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HUMPBACK WHALE (*Megaptera novaeangliae*): Western North Pacific Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The humpback whale is distributed worldwide in all ocean basins. In winter, most humpback whales occur in the subtropical and tropical waters of the Northern and Southern Hemispheres. Humpback whales in the high latitudes of the North Pacific are seasonal migrants that feed on euphausiids and small schooling fishes (Nemoto 1957; 1959, Clapham and Mead 1999). The historic feeding range of humpback whales in the North Pacific encompassed coastal and inland waters around the Pacific Rim from Point Conception, California, north to the Gulf of Alaska and the Bering Sea, and west along the Aleutian Islands to the Kamchatka Peninsula and into the Sea of Okhotsk and north of the Bering Strait (Zenkovich 1954, Nemoto 1957, Tomlin 1967, Johnson and Wolman 1984). The Asian wintering area extends from the South China Sea east through the Philippines, Ryukyu Retto, Ogasawara Gunto, Mariana Islands, and Marshall Islands (Rice 1998). The humpback whale population in much of this range was considerably reduced as a result of intensive commercial exploitation during the 20th century.

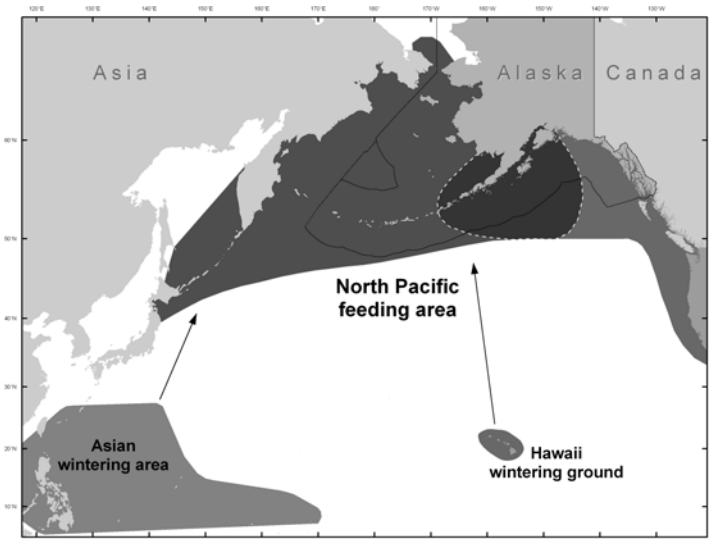

Figure 38. Approximate distribution of humpback whales in the western North Pacific (shaded area). Feeding and wintering grounds are presented above (see text). Area within the dotted line is known to be an area of overlap with the Central North Pacific stock. See Figure 39 for humpback whale distribution in the eastern North Pacific.

A vessel survey in the central Bering Sea in July of 1999 documented 17 humpback whale sightings, most of which were distributed along the eastern Aleutian Island chain and along the U.S.-Russia Convention Line south of St. Lawrence Island (Moore et al. 2000). A few sightings occurred in the southeastern Bering Sea, primarily outside Bristol Bay and north of the eastern Aleutian Islands (Moore et al. 2002). However, a NOAA survey conducted in 2005 found numerous humpback whales north of the central Aleutian Islands, reinforcing the idea that the Bering Sea is an important feeding area. The historical importance of this area is suggested by the fact that the U.S.S.R. is known to have killed hundreds of humpback whales in the Bristol Bay area during its illegal whaling operations in the 1960s. Analysis of whaling data show historical catches of humpback whales well into the Bering Sea and catches in the Bering Strait and Chukchi Sea from August-October in the 1930s (Mizroch and Rice in prep).

Aerial, vessel, and photo-identification surveys and genetic analyses indicate that within the U. S. Exclusive Economic Zone (EEZ) there are at least three populations that migrate between their respective summer/fall feeding areas to winter/spring calving and mating areas (Calambokidis et al. 1997, Baker et al. 1998, Figs. 38 and 39): 1) winter/spring populations in coastal Central America and coastal Mexico which migrate to the coast of California to southern British Columbia in summer/fall (Calambokidis et al. 1989, Steiger et al. 1991, Calambokidis et al. 1993) - referred to as the California/Oregon/Washington and Mexico stock; 2) winter/spring populations of the Hawaiian Islands which migrate to northern British Columbia/Southeast Alaska and Prince William Sound west to Unimak Pass (Baker et al. 1990, Perry et al. 1990, Calambokidis et al. 1997) - referred to as the Central North Pacific stock; and 3) winter/spring populations off Asia which, based on photo-identification and Discovery mark data have been found in the Bering Sea, Eastern Aleutians, and British Columbia (Darling 1991; 1993; Mizroch pers. comm., North Pacific Humpback Whale Working Group,unpublished data) Discovery-type mark recovery data demonstrate long-distance migratory movements between Ogasawara and both the Gulf of Anadyr and the eastern Aleutians near Unimak Pass and between Okinawa and Unimak Pass. Mark recovery data

