighting documented in MML's Platforms of Opportunity database; Japan = Japanese sighting survey; Other = Bering Sea (Navarin Basin) survey (Brueggeman et al. 1984).

There have been far fewer sightings of right whales in the Gulf of Alaska than in the Bering Sea (Brownell et al. 2001); although, until the summer of 2015, survey effort was lacking in the Gulf, notably in the offshore areas where right whales commonly occurred during whaling days (Ivashchenko and Clapham 2012). Nonetheless, sightings in the Gulf of Alaska since the cessation of whaling are extremely rare (Fig. 2), and there have been only a few acoustic detections (Mellinger et al. 2004, Širović et al. 2015).

Three separate surveys have occurred in the Gulf of Alaska in the summer. In summer 2013, the U.S. Navy-funded Gulf of Alaska Line-Transect Survey (GOALS-II) surveyed for marine mammals within the Temporary Maritime Activities Area (TMAA) using visual line-transect methods and passive acoustic monitoring (Rone et al. 2014). In August 2015, a dedicated vessel survey for right whales was conducted by NMFS using visual and acoustic survey techniques, surveying both the shelf and deeper waters to the south (Rone et al. 2017). And in summer 2019, the IWC POWER cruise systematically surveyed the northern Gulf of Alaska, within the U.S. Exclusive Economic Zone, from Umnak Pass in the Aleutian Islands to the Canadian border in the eastern North

Pacific (Matsuoka et al. 2020). In all three surveys, right whales were acoustically detected in the Barnabus Trough area off Kodiak Island, but were not visually observed.

Most of the illegal Soviet catches of right whales occurred in offshore areas, including a large area to the east and southeast of Kodiak Island (Doroshenko 2000, Ivashchenko and Clapham 2012); the Soviet catch distribution closely parallels that seen in plots of 19th-century American whaling catches by Townsend (1935). Whether this region remains an important habitat for this species is currently unknown. The sightings and acoustic detection of right whales in coastal waters east of Kodiak Island indicate at least occasional use of this area; however, the lack of visual detections of right whales during the GOALS-II cruise in July 2013, the NMFS cruise in August 2015, and the IWC POWER cruise in 2019 adds to the concern that right whales may today be extremely rare in the Gulf of Alaska. To date, there have been no matches of photographically identified individuals between the Gulf of Alaska and the Bering Sea, and there is no information to address the question of whether these regions are connected or whether they form largely separate subpopulations.

As noted above, the location of winter calving grounds for North Pacific right whales has long been a mystery. North Atlantic (*E. glacialis*) and Southern Hemisphere (*E. australis*) right whales calve in coastal waters during the winter months. However, in the eastern North Pacific no such calving grounds have been identified (Scarff 1986). Migratory patterns of North Pacific right whales are unknown, although it is thought they migrate from high-latitude feeding grounds in summer to more temperate waters during the winter, possibly including offshore waters (Braham and Rice 1984, Scarff 1986, Clapham et al. 2004). A right whale sighted off Maui in April 1996 (Salden and Michelsen 1999) was identified 119 days later and 4,111 km north in the Bering Sea (Kennedy et al. 2011); to date this is the only low- to high-latitude match of an individually identified right whale in the eastern North Pacific. There is one other modern record from Hawaii of a right whale, an animal seen twice in March and April 1979 (Herman et al. 1980, Rowntree et al. 1980) (Fig. 2).

Although there were a handful of sightings of right whales in the eastern North Pacific from Japanese sighting surveys in the 1970s (Fig. 2), sightings in that area since then have been extremely rare. Two sightings of individual right whales occurred off British Columbia in 2013, one in June and one in October (Ford et al. 2016). The two different individuals represent the first right whale sightings in Canadian waters since the 1950s. Another right whale sighting was made by the Canadian Coast Guard in the same area in June 2018. Most recently, a right whale was sighted off Vancouver Island in May 2020. The timing of these sightings lends support to the theory that right whales migrate to more temperate waters during the winter.

Occasional sightings of right whales have been made off California and off Baja California, Mexico (Fig. 2); this includes two recent records from California in 2017, off La Jolla and in the Channel Islands (both of which were single whales). While the scarcity of records from this region superficially suggests (as did Brownell et al. 2001) that it lacked historical importance for the species, this ignores the fact that right whales had been severely depleted in their feeding grounds prior to 1854, when the first coastal whaling station was established in California. It remains possible that California and Mexico, and possibly offshore waters of Hawaii, were once the principal calving grounds for right whales from the Gulf of Alaska and Bering Sea.

