Revised 11/15/2011

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

STOCK DEFINITION AND GEOGRAPHIC RANGE

A comprehensive review of all 20th century sighting, catches, and strandings of North Pacific right whales was conducted by Brownell et al. (2001). Data from this review were subsequently combined with historical whaling records to map the known distribution of the species (Clapham et al. 2004, Shelden et al. 2005). Although whaling records initially indicated that right whales ranged across the entire North Pacific north of 35°N and occasionally as far south as 20°N (Scarff 1986, 1991; Fig. 39), recent analysis shows a pronounced longitudinally bimodal distribution (Josephson et al. 2008a). Before right whales in the North Pacific were heavily exploited by commercial whalers, concentrations were found in the Gulf of Alaska, eastern Aleutian Islands, south-central Bering Sea, Sea of Okhotsk, and Sea of Japan (Braham and Rice 1984). An analysis conducted on the North Pacific right whale fishery by Josephson et al. (2008b) showed that within the course of a decade (1840s), right whale abundance was severely depleted, particularly in the eastern portion of their range. During 1965-99, following large illegal catches by the U.S.S.R., there were only 82 sightings of right whales in the entire eastern North Pacific, with the majority of these occurring in the Bering Sea and adjacent areas of the Aleutian Islands (Brownell et al. 2001). Sightings have been reported as far south as central Baja California in the eastern North Pacific, as far south as Hawaii in the central North Pacific, and as far north as the sub-Arctic waters of the Bering Sea and Sea of Okhotsk in the summer (Herman et al. 1980, Berzin and Doroshenko 1982, Brownell et al. 2001).

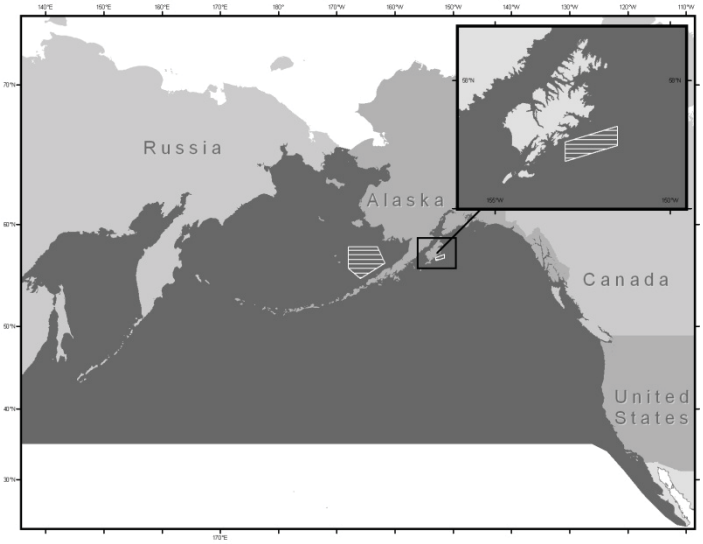

Figure 39. Approximate historical distribution of North Pacific right whales in the eastern North Pacific (shaded area). Striped areas indicate northern right whale critical habitat (71 FR 38277, 6 July 2006).

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 well offshore (Braham and Rice 1984, Scarff 1986, Clapham et al. 2004).

Information on the current seasonal distribution of right whales is available from dedicated vessel and aerial surveys, bottom-mounted acoustic recorders, and vessel surveys for fisheries ecology and management which have also included dedicated marine mammal observers. Aerial and vessel surveys for right whales have occurred in recent years in a portion of the southeastern Bering Sea (Fig. 39) where right whales have been observed most summers since 1996 (Goddard and Rugh 1998). North Pacific right whales are observed consistently in this area, although it is clear from historical and Japanese sighting survey data that right whales often range outside this area and occur elsewhere in the Bering Sea (Clapham et al. 2004, LeDuc et al. 2001, Moore et al. 2000, Moore et al. 2002). Bottom-mounted acoustic recorders were deployed in the southeastern Bering Sea and the northern Gulf of Alaska starting in 2000 to document the seasonal distribution of right whale calls (Mellinger et al. 2004). Analysis of the data from those recorders deployed between October 2000 and January 2006 indicates that right whales remain in the southeastern Bering Sea from May through December with peak call detection in September (Munger and Hildebrand 2004). Data from recorders deployed between May 2006 and April 2007 show the same trends (Stafford and Mellinger 2009). Recorders deployed from 2007 on have not yet been fully analyzed, but seem to