suggest that whales may congregate in the eastern Aleutians early in the season (April-May) and late in the season (September) (Mizroch and Rice in prep). This latter population is referred to as the Western North Pacific stock.

Breeding populations of humpback whales also occur in winter near Mexico's offshore islands in the Revillagigedo Archipelago and there is one confirmed movement (based on photo-identification data) between the Revillagigedo Archipelago and Japan (Mizroch pers. comm., North Pacific Humpback Whale Working Group, unpublished data). The migratory destination of these offshore Mexican whales is not well known (Calambokidis et al. 1993, Calambokidis et al. 1997), but whales photographed in the Revillagigedo Archipelago have also been photographed in California, Washington, British Columbia, Southeast Alaska, Prince William Sound, Kodiak and eastern Aleutians (Witteveen et al. 2004, J. Straley, pers. comm., Mizroch pers. comm., North Pacific Humpback Whale Working Group, unpublished data).

Movement between Japan and British Columbia, and Japan and the Kodiak Archipelago has been documented (Darling et al. 1996, Calambokidis et al. 1997). Calambokidis et al. (2001) concludes that there are at least three subpopulations of humpback whales on the wintering grounds (Hawaii, Japan, and Mexico), and possibly as many as six subpopulations, with subdivisions in Mexico, Japan, and Central America.

Currently, there are insufficient data to apply the Dizon et al. (1992) phylogeographic approach to classify population structure in humpback whales. Until further information becomes available, three stocks of humpback whales (as described above) are recognized within the U.S. EEZ of the North Pacific: one in the eastern North Pacific (the California/Oregon/Washington - Mexico stock), one in the central North Pacific, and one in the western North Pacific. The California/Oregon/Washington - Mexico humpback whale stock is reported separately in the Stock Assessment Reports for the Pacific Region. Data from a large-scale study throughout the North Pacific conducted in 2004-06 (the Structure of Populations, Levels of Abundance, and Status of Humpbacks, or SPLASH, project) are expected to provide a much more comprehensive understanding of humpback whale population structure in the North Pacific in the near future.

Available information about feeding areas in U.S. waters for the western stock of humpback whales indicates that there could be considerable overlap between the Western North Pacific and Central North Pacific stocks in the Gulf of Alaska between Kodiak Island and the Shumagin Islands. Mizroch et al. (2004) examined photographs taken from 1979-1996 and reported that fewer than 1% of the individual whales photographed in either Southeast Alaska or Prince William Sound moved between areas. Based on photographs taken across all Alaska feeding areas from 1979-1996, fewer than 2% of individuals were seen in more than one area (Mizroch et al. 2004).

Over a 3 year period, Waite et al. (1999) collected photographs of 127 individuals located near Kodiak Island, 22 individuals located near the Shumagin Islands, 8 individuals located offshore to the southeast of the Shumagin Islands, and 7 individuals located near Akutan Island in the eastern Aleutian Islands. Only 7 of these individuals have been documented in Prince William Sound or Southeast Alaska. Witteveen (2003) conducted a photo-identification study in Marmot and Chiniak Bays (on the northeast side of Kodiak Island), documented 103 individual animals, and estimated that the number of humpback whales in that area totaled 157 (95% CI: 114, 241). Witteveen et al. (2004) reported matches between whales photographed at the Shumagin Islands between 1999 and 2002 and whales photographed in Hawaii, offshore Mexico Islands, coastal Mexico waters, and Japan. In addition, a small number of individuals identified off Japan have been resighted in the eastern North Pacific (Darling et al. 1996, Calambokidis et al. 1997).

In summary, information from a variety of sources indicates that humpback whales from the Western and Central North Pacific stocks mix to a limited extent on summer feeding grounds ranging from British Columbia through the central Gulf of Alaska and up to the Bering Sea.