The following information was considered in classifying stock structure according to the Dizon et al. (1992) phylogeographic approach: 1) Distributional data: distinct geographic distribution; 2) Population response data: unknown; 3) Phenotypic data: unknown; and 4) Genotypic data: evidence for some isolation of populations. Based on this limited information, two stocks of North Pacific right whales are currently recognized: a Western North Pacific stock (feeding primarily in the Sea of Okhotsk) and an Eastern North Pacific stock (feeding primarily in the southeastern Bering Sea) (Rosenbaum et al. 2000, Brownell et al. 2001, LeDuc et al. 2012).

In summary, the range of the right whale in the North Pacific was historically broad, with feeding grounds in the Bering Sea, Gulf of Alaska, Okhotsk Sea, and northwestern North Pacific; all of these areas remain inhabited today from May to December.

POPULATION SIZE

The historical (pre-whaling) population size of the North Pacific right whale is unknown. However, Scarff (1991) estimated that 26,500 to 37,000 animals were killed during the period from 1839 to 1909, with the majority being taken in a single decade (1840 to 1849). The U.S.S.R. illegally killed an estimated 771 right whales in the eastern and western North Pacific, with the majority (662) killed between 1962 and 1968 (Ivashchenko et al. 2017). These takes severely impacted the two populations concerned, notably in the east (Ivashchenko and Clapham 2012, Ivashchenko et al. 2013). Of the 662 right whales killed in the 1960s, 517 were taken in the eastern North Pacific, including 366 in the Gulf of Alaska, 31 in the Aleutian Islands, 116 in the Bering Sea, and 4 in unspecified pelagic waters (Ivashchenko et al. 2013).

Earlier estimates of population size were at best speculative. Based on sighting data, Wada (1973) estimated a total population of 100-200 right whales in the North Pacific in 1970. Rice (1974) stated that only a few individuals remained in the Eastern North Pacific stock and that for all practical purposes the stock was extinct because no sightings of a mature female with a calf had been confirmed since 1900. However, various sightings made since 1996 have invalidated this view (Wade et al. 2006, Zerbini et al. 2015, Ford et al. 2016, Matsuoka et al. 2017). Brownell et al. (2001) suggested from a review of sighting records that the abundance of this species in the western North Pacific was likely in the "low hundreds," including the population in the Sea of Okhotsk.

The North Pacific Right Whale Photo-identification Catalogue currently contains a minimum of 26 individual whales from the eastern North Pacific. From 2008 to 2018, 26 right whales were photographically identified, some repeatedly (Clapham et al. 2013; Ford et al. 2016; Matsuoka et al. 2017, 2018). Including individuals observed more than once across years, this comprises 8 animals photographed in 2008 (all in the Bering Sea), 7 in 2009 (Bering Sea), 3 in 2010 (1 in the Bering Sea, 2 off Kodiak), 2 in 2011 (Bering Sea), 1 in 2012 (Gulf of Alaska), 2 in 2013 (both off British Columbia), 14 in 2017 (12 in the Bering Sea, 1 in Kodiak, 1 in the Channel Islands), and 3 in the Bering Sea in 2018. The number of unique right whales decreased from previous years as a result of obtaining better quality photographs that allowed for additional internal matches in the catalogue.

LeDuc et al. (2012) analyzed 49 biopsy samples from 24 individual right whales, all but one of which were from the eastern North Pacific. The analysis revealed a male-biased sex ratio and a loss of genetic diversity that appeared to be midway between that observed for right whales in the North Atlantic and the Southern Hemisphere. The analysis also suggested a degree of separation between eastern and western populations, a male:female ratio of 2:1, and a low effective population size for the Eastern North Pacific stock, which LeDuc et al. (2012) considered to be at "extreme risk" of extirpation. Six biopsy samples were obtained from right whales in the Bering Sea during the IWC POWER cruises (3 in 2017, 3 in 2018), all from individuals of previously unknown sex. None were obtained during the 2019 cruise. Of the six whales sampled, five were male and only one was female. This suggests that the sex ratio may in fact be more skewed toward males than previously believed, which would put the population at even greater risk. These samples have not yet been integrated into the overall sample for reanalysis; while this may change the male:female ratio, it is unlikely to change the overall conclusions of LeDuc et al. (2012).