indicate the presence of right whales well into February in 2009 & 2010 (available Catherine Berchok, NOAA/AFSC/NMML, 7600 Sand Point Way, Seattle, WA; unpublished data). Use of this habitat may intensify in mid-summer through early fall based on higher monthly and daily call detection rates. Rates of detection on the middle shelf (<100 m depth) suggests that right whales pass through intermittently and typically do not remain longer than a few days (Munger and Hildebrand 2004, Munger et al. 2008). Right whale calls were rarely detected in the northwestern Gulf of Alaska in the late summer (Mellinger et al. 2004). Right whales have not been observed outside the localized area in the southeastern Bering Sea during surveys conducted for fishery management purposes which covered a broader area of Bristol Bay and the Bering Sea (Moore et al. 2000, 2002; see Fig. 37 for locations of tracklines for these surveys).

The use of satellite telemetry has been implemented to provide information about habitat use and population size. In 2004, a right whale was successfully tagged with a satellite-monitored transmitter for 40 days, during which time the animal moved over a large part of the southeastern Bering Sea including the outer shelf area (Wade et al. 2006). In September 2004, information from the tag was used together with acoustic detections to find the largest aggregation of right whales observed in the eastern North Pacific since Soviet whaling. A minimum of 17 individuals were identified by photo-id and by genotyping from skin biopsies. During a NMFS survey in 2008, a second right whale, last sighted in 2002, was satellite-tagged. The animal remained inside the Bering Sea critical habitat providing further indication of this area's importance as foraging habitat for eastern North Pacific right whales. Similarly, three other whales that were tagged in July and August 2009 remained within the critical habitat for periods of days to weeks (Phil Clapham, AFSC-NMML, pers. comm., 9 October 2009).

There are fewer recent sightings of right whales in the Gulf of Alaska than in the Bering Sea (Brownell et al. 2001), although little survey effort has been conducted in this region. Waite et al. (2003) summarized sightings from the Platforms of Opportunity Program from 1959-97. Seven sightings of right whales were reported, but only one sighting of four right whales at the mouth of Yakutat Bay in 1979 could be positively confirmed (Waite et al. 2003). Sightings of a single right whale off eastern Kodiak Island occurred in July 1998 during an aerial survey (Waite et al. 2003), and additional lone animals were observed off Kodiak Island in the Barnabas Canyon area from NOAA surveys in August 2004, 2005, and 2006 (available Alex Zerbini, AFSC-NMML, 7600 Sand Point Way, Seattle, WA; unpublished data). Acoustic monitoring from May 2000 to July 2001 at seven sites in the Gulf of Alaska detected right whale calls at only two: one off eastern Kodiak (detection distance 20-50 km) and the other in deep water south of the Alaska Peninsula (detection distance 10s of kilometers) (Mellinger et al. 2004).

Many of the illegal Soviet catches of right whales occurred across a large area to the southeast of Kodiak, where right whales were found in tight feeding concentrations (primarily in 1963 and 1964, Doroshenko 2000). Whether this region remains an important habitat for this species, or whether cultural memory of its existence has been lost, is currently unknown. The sightings and acoustic detection of right whales east of Kodiak indicates at least occasional continuing use of this area.

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: unknown. Based on this limited information, two stocks of North Pacific right whales are currently recognized: a Western North Pacific and an Eastern North Pacific stock (Rosenbaum et al. 2000, Brownell et al. 2001). The former is believed to feed primarily in the Sea of Okhotsk.