POPULATION SIZE

The abundance estimate of humpback whales in the North Pacific is based on data collected by nine independent research groups that conducted photo-identification studies of humpback whales in the three wintering areas (Mexico, Hawaii, and Japan). Photographs taken between 1991 and 1993 were used to estimate abundance because samples throughout the North Pacific were the largest and most complete during this period. Using Darroch's (1961) method, which utilizes only data from wintering areas (in this case data provided by two Japanese research groups), and averaging the 1991-92, 1992-93, and 1991-93 winter release-recovery information results in an abundance estimate of 394 (CV = 0.084) for the western North Pacific humpback whale stock (Calambokidis et al. 1997). However, in light of the low geographic coverage of sampling effort for the western North Pacific population during this time, this is likely to represent an underestimate of the stock's true abundance.

A vessel survey conducted in August of 1994 covered 2,050 nmi of trackline south of the Aleutian Islands encountered humpback whales in scattered aggregations (57 sightings) throughout the study area (Forney and

Brownell 1996). It is unknown whether the humpback whales encountered during this survey belonged to the Western or Central North Pacific stock.

A vessel survey for cetaceans was conducted in the central Bering Sea in July-August 1999 in cooperation with research on commercial fisheries (Moore et al. 2000). The survey included 6,043 nmi of tracklines, most of which were West of St. Matthew Island, north of the 200 m bathymetric contour, and south of the U.S./Russia Convention Line. Ten on-effort sightings of humpback whales occurred during this survey, the majority of which took place along the eastern Aleutian chain and near the U.S./Russian Convention Line just south of St. Lawrence Island. If these localized sightings are extrapolated to the entire survey area, an estimated abundance of 1,175 humpback whales (95% CI: 197-7,009) occur in the central Bering Sea during the summer. However, Moore et al. (2002) determined that these sightings were too clumped in the central-eastern Bering Sea to be used to provide a reliable estimate for the area and decided to improve upon the method used to stratify the data in the analysis. Sightings of humpback whales also occurred during the survey conducted in the eastern Bering Sea in 2000; these sightings resulted in an estimated abundance of 102 (95% CI: 40-262). It is unknown whether these animals belong to the central or western North Pacific stock of humpback whales.

Photo-identification studies initiated to the west of Kodiak Island from 1999 to 2002 identified 171 individual humpback whales, which resulted in a mark-recapture estimate of 410 (95% CI: 241-683). It is not known how many animals occurring to the west of Kodiak Island belong to the Western or Central North Pacific stock, but matches between animals photographed west of Kodiak Island and animals photographed in Hawaii, offshore Mexico, coastal Mexico, and Japan clearly indicate that overlap between stocks occurs in this area (Witteveen et al. 2004). The Kodiak catalog currently has 738 individuals and the Shumagins catalog has 266 individuals (Witteveen, pers. comm., University of Central Florida, P.O. Box 160112, Orlando, FL 32816-0112).

There are no reliable estimates for the abundance of humpback whales in feeding areas for this stock because surveys of the known feeding grounds are incomplete, and because not all feeding areas are known.

Minimum Population Estimate

The minimum population estimate (N_{MIN}) for this stock is calculated according to Equation 1 from the PBR Guidelines (Wade and Angliss 1997): $N_{MIN} = N/\exp(0.842 \times [\ln(1+[CV(N)]^2)]^{½})$. Using the population estimate (N) of 394 and its associated CV(N) of 0.084, N_{MIN} for this humpback whale stock is 367.

Current Population Trend

Reliable information on trends in abundance for the Western North Pacific humpback whale stock is currently not available.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Utilizing a birth-interval model, Barlow and Clapham (1997) have estimated a population growth rate of 6.5% (SE = 1.2%) for the well-studied humpback whale population in the Gulf of Maine, although there are indications that this rate has slowed in recent years (Clapham et al. 2003). Mobley et al. (2001) estimated a trend of 7% for 1993-00 using data from aerial surveys that were conducted in a consistent manner for several years across all of the Hawaiian Islands and were developed specifically to estimate a trend for the Central North Pacific stock. Although there is no estimate of the maximum net productivity rate for the Western stock, it is reasonable to assume that R_{MAX} for this stock would be at least 7%. Hence, until additional data become available from the Western North Pacific humpback whale stock, it is recommended that 7% be employed as the maximum net productivity rate (R_{MAX}) for this stock (Wade and Angliss 1997).