The only recent estimate of abundance comes from mark-recapture analyses of photo-identification and genetic data. Photographic (18 identified individuals) and genotype (21 identified individuals) data through 2008 were used to calculate the first mark-recapture estimates of abundance for right whales in the Bering Sea and Aleutian Islands, resulting in separate estimates of 31 (95% CL: 23-54; CV = 0.22) and 28 (95% CL: 24-42), respectively (Wade et al. 2011). The abundance estimates are for the last year of each study, corresponding to 2008 for the photo-identification estimate and 2004 for the genetic identification estimate. Wade et al. (2011) also estimated that the population consisted of 8 females (95% CL: 7-18) and 20 males (95% CL: 17-37).

The Wade et al. (2011) estimates may relate to a subpopulation that uses the Bering Sea; there is no estimate for right whales in the Gulf of Alaska, and to date there have been no photo-identification matches between the two regions. Consequently, the total size of the Eastern North Pacific population may be somewhat higher than the Wade et al. (2011) estimates. However, given the extreme paucity of recent sightings in the Gulf of Alaska, it seems unlikely that the overall abundance is significantly larger.

Minimum Population Estimate

The minimum estimate of abundance (N_{MIN}) of Eastern North Pacific right whales is 26 whales based on the 20th percentile of the photo-identification estimate of 31 whales (CV = 0.226: Wade et al. 2011). This estimate will be 12 years old in 2020, and the 2016 guidelines for preparing Stock Assessment Reports (NMFS 2016) recommend that N_{MIN} be considered unknown if the abundance estimate is more than 8 years old; however, given the extremely low abundance of this stock and the very low calf production, it seems unlikely that the current abundance is significantly different.

Current Population Trend

Due to a low resighting rate and the extremely low population size, no estimate of trend in abundance is available for this stock.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Due to insufficient information, the default cetacean maximum theoretical net productivity rate (R_{MAX}) of 4% is used for this stock (NMFS 2016). However, given the small apparent size, male bias, and very low calf production in this population, this rate is likely to be unrealistically high.

POTENTIAL BIOLOGICAL REMOVAL

Potential biological removal (PBR) is defined as the product of the minimum population estimate, one-half the maximum theoretical net productivity rate, and a recovery factor: $PBR = N_{MIN} \times 0.5R_{MAX} \times F_R$. The recovery factor ($F_R$) for this stock is 0.1, the recommended value for cetacean stocks which are listed as endangered (NMFS 2016). A reliable estimate of N_{MIN} for this stock is 26 whales based on the mark-recapture estimate of 31 whales (CV = 0.226: Wade et al. 2011). The calculated PBR level for this stock is therefore 0.05 ($26 \times 0.02 \times 0.1$), which would be equivalent to one take every 20 years. However, the male bias likely results in lower than expected calf production and, thus, this PBR could be overestimated.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Information for each human-caused mortality, serious injury, and non-serious injury reported for NMFS-managed Alaska marine mammals between 2014 and 2018 is listed, by marine mammal stock, in Young et al. (2020); however, only the mortality and serious injury data are included in the Stock Assessment Reports. No human-caused mortality or serious injury of Eastern North Pacific right whales was reported between 2014 and 2018; although, given the remote nature of the known and likely habitats of North Pacific right whales, it is very unlikely that any mortality or serious injury in this population would be observed. Consequently, it is possible that the current absence of reported mortality or serious injury due to entanglement in fishing gear, ship strikes, or other anthropogenic causes (e.g., oil spills) is not a reflection of the true situation.

Fisheries Information

Information for federally-managed and state-managed U.S. commercial fisheries in Alaska waters is available in Appendix 3 of the Alaska Stock Assessment Reports (observer coverage) and in the NMFS List of Fisheries (LOF) and the fact sheets linked to fishery names in the LOF (observer coverage and reported incidental takes of marine mammals: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-protection-act-list-fisheries, accessed December 2020).

There are no historical reports of fisheries-caused mortality or serious injury of Eastern North Pacific right whales. However, given what we know about susceptibility of other large whales to fisheries-caused mortality and serious injury, we assume that the potential exists for North Pacific right whales. Mortality and serious injury of humpback whales and fin whales in trawl gear, gray whales in gillnet gear, and bowhead whales in pot gear (George et al. 2017) has been documented. While much of the trawl fleet has observer coverage, several gillnet fisheries and pot fisheries in the range of Eastern North Pacific right whales do not. Therefore, the potential for fisheries-caused mortality and serious injury may be greater than is reflected in existing observer data.