POPULATION SIZE

Based on sighting data, Wada (1973) estimated a total population of 100-200 in the North Pacific. 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, confirmed sightings over the last 14 years, starting in 1996 (Goddard and Rugh 1998), have invalidated this view (Wade et al. 2006). 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 Ohkotsk Sea.

There were several sightings of North Pacific right whales in the mid-1990s which renewed interest in conducting dedicated surveys for this species. Right whales can be individually identified by photographs of the unique callosity patterns on their heads. In April 1996 a right whale was sighted off Maui (Salden and Mickelsen 1999) , and that same animal was identified 119 days later and 4,111km north (in the Bering Sea); this represents the first high- to low-latitude match of a North Pacific right whale (Kennedy et al. 2011). The April Maui sighting was the first documented sighting of a right whale in Hawaiian waters since 1979 (Herman et al. 1980, Rowntree et al.

1980) and, even though the photographic match confirms that Bering Sea animals occasionally travel south, there is no reason to believe that either Hawaii or tropical Mexico have ever been anything except extra-limital habitats for this species (Brownell et al. 2001). A group of 3-4 right whales was sighted in western Bristol Bay, southeastern Bering Sea, in July 1996 which may have included a juvenile animal (Goddard and Rugh 1998).

In July 1997, a group of 4-5 individuals was encountered one evening in Bristol Bay, followed by a second sighting of 4-5 whales the following morning in approximately the same location (Tynan 1999). During dedicated surveys in July 1998, July 1999, and July 2000, 5, 6, and 13 right whales, were again found in the same general region of the southeastern Bering Sea (Leduc et al. 2001). Biopsy samples of right whales encountered in the southeastern Bering Sea were taken in 1997 and 1999. Genetic analyses identified three individuals in 1997 and four individuals in 1999; of the animals identified, one was identified in both years, resulting in a total genetic count of six individuals (LeDuc et al. 2001). Genetic analyses on samples from all six whales sampled in 1999 determined that the animals were male (LeDuc et al. 2001). Two right whales were observed during a vessel-based survey in the central Bering Sea in July 1999 (Moore et al. 2000).

During the southest Bering Sea survey in 2002, there were seven sightings of right whales (LeDuc 2004). One of the sightings in 2002 included a right whale calf; this is the first confirmed sighting of a calf in decades (a possible calf or juvenile sighting was also reported in Goddard and Rugh 1998). This concentration also included two probable calves. In the southeast Bering Sea during September 2004, multiple right whales were acoustically located and subsequently sighted by another survey vessel approaching a near-real-time position of an individual located with a satellite tag (Wade et al. 2006). An analysis of photographs confirmed at least 17 individual whales (not including the tagged whales). Genetic analysis of biopsy samples identified 17 individuals: 10 males and 7 females. The discovery of 7 females was significant as only 1 female had been identified previously, and at least two calves were present. From 2007 to 2010, 12 individual right whales were seen (some individuals were seen many times over all survey years).

Photographic and genotype 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 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 estimates. Wade et al. (2011) also estimate the population consists of eight females (95% CL 7-18) and 20 males (95% CL 17-37). Wade et al. (2011) summarized the photo-identification and genetic-identification catalogues as follows. Twenty-one individuals were identified from genotyping from the Aleutian Islands and Bering Sea from 1997-2004, comprising 15 males and 6 females. In aggregate, there were 8 matches across years involving 5 individuals. Wade et al. (2006) reported 17 individuals (including 7 females) identified from genotyping in 2004; that number was revised to 16 individuals (including 6 females) because a typographical error was subsequently discovered that masked a duplicate sample. There were 4 biopsies taken in 2008 and 2009 of 2 males and 2 females; three of these animals had been sampled in previous years. These samples were only recently processed and did not make it into Wade et al. (2011) abundance estimate (Amy Kennedy, pers comm., 21 September 2011).

The photo-identification catalogue, for purposes of abundance estimation, was restricted to aerial or left-side oblique photographs of good or excellent photo quality. After this restriction, there were a total of eighteen unique individuals identified from photographs of callosity patterns and scars from 1998-2008, with 10 resights across years involving 5 individuals. Another 7 individuals were observed in the summer of 2009 (Amy Kennedy, AFSC-NMML, pers. comm. 3 November 2010). One individual was seen in the summer of 2010 (Amy Kennedy, AFSC-NMML, pers. comm. 3 November 2010).