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 value for cetacean stocks listed as endangered under the Endangered Species Act (Wade and Angliss 1997). Thus, using the abundance estimate calculated from 1993 surveys, the PBR for the Western North Pacific stock of humpback whale would be calculated to be 1.3 animals ($367 \times 0.035 \times 0.1$). However, the 2005 revisions to the SAR guidelines (NMFS 2005) state that abundance estimates older than 8 years should not be used to calculate PBR due to a decline in confidence in the reliability of an aged abundance estimate. Therefore, the PBR for this stock is considered undetermined. Data collected between 2004-2006 during SPLASH surveys are currently being analyzed, and a new abundance estimate and PBR for this stock will be calculated from these data.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fisheries Information

Until 2004, there were six different federally-regulated commercial fisheries in Alaska that occurred within the range of the Western North Pacific humpback whale stock that were monitored for incidental mortality by fishery observers. As of 2004, changes in fishery definitions in the List of Fisheries have resulted in separating these six fisheries into 22 fisheries (69 FR 70094, 2 December 2004). This change does not represent a change in fishing effort, but provides managers with better information on the component of each fishery that is responsible for the incidental serious injury or mortality of marine mammal stocks in Alaska. Estimates of marine mammal serious injury/mortality in each of these observed fisheries are provided in Perez (2006) and Perez (unpubl. ms.). Between 2002 and 2006, there were incidental serious injuries and mortalities of Western North Pacific humpback whales in the Bering Sea/Aleutian Islands sablefish pot fishery (Table 36). Average annual mortality from observed fisheries was 0.20 humpbacks from this stock (Table 36). Note, however, that the stock identification is uncertain and the mortality may have involved a whale from the central North Pacific stock of humpback whales. Thus, this mortality is assigned to both the central and western stocks.

Strandings of humpback whales entangled in fishing gear or with injuries caused by interactions with gear are another source of mortality data. The only fishery-related humpback stranding in an area thought to be occupied by animals from this stock was reported by a U. S. Coast Guard vessel in late June 1997 operating near the Bering Strait. The whale was found floating dead entangled in netting and trailing orange buoys (National Marine Mammal Laboratory, Platforms of Opportunity Program, unpubl. data, 7600 Sand Point Way NE, Seattle, WA 98115). With the given data it is not possible to determine which fishery (or even which country) caused the mortality. Note, that this mortality has been attributed the Western North Pacific stock, but without a tissue sample (for genetic analysis) or a photograph (for matching to known Japanese animals) it is not possible to be for certain (i.e., it may have belonged to the Central North Pacific stock). No strandings or sightings of entangled humpback whales of this stock were reported between 2001 and 2005; however, effort in western Alaska is low.

Table 36. Summary of incidental mortality and serious injury of humpback whales (Western North Pacific stock) due to commercial fisheries from 2002 to 2006 and calculation of the mean annual mortality rate. Mean annual mortality in brackets represents a minimum estimate. Details of how percent observer coverage is measured is included in Appendix 6. N/A indicates that data are not available.

Fishery name	Years	Data type	Observer coverage	Observed mortality (in given yrs.)	Estimated mortality (in given yrs.)	Mean annual mortality
Bering Sea sablefish pot	2002	obs	40.6	0	1[1]	0.20[2]
	2003	data	21.7	0	0	(N/A)
	2004		49.1	0	0	
	2005		39.2	0	0	
	2006		35.3	0	0	
Observer program total						0.20
Minimum total annual mortality						[$0.2]

[1] Mortality was seen by an observer but not during an "observed set"; thus quantification of effort cannot be accomplished and the single record cannot be extrapolated to provide a total estimated mortality level.
[2] These mortalities occurred in an area of known overlap with the Central North Pacific stock of humpback whales. Since the stock identification is unknown, the mortalities are reflected in both stock assessments.

The estimated annual mortality rate incidental to U. S. commercial fisheries is 0.2 whales per year from this stock based on 0.2 from observed fisheries. However, this estimate is considered a minimum because there are no data concerning fishery-related mortalities in Japanese, Russian, or international waters. In addition, there is a small probability that fishery interactions discussed in the assessment for the Central North Pacific stock may have involved animals from this stock because the only known matches to feeding areas come from areas typically used by the Central North Pacific stock. Finally, much information on fishery interaction with the Central North Pacific stock is based on information reported to the Alaska Region as stranding data. However, very few stranding reports are received from areas west of Kodiak.