Right whales, presumably from the Western North Pacific population, have suffered fisheries-caused mortality or serious injury. Gillnets were implicated in the death of a right whale off the Kamchatka Peninsula (Russia) in October of 1989 (Kornev 1994). The Marine Mammal Commission reported that in February 2015, a young right whale was found entangled in aquaculture gear in South Korea; much of the gear was cut off, but the whale's fate is unknown. In October 2016, an entangled right whale was reported to have died while being disentangled in Volcano Bay, Hokkaido, Japan. And in July 2018, fishermen in the Sea of Okhotsk took video of a right whale that was entangled in the rope of a crab pot but later freed itself. No other incidental takes of right whales are known to have occurred in the North Pacific, although two photographs from the North Pacific Right Whale Photo-identification Catalogue show possible fishing gear entanglement (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). Given the very small estimate of abundance, any mortality or serious injury incidental to commercial fisheries would be considered significant. Entanglement in fishing gear, including lobster pot and sink gillnet gear, is a significant source of mortality and serious injury for North Atlantic right whales (Waring et al. 2014).

Alaska Native Subsistence/Harvest Information

Subsistence hunters in Alaska and Russia do not hunt animals from this stock.

Other Mortality

Ship strikes are considered one of the primary sources of human-caused mortality and serious injury of right whales in the North Atlantic (Cole et al. 2005; Henry et al. 2012, 2019; Hayes et al. 2018), and it is possible that right whales in the North Pacific are also vulnerable to this source of mortality. However, due to their rare occurrence and scattered distribution, it is impossible to assess the threat of ship strikes to the Eastern North Pacific

stock of right whales. There is concern that increased shipping through Arctic waters and the Bering Sea, with retreating sea ice, may increase the potential risk to right whales from shipping.

Overall, given the remote nature of the known and likely habitats of North Pacific right whales, it is very unlikely that any mortality or serious injury in this population would be observed. Consequently, it is possible that the current absence of reported ship-strike-related or other anthropogenic mortality or serious injury in this stock is not a reflection of the true situation.

STATUS OF STOCK

The right whale is listed as endangered under the Endangered Species Act of 1973, and therefore designated as depleted under the Marine Mammal Protection Act. In 2008, NMFS relisted the North Pacific right whale as endangered as a separate species (*Eubalaena japonica*) from the North Atlantic species, *E. glacialis* (73 FR 12024, 06 March 2008). As a result, the stock is classified as a strategic stock. The abundance of this stock is considered to represent only a small fraction of its pre-commercial whaling abundance, i.e., the stock is well below its Optimum Sustainable Population (OSP). The minimum estimated mean annual level of human-caused mortality and serious injury is unknown for this stock. The reason(s) for the apparent lack of recovery for this stock is (are) unknown. Brownell et al. (2001) and Ivashchenko and Clapham (2012) noted the devastating impact of extensive illegal Soviet catches in the eastern North Pacific in the 1960s, and both suggested that the prognosis for right whales in this area was poor. Biologists working aboard the Soviet factory ships that killed right whales in the eastern North Pacific in the 1960s considered that the fleets had caught close to 100% of the animals they encountered (Ivashchenko and Clapham 2012); accordingly, it is quite possible that the Soviets killed the great majority of the animals in the population at that time. In its review of the status of right whales worldwide, the IWC expressed "considerable concern" over the status of this population (IWC 2001), which is currently the most endangered stock of large whales in the world for which an abundance estimate is available. A genetic analysis of biopsy samples from North Pacific right whales found an apparent loss of genetic diversity, low frequencies of females and calves, extremely low effective population size, and possible isolation from conspecifics in the western Pacific indicating that right whales in the eastern North Pacific are in severe danger of immediate extirpation from the eastern North Pacific (LeDuc et al. 2012).