Detections of right whales have been very rare in the Gulf of Alaska, even though large numbers of whales were caught there in the 1800s. From the 1960s through 2002, only two sightings of right whales occurred in the Gulf of Alaska: an opportunistic sighting in March 1979 near Yakutat Bay in the eastern Gulf (Shelden et al. 2005) and a sighting during an aerial survey for harbor porpoise in July 1998 south of Kodiak Island, Alaska (Waite et al. 2003). Both sightings occurred in shelf waters less than 100 m deep. However, from 2004 to 2006, four sightings of right whales occurred in the Barnabus Trough region on Albatross Bank, south of Kodiak Island, Alaska (Wade et al. 2011). Sightings of right whales occurred at locations within the trough with the highest density of zooplankton, as measured by active-acoustic backscatter. Photo-identification (of two whales) and genotyping (of one whale) failed to reveal a match to Bering Sea right whales. Fecal hormone metabolite analysis from one whale estimated levels consistent with an immature male, indicating either recent reproduction in the Gulf of Alaska or movements between the Bering Sea and Gulf of Alaska.

In recent decades, the only detections of right whales in pelagic waters of the Gulf of Alaska came from passive-acoustic recorders. These detections of calls were exceptionally rare; instruments in seven widespread

locations detected right whale calls from only 2 of the locations on only 6 days out of a total of 80 months of recordings (Mellinger et al. 2004), and on only 5 days out of a total of 70 months of recordings from the 5 deep-water stations. The calls were heard at the deep-water station in the Gulf of Alaska ~500 km southwest of Kodiak Island on 5 days in August and September of 2000, but no calls were detected from 4 other instruments deployed in deep water farther east during 2000 and 2001 (Mellinger et al. 2004). Calls classified as "probable" right whales were detected from an instrument deployed on the shelf at the location of the aerial visual detection on Albatross Bank on 6 September 2000 (Waite et al. 2003), but no calls were detected from two instruments deployed at the base of the continental slope off Albatross Bank just northeast of Barnabus Trough (Mellinger et al. 2004, Munger et al. 2008). Twenty sonobuoy deployments in 2004 throughout the Gulf of Alaska resulted in the detection of right whale calls only in Barnabus Trough, near the location of the visual sightings mentioned above (Wade et al. 2011). The lack of detection of right whales from passive acoustic recorders does not provide indisputable evidence there were no right whales in the area, as the whales may not always vocalize or their calls may not always be detected by the automatic algorithms used. However, it is interesting to note the contrasting data from the southeastern Bering Sea where similar instruments on the middle shelf (<100m depth) detected right whale calls on > 6 d per month in July-October (Munger et al. 2008), despite a population estimated to be only 31 whales (Wade et al. 2010). The lack of detections of right whales in pelagic waters of the Gulf of Alaska may still be partially due to a lack of survey and recording effort in those areas, but the lack of calls in passive-acoustic monitoring suggests that right whales are very rare in pelagic waters today. More extensive coverage of shelf and nearshore waters of the Gulf of Alaska during previous ship and airplane surveys for cetaceans (summarized in Wade et al. 2011) have not detected right whales other than the single detection near Kodiak Island by Waite et al. (2003). Therefore, the Barnabus Trough/Albatross Bank area represents the only location in the Gulf of Alaska where right whales have been repeatedly detected in the last 4 decades, and those detections add only a minimum of two additional whales (from photo-identification in 2005 and 2006) to the total eastern population).

Minimum Population Estimate

The minimum estimate of abundance of North Pacific right whales is 25.7 based on the 20th percentile of the photo-identification estimate of 31 (CV=0.226; Wade et al. 2011). The photo-identification catalogue used in the mark-recapture abundance estimate has a minimum of 18 reliably unique individuals seen from 1998 to 2011, yet this number could be higher given that there are many animals with poor quality photos or poor coverage (one side only). The genetic-identification catalogue has a total of 22 individuals identified from 1997 to 2009.