Brownell et al. (2000) compiled records of bycatch in Japanese and Korean commercial fisheries between 1993 and 2000. During the period 1995-99, there were six humpback whales indicated as "bycatch". In addition, two strandings were reported during this period. Furthermore, analysis of four samples from meat found in markets indicated that humpback whales are being sold. At this time, it is not known whether any or all strandings were caused by incidental interactions with commercial fisheries; similarly, it is not known whether the humpback whales identified in market samples were killed as a result of incidental interactions with commercial fisheries. It is also not known which fishery may be responsible for the bycatch. Regardless, these data indicate a minimum mortality level of 1.1/year (using bycatch data only) to 2.4/year (using bycatch, stranding, and market data) in the waters of Japan and Korea. Because many mortalities pass unreported, the actual rate in these areas is likely much higher.

Subsistence/Native Harvest Information

Subsistence hunters in Alaska and Russia have not been reported to take humpback whales from this stock.

HISTORICAL WHALING

Rice (1978) estimated that the number of humpback whales in the North Pacific may have been approximately 15,000 individuals prior to exploitation; however, this was based upon incomplete data and, given the level of known catches (legal and illegal) since World War II, may be an underestimate. Intensive commercial whaling removed more than 28,000 animals from the North Pacific during the 20th century (Rice 1978). From 1961 to 1971, an additional 6,793 humpback whales were killed illegally by the USSR. Many animals during this period were taken from the Gulf of Alaska and Bering Sea (Doroshenko 2000); however, additional illegal catches were made across the North Pacific, from the Kuril Islands to the Queen Charlotte Islands, and other takes in earlier years may have gone unrecorded. Humpback whales in the North Pacific were theoretically protected in 1965, but illegal catches by the U.S.S.R. continued until 1972 (Ivashchenko et al. 2007).

STATUS OF STOCK

The estimated human-related annual mortality rate (0.2) is less than the PBR level for this stock (1.3). The estimated human-related mortality rate is based solely on mortalities that occurred incidental to U. S. commercial fisheries therefore, the estimated fishery mortality and serious injury rate exceeds 10% of the PBR (0.1). The rate cannot be considered insignificant and approaching zero. The humpback whale is listed as "endangered" under the Endangered Species Act, and therefore designated as "depleted" under the MMPA. As a result, the Western North Pacific stock of humpback whale is classified as a strategic stock. Reliable population trend data and the status of this stock relative to its Optimum Sustainable Population size are currently unknown.

HABITAT CONCERNS

Elevated levels of sound from the U. S. Navy's Low Frequency Active Sonar program and other anthropogenic sources (e.g., shipping) is a potential concern for humpback whales in the North Pacific, but no specific habitat concerns have been identified for this stock.

CITATIONS

Baker, C. S., S. R. Palumbi, R. H. Lambertsen, M. T. Weinrich, J. Calambokidis, and S. J. O'Brien. 1990. Influence of seasonal migration on geographic distribution of mitochondrial DNA haplotypes in humpback whales. Nature 344:238-240.

Baker, C. S., L. Medrano-Gonzalez, J. Calambokidis, A. Perry, F. Pichler, H. Rosenbaum, J. M. Straley, J. Urban-Ramirez, M. Yamaguchi, and O. von Ziegesar. 1998. Population structure of nuclear and mitochondrial DNA variation among humpback whales in the North Pacific. Mol. Ecol. 7(695-707).

Barlow, J., and P. J. Clapham. 1997. A new birth-interval approach to estimating demographic parameters of humpback whales. Ecol. 78(2):535-546.

Brownell, R. L., T. Kasuya, W. P. Perrin, C. S. Baker, F. Cipriano, J. Urban R., D. P. DeMaster, M. R. Brown, and P. J. Clapham. 2000. Unknown status of the western North Pacific humpback whale population: a new conservation concern. Unpublished report to the International Whaling Commission. 5 pp.

Calambokidis, J., G. H. Steiger, J. C. Cubbage, K. C. Balcomb III, and P. Bloedel. 1989. Biology of humpback whales in the Gulf of the Farallones. Report to Gulf of the Farallones National Marine Sanctuary, San Francisco, CA by Cascadia Research Collective, 218½ West Fourth Avenue, Olympia, WA. 93 pp.