There are key uncertainties in the assessment of the Eastern North Pacific stock of North Pacific right whales. The abundance of this stock is critically low and migration patterns, calving grounds, and breeding grounds are not well known. There appear to be considerably more males than females in the population and calf production is very low. PBR is designed to allow stocks to recover to, or remain above, the maximum net productivity level (MNPL) (Wade 1998). An underlying assumption in the application of the PBR equation is that marine mammal stocks exhibit certain dynamics. Specifically, it is assumed that a depleted stock will naturally grow toward OSP, and that some surplus growth could be removed while still allowing recovery. However, the Eastern North Pacific right whale population is far below historical levels and at a very small population size, and small populations can have different dynamics than larger populations from Allee effects and stochastic dynamics. Although there is currently no known direct human-caused mortality, given the small number of animals estimated to be in the population, any human-caused mortality or serious injury from ship strikes or commercial fisheries is likely to have a serious population-level impact.

HABITAT CONCERNS

NMFS conducted an analysis of right whale distribution in historical times and in more recent years and stated that principal habitat requirements for right whales are dense concentrations of prey (Clapham et al. 2006) and, on this basis, proposed two areas of critical habitat: one in the southeastern Bering Sea and another south of Kodiak Island (70 FR 66332, 2 November 2005). In 2006, NMFS issued a final rule designating these two areas as northern right whale critical habitat, one in the Gulf of Alaska and one in the Bering Sea (71 FR 38277, 6 July 2006; Fig. 1). In 2008, NMFS redesignated the same two areas as Eastern North Pacific right whale critical habitat under the newly recognized species name, *E. japonica* (73 FR 19000, 8 April 2008; Fig. 1).

Potential threats to the habitat of this population derive primarily from commercial shipping and fishing vessel activity. There is considerable fishing activity within portions of the critical habitat of this species, increasing the risk of entanglement. However, photographs of right whales in the eastern North Pacific to date have shown little evidence of entanglement scars; the sole exception is the animal photographed in the Strait of Juan de Fuca in October 2013 (Ford et al. 2016). Unimak Pass is a choke-point for shipping traffic between North America and Asia, with shipping density and risk of an accidental spill highest in the summer (Renner and Kuletz 2015), a time when right whales are believed to be present (Wright et al. 2018). The high volume of large vessels transiting Unimak Pass (e.g., 1,961 making 4,615 transits in 2012: Nuka Research and Planning Group, LLC 2014a, 2014b), a

subset of which continue north through the Bering Sea, increases both the risk of ship strikes and the risk of a large or very large oil spill in areas in which right whales may occur. The risk of accidents in Unimak Pass, specifically, is predicted to increase in the coming decades, and studies indicate that more accidents are likely to involve container vessels (Wolniakowski et al. 2011).

Past offshore oil and gas leasing has occurred in the Gulf of Alaska and Bering Sea in the northern areas of known right whale habitat. The Bureau of Ocean Energy Management (BOEM) proposed an Outer Continental Shelf leasing plan for 2007-2012 that prioritized lease sales for the North Aleutian Basin in 2010 and 2012 (Aplin and Elliott 2007), but it was later withdrawn by Presidential Executive Order. Therefore, the North Aleutian Basin was not included in the 2017-2022 national lease schedule by BOEM, and there are no residual active leases from past sales. However, BOEM has announced plans to replace the 2017-2022 OCS plan (with a new 2019-2024 leasing plan) and to reconsider all current moratoria on offshore oil and gas exploration and extraction (82 FR 30886, 3 July 2017). It is noteworthy that two tagged right whales were observed to briefly visit the North Aleutian Basin area, one in 2004 and one in 2009 (Zerbini et al. 2015). The development of oil fields off Sakhalin Island in Russia is occurring within habitat of the western North Pacific population of right whales (NMFS 2006). However, no oil exploration or production is currently underway in offshore areas of the Bering Sea or Gulf of Alaska, and no lease sales are currently scheduled to occur in those areas. The possibility remains that there will be lease sales in these areas in the future, even though no discoveries have yet been announced and most leases have not contained commercially viable deposits (NMFS 2006). However, in Cook Inlet, lease sales are planned (the next federal sale under the existing 2017-2022 leasing plan will occur in 2021 and state sales currently occur annually) and exploration activity is occurring in both state and federal waters. BOEM (2016) conducted an oil spill model for lower Cook Inlet that suggested if a very large oil spill occurs in offshore waters it will impact right whale habitat around Kodiak Island and along the Alaska Peninsula. Although there is currently no oil and gas activity in the Alaska Chukchi Sea, oil exploration and production is ongoing in the Beaufort Sea, and this will likely include an increased level of associated vessel traffic through the Bering Sea en route to and from the Arctic, which could increase risks to right whales from ship strikes.

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