Current Population Trend

No estimate of trend in abundance is currently available.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Due to insufficient information, the default cetacean maximum net productivity rate (R_{MAX}) of 4% is used for this stock (Wade and Angliss 1997). However, given the small apparent size and low observed calving rate of this population, this rate may be unrealistically high.

POTENTIAL BIOLOGICAL REMOVAL

Under the 1994 reauthorized Marine Mammal Protection Act (MMPA), the 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 (Wade and Angliss 1997). A reliable estimate of minimum abundance for this stock is 25.7 based on the mark-recapture estimate of 31 (CV = 0.226; Wade et al. 2011). The PBR level for this stock is therefore 0. This PBR level is nearly zero, as this is equivalent to one take every 20 years. Regardless of the PBR level, because this species is listed under the Endangered Species Act and no negligible impact determination has been made, no human-caused takes of this population are authorized.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fisheries Information

Gillnets were implicated in the death of a right whale off the Kamchatka Peninsula (Russia) in October of 1989 (Kornev 1994). No other incidental takes of right whales are known to have occurred in the North Pacific,

although one photograph from the catalog shows potential fishing gear entanglement (Amy Kennedy, pers comm. 21 September 2011). Vessel collisions are considered the primary source of human-caused mortality of right whales in the Atlantic (Cole et al. 2005). Any mortality 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 for the North Atlantic right whale stock (Waring et al. 2004). An analysis of right whale photographs to estimate entanglement rate from scarring data is currently under way.

There are no records of fisheries mortalities of eastern North Pacific right whales. Thus, the estimated annual mortality rate incidental to U. S. commercial fisheries approaches zero whales per year from this stock. Therefore, the annual human-caused mortality level is considered to be insignificant and approaching a zero mortality and serious injury rate.

Subsistence/Native Harvest Information

Subsistence hunters in Alaska and Russia are not reported to take animals from this stock.

Other Mortality

Right whales are large, slow-swimming whales which tend to congregate in coastal areas. Their thick layer of blubber causes them to float when killed. These attributes made them an easy and profitable species for early (pre-modern) whalers. By the time the modern whale fishery (harpoon cannons and steam powered catcher boats) began in the late 1800s, right whales were rarely encountered (Braham and Rice 1984). Best (1987) estimated that between 1835 and 1909 15,374 right whales were taken from the North Pacific by American-registered whaling vessels, with most of those animals taken prior to 1875. Scarff (2001) updated that analysis with adjustments for struck-and-lost whales and whaling conducted by citizens of countries other than the U.S.; he estimated that 26,500-37,000 right whales were killed during the period 1839-1909, with the great majority taken in the single decade of 1840-49. From 1900 to 1999, a total of 742 right whales are known to have been killed by whaling; of those, 331 were killed in the western North Pacific and 411 in the eastern North Pacific (Brownell et al. 2001). The latter total includes 372 whales killed illegally by the U.S.S.R. in the period 1963-67, primarily in the Gulf of Alaska and Bering Sea (Doroshenko 2000, Brownell et al. 2001).

Ship strikes are significant sources of mortality for the North Atlantic stock of right whales, 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 North Pacific stock of right whales at this time.

STATUS OF STOCK

The right whale is listed as “endangered” under the Endangered Species Act of 1973, and therefore designated as “depleted” under the MMPA. 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. Reliable estimates of the minimum population size, population trends, and PBR are currently not available. Though reliable numbers are not known, the abundance of this stock is considered to represent only a small fraction of its precommercial whaling abundance (i.e., the stock is well below its Optimum Sustainable Population size). The estimated annual rate of human-caused mortality and serious injury seems minimal for this stock. The reason(s) for the apparent lack of recovery for this stock is (are) unknown. Brownell et al. (2001) noted the devastating impact of extensive illegal Soviet catches in the eastern North Pacific in the 1960s, and suggested that the prognosis for right whales in this area was "poor". Biologists working aboard the Soviet factory ships which 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 (Nikolai V. Doroshenko, pers. comm.); accordingly, it is quite possible that the Soviets wiped out the great majority of the animals in the population at that time. In its review of the status of right whales worldwide, the International Whaling Commission expressed "considerable concern" over the status of this population (IWC 2001), which is arguably the most endangered stock of large whales in the world.