Calambokidis, J., G. H. Steiger, J. M. Straley, L. M. Herman, S. Cerchio, D. R. Salden, J. Urban R., J. K. Jacobsen, O. von Ziegesar, K.C. Balcomb, C. M. Gabriele, M. E. Dahlheim, S. Uchida, G. Ellis, Y. Miyamura, P. Ladrón de Guevara P., M. Yamaguchi, F. Sato, S. A. Mizroch, L. Schlender, K. Rasmussen, J. A. Y. Barlow and T. J. Quinn, II. 2001. Movements and population structure of humpback whales in the North Pacific. Mar. Mammal Sci. 17(4): 769-794.

Calambokidis, J., G. H. Steiger, and J. R. Evenson. 1993. Photographic identification and abundance estimates of humpback and blue whales off California in 1991-92. Final Contract Report 50ABNF100137 to Southwest Fisheries Science Center, P.O. Box 271, La Jolla, CA 92038. 67 pp.

Calambokidis, J., G. H. Steiger, J. M. Straley, T. Quinn, L. M. Herman, S. Cerchio, D. R. Salden, M. Yamaguchi, F. Sato, J. R. Urban, J. Jacobson, O. Von Ziegesar, K. C. Balcomb, C. M. Gabriele, M. E. Dahlheim, N. Higashi, S. Uchida, J. K. B. Ford, Y. Miyamura, P. Ladrón de Guevara, S. A. Mizroch, L. Schlender, and K. Rasmussen. 1997. Abundance and population structure of humpback whales in the North Pacific basin. Final Contract Report 50ABNF500113 to Southwest Fisheries Science Center, P.O. Box 271, La Jolla, CA 92038. 72 pp.

Clapham, P. J., J. Barlow, M. Bessinger, T. Cole, D. Mattila, R. Pace, D. Palka, J. Robbins, and R. Seton. 2003. Abundance and demographic parameters of humpback whales from the Gulf of Maine, and stock definition relative to the Scotian Shelf. J. Cet. Res. Manag. 5:13-22.

Clapham, P. J., and J. G. Mead. 1999. *Megaptera novaeangliae*. Mamm. Species. 604:1-9.

Darling, J. D. 1991. Humpback whales in Japanese waters. Ogasawara and Okinawa. Fluke identification catalog 1987-1990. Final Contract Report, World Wide Fund for Nature, Japan. 22 pp.

Darling, J. D., and S. Cerchio. 1993. Movement of a humpback whale (*Megaptera novaeangliae*) between Japan and Hawaii. Mar. Mammal Sci. 1:84-89.

Darling, J. D., and D. J. McSweeney. 1985. Observations on the migrations of North Pacific humpback whales (*Megaptera novaeangliae*). Can. J. Zool. 63:308-314.

Darling, J. D., J. Calambokidis, J., K. C. Balcomb, P. Bloedel, K. Flynn, A. Mochizuki, K. Mori, F. Sato, and M. Yamaguchi. 1996. Movement of a humpback whale (*Megaptera novaeangliae*) from Japan to British Columbia and return. Mar. Mammal Sci. 12(2):281-287.

Darroch, J. N. 1961. The two-sample capture-recapture census when tagging and sampling are stratified. Biometrika 48:241-260.

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 catches of humpback whales (*Megaptera novaeangliae*) in the North Pacific. *In* A. V. Yablokov and V. A. Zemsky (eds.), Soviet whaling data (1949-1979), Center for Russian Environmental Policy, Marine Mammal Council, Moscow, 96-103.

Forney, K. A., and R. L. Brownell. 1996. Preliminary report of the 1994 Aleutian Island marine mammal survey. Unpubl. doc. submitted to Int. Whal. Comm. (SC/48/O 11). 15 pp.

Ivashchenko, Y. V., P. J. Clapham, and R. L. Brownell Jr. (eds.). 2007. Scientific reports of Soviet whaling expeditions, 1955-1978. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-175. 36 pp. [Translation: Y. V. Ivashchenko] + Appendix.

Johnson, J. H., and A. A. Wolman. 1984. The humpback whale, *Megaptera novaeangliae*. Mar. Fish. Rev. 46(4):30-37.

Mobley, J. M., S. Spitz, R. Grotefendt, P. Forestell, A. Frankel, and G. Bauer. 2001. Abundance of humpback whales in Hawaiian waters: Results of 1993-2000 aerial surveys. Report to the Hawaiian Islands Humpback Whale National Marine Sanctuary. 16 pp.