HABITAT CONCERNS

NMFS conducted an analysis of right whale distribution in historic times and in 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. 39). In 2008, NMFS redesignated the same two areas as eastern North Pacific right whale critical habitat under the newly recognized species name, *E. japonica*.

There are no known current threats to the habitat of this population, although this partly reflects a lack of information about the current distribution and habitat requirements of right whales in the eastern North Pacific, as well as about the location and nature of any potential threats to the animal or its environment. The Department of the Interior has designated areas within the southeastern Bering Sea, including areas designated as right whale critical habitat, as one of their outer continental shelf oil and gas lease areas. This planning area, referred to as the North Aleutian Basin, was not included in the current 2012-2017 National lease schedule by the Bureau of Ocean Energy Management, and there are no residual active leases from past sales. The Mineral Management Service (currently Bureau of Ocean Energy Management) supported a series of surveys from 2007-2009 to better understand right whale distribution in this area so that potential impacts and mitigation measures can be better assessed.

CITATIONS

Berzin, A. A., and N. V. Doroshenko. 1982. Distribution and abundance of right whales in the North Pacific. Rep. Int. Whal. Comm. 32:381-383.

Best, P. B. 1987. Estimates of the landed catch of right whale (and other whalebone) whales in the American fishery. Fish. Bull., U.S. 85(3):403-418.

Braham, H. W., and D. W. Rice. 1984. The right whale, *Balaena glacialis*. Mar. Fish. Rev. 46(4):38-44.

Brownell, R. L., P. J. Clapham, T. Miyashita, and T. Kasuya. 2001. Conservation status of North Pacific right whales. J. Cetacean Res. Manage. (Special Issue). 2:269-86.

Clapham, P. J., C. Good, S. E. Quinn, R. R. Reeves, J. E. Scarff, and R. L. Brownell, Jr. 2004. Distribution of North Pacific right whales (*Eubalaena japonica*) as shown by 19th and 20th century whaling catch and sighting records. J. Cetacean Res. Manage. 6(1): 1-6.

Clapham, P.J., K. E. W. Shelden, and P. R. Wade. 2006. Review of information relating to possible Critical Habitat for eastern North Pacific right whales. Pp. 1-27 *In* Habitat Requirements and Extinction Risks of Eastern North Pacific Right Whales. Eds: Clapham, P.J., Shelden, K. E. W. and Wade, P. R. AFSC Processed Report 2006-06, Alaska Fisheries Science Center, National Marine Fisheries Service, Seattle.

Cole, T.V.N., D.L. Hartley, and R.M. Merrick. 2005. Mortality and serious injury determinations for large whale stocks along the eastern seaboard of the United States, 1999-2003. U. S. Dep Commer., NOAA-National Marine Fisheries Service-NEFSC Ref. Doc. 05-08; 20 p. Available from National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026.

Dizon, A. E., C. Lockyer, W. F. Perrin, D. P. DeMaster, and J. Sisson. 1992. Rethinking the stock concept: a phylogeographic approach. Conserv. Biol. 6:24-36.

Doroshenko, N. V. 2000. Soviet whaling for blue, gray, bowhead and right whales in the North Pacific Ocean, 1961-1979. Pp. 96-103 *In* Soviet whaling data (1949-1979). Eds: Yablokov, A. V. and Zemsky, V. A. Center for Russian Environmental Policy, Marine Mammal Council, Moscow.

Goddard, P. C., and D. J. Rugh. 1998. A group of right whales seen in the Bering Sea in July 1996. Mar. Mammal Sci. 14(2):344-349.

Herman, L. M., C. S. Baker, P. H. Forestell, and R. C. Antinoja. 1980. Right whale, *Balaena glacialis*, sightings near Hawaii: a clue to the wintering grounds? Mar. Ecol. Prog. Ser. 2:271-275.

International Whaling Commission. 2001. Report of the workshop on the comprehensive assessment of right whales: a worldwide comparison. J. Cetacean Res. Manage. (Special Issue 2):1-60.

Josephson, E., T.D. Smith, and R.R. Reeves. 2008a. Historical distribution of right whales in the North Pacific. Fish Fish. 24:4, 795-814.

Josephson, E.A., T.D. Smith and R.R. Reeves. 2008b. Depletion within a decade: the American 19th-century North Pacific right whale fishery. In: *Oceans Past: Management Insights from the History of Marine Animal Populations* (eds D.J. Starkey, P. Holm and M. Barnard). Earthscan, London, p. 133-147.

Kennedy, A.S., Salden, D.R., Clapham, P.J. 2011. First high- to low-latitude match of an eastern North Pacific right whale (*Eubalaena japonica*). Mar. Mammal Sci. doi: 10.1111/j.1748-7692.2011.00539.x

Kornev, S. I. 1994. A note on the death of a right whale (*Eubalaena glacialis*) off Cape Lopakta (Kamchatka). Rep. Int. Whal. Comm. (Special Issue 15):443-444.

LeDuc, R. G., W. L. Perryman, J. W. Gilpatrick, Jr., J. Hyde, C. Stinchcomb, J. V. Carretta, R. L. Brownell, Jr. 2001. A note on recent surveys for right whales in the southeastern Bering Sea. J. Cetacean Res. Manage. (Special Issue 2):287-289.

LeDuc, R. 2004. Report of the results of the 2002 survey for North Pacific right whales. U.S. Dep. Commer. NOAA Tech. Memo. NMFS-SWFSC-357, 58 pp.

Mellinger, D. K., K. M. Stafford, S. E. Moore, L. Munger, and C. G. Fox. 2004. Detection of North Pacific right whale (*Eubalaena japonica*) calls in the Gulf of Alaska. Mar. Mammal Sci. 20: 872-879.

Moore, S. E., J. M. Waite, L. L. Mazzuca, and R. C. Hobbs. 2000. Provisional estimates of mysticete whale abundance on the central Bering Sea shelf. J. Cetacean Res. Manage. 2(3):227-234.

Moore, S. E., J. M. Waite, N. A. Friday and T. Honkalehto. 2002. Distribution and comparative estimates of cetacean abundance on the central and south-eastern Bering Sea shelf with observations on bathymetric and prey associations. Progr. Oceanogr. 55(1-2):249-262.

Munger, L. M., and J. A. Hildebrand. 2004. Final Report: Bering Sea Right Whales: Acoustic recordings and public outreach. NPRB Grant T-2100.

Munger, L.M., S.M. Wiggins, S.E. Moore, and J.A. Hildebrand. 2008. North Pacific right whale (*Eubalaena japonica*) seasonal and diel calling patterns from long-term acoustic recordings in the southeastern Bering Sea, 2000-2006. Mar. Mammal Sci. 24:4, 795-814.

Rice, D. W. 1974. Whales and whale research in the eastern North Pacific. Pp. 170-195 *In* W. E. Schevill (ed.), The whale problem: A status report. Harvard Press, Cambridge, MA.

Rosenbaum, H.C., R.L. Brownell, M.W. Brown, C. Schaeff, V. Portway, B.N. White, S. Malik, L.A. Pastene, N.J. Patenaude, C.S. Baker, M.Goto, P.B. Best, P.J. Clapham, P. Hamilton, M. Moore, R. Payne, V. Rowntree, C.T. Tynan, J.L. Bannister, and R. DeSalle. 2000. World-wide genetic differentiation of *Eubalaena*: questioning the number of right whale species. Molec. Ecol. 9 (11): 1793-1802.

Rowntree, V., J. Darling, G. Silber, and M. Ferrari. 1980. Rare sighting of a right whale (*Eubalaena glacialis*) in Hawaii. Can. J. Zool. 58:308-312.

Salden, D. R., and J. Mickelsen. 1999. Rare sightings of a North Pacific right whale (*Eubalaena glacialis*) in Hawaii. Pac. Sci. 53:341-345.

Scarff, J. E. 1986. Historic and present distribution of the right whale, (*Eubalaena glacialis*,) in the eastern North Pacific south of 50˚ N and east of 180˚ W. Rep. Int. Whal. Comm. (Special Issue 10):43-63.

Scarff, J. E. 1991. Historic distribution and abundance of the right whale, *Eubalaena glacialis*, in the North Pacific, Bering Sea, Sea of Okhotsk and Sea of Japan from the Maury Whale Charts. Rep. Int. Whal. Commn. 41:467-487.

Scarff, J. E. 2001. Preliminary estimates of whaling-induced mortality in the 19th century North Pacific right whale (*Eubalaena japonicus*) [sic] fishery, adjusting for struck-but-lost whales and non-American whaling. J. Cetacean Res. Manage. (Special Issue) 2:261-268.

Shelden, K. E. W., S. E. Moore, J. M. Waite, P. R. Wade, and D. J. Rugh. 2005. Historic and current habitat use by North Pacific right whales *Eubalaena japonica* in the Bering Sea and Gulf of Alaska. Mamm. Rev. 35: 129-155.

Stafford, K. M. and D. K. Mellinger. 2009. Analysis of acoustic and oceanographic data from the Bering Sea, May 2006 – April 2007. North Pacific Research Board Final Report, NPRB Project #719, 24 pp.

Tynan, C. 1999. Redistribution of cetaceans in the southeast Bering Sea relative to anomalous oceanographic conditions during the 1997 El Niño. *In* Proceedings of the 1998 science board symposium on the impacts of the 1997/98 El Niño event on the North Pacific Ocean and its marginal seas. (Eds: Freeland, H. J., Peterson, W. T., Tyler, A.) (PICES Scientific Report No. 10) North Pacific Marine Science Organization (PICES), Sydney, BC, Canada, 115-117.

Wada, S. 1973. The ninth memorandum on the stock assessment of whales in the North Pacific. Rep. Int. Whal. Comm. 23:164-169.

Wade, P. R., and R. Angliss. 1997. Guidelines for assessing marine mammal stocks: report of the GAMMS workshop April 3-5, 1996, Seattle, Washington. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-OPR-12, 93 pp.

Wade, P. R., M. P. Heide-Jorgensen, K. Shelden, J. Barlow, J. Carretta, J. Durban, R. LeDuc, L. Munger, S. Rankin, A. Sauter and C. Stinchcomb. 2006. Acoustic detection and satellite tracking leads to discovery of rare concentration of endangered North Pacific right whales. Biol. Lett. 2:417-419.

Wade, P. R., A. Kennedy, R. LeDuc, J. Barlow, J. Carretta, K. Shelden, W. Perryman, R. Pitman, K. Robertson, B. Rone, J. Carlos Salinas, A. Zerbini, R. L. Brownell, Jr., and P. Clapham. 2011. The world's smallest whale population. Biol. Letters 7:83-85.

Wade, P. R., A. De Robertis, K. Hough, R. Booth, A. Kennedy, R. LeDuc, L. Munger, J. Napp, K. E. W. Shelden, S. Rankin, O. Vasquez, C. Wilson. 2011. Rare detections of North Pacific right whales in the Gulf of Alaska, with observations of their potential prey. Endangered Species Research, 13:99-109.

Waite, J. M., K. Wynne, and D. K. Mellinger. 2003. Documented sighting of a North Pacific right whale in the Gulf of Alaska and post-sighting acoustic monitoring. Northwest. Nat. 84:38-43.

Waring, G. T., P. M. Richard, J. M. Quinta, C. P. Fairfield, and K. Maze-Foley. (Eds.) 2004. U. S. Atlantic and Gulf of Mexico marine mammal stock assessments - 2003. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-NE-182, 287 p.