Mizroch, S. A. and D. W. Rice. In prep. Distribution and movements of humpback whales (*Megaptera novaeangliae*) in the North Pacific Ocean. Presented at the 17th Biennial Conference on the Biology of Marine Mammals, Cape Town, South Africa.

Mizroch, S. A., L. M. Herman, J. M. Straley, D. A. Glockner-Ferrari, C. Jurasz, J. Darling, S. Cerchio, C. M. Gabriele, D. R. Salden, and O. von Ziegesar. 2004. Estimating the adult survival rate of central North Pacific humpback whales (Megaptera novaeangliae). J. Mammal. 85(5):963-972.

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.

Nemoto, T. 1957. Foods of baleen whales in the northern Pacific. Sci. Rep. Whales Res. Inst. Tokyo 12:33-89.

Nemoto T. 1959. Food of baleen whales with reference to whale movements. *S*cientific Reports of the Whales Research Institute, 14**:**149-290.

Nishiwaki, M. 1966. Distribution and migration of the larger cetaceans in the North Pacific as shown by Japanese whaling results. Pp. 172-191 *In* K. S. Norris (ed.), Whales, Dolphins and Porpoises, University of California Press, Berkeley, CA.

NMFS. 2005. Guidelines for Preparing Stock Assessment Reports Pursuant to Section 117 of the Marine Mammal Protection Act, SAR Guidelines Revisions, June 2005, 24 pp.

Perry, A., C. S. Baker, and L. M. Herman. 1990. Population characteristics of individually identified humpback whales in the central and eastern North Pacific: a summary and critique. Rep. Int. Whal. Comm. (Special Issue 12):307-317.

Perez, M. A. 2006. Analysis of marine mammal bycatch data from the trawl, longline, and pot groundfish fisheries of Alaska, 1998-2004, defined by geographic area, gear type, and target groundfish catch species. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-167.

Perez, M. A. Unpubl. ms. Bycatch of marine mammals by the groundfish fisheries in the U.S. EEZ of Alaska, 2005. Available NMML-AFSC, 7600 Sand Point Way NE, Seattle, WA 98115.

Perez, M. A. Unpubl. ms. Bycatch of marine mammals by the groundfish fisheries in the U.S. EEZ of Alaska, 2006, 67 pp. Available NMML-AFSC, 7600 Sand Point Way NE, Seattle, WA 98115.

Rice, D. W. 1978. The humpback whale in the North Pacific: distribution, exploitation and numbers. Appendix 4. Pp. 29-44 *In* K. S. Norris and R. R. Reeves (eds.), Report on a workshop on problems related to humpback whales (*Megaptera novaeangliae*) in Hawaii. U.S. Dep. Commer., Nat. Tech. Info. Serv. PB-280 794. Springfield, VA.

Rice, D. W. 1998. Marine Mammals of the World: Systematics and Distribution. Society Marine Mammalogy, Spec. Publ. No. 4.

Steiger, G. H., J. Calambokidis, R. Sears, K. C. Balcomb, and J. C. Cubbage. 1991. Movement of humpback whales between California and Costa Rica. Mar. Mammal Sci. 7:306-310.

Tomlin, A. G. 1967. Mammals of the USSR and adjacent countries. vol. 9, Cetacea. Israel Program Sci. Transl. No. 1124, Natl. Tech. Info. Serv. TT 65-50086. Springfield, VA. 717 pp. (Translation of Russian text published in 1957).

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.

Waite, J. M., M. E. Dahlheim, R. C. Hobbs, S. A. Mizroch, O. Ziegesar-Matkin, J. M. Straley, L. M. Herman, and J. Jacobsen. 1999. Evidence of a feeding aggregation of humpback whales (*Megaptera novaeangliae*) around Kodiak Island, AK. Mar. Mammal Sci. 15(1):210-219.

Witteveen, B. H. 2003. Abundance and feeding ecology of humpback whales (*Megaptera novaeangliae)* in Kodiak, Alaska. M.S. thesis, University of Alaska. 109 pp.

Witteveen, B. H., J. M. Straley, O. Ziegesar, D. Steel, and C. S. Baker. 2004. Abundance and mtDNA differentiation of humpback whales (*Megaptera novaeangliae*) in the Shumagin Islands, Alaska. Can. J. Zool. 82:1352-1359.

Zenkovich B. A. 1954. Vokrug sveta za kitami, Vol. Gosudarstvennoe Izdatel'stvo Geograficheskoi Literatury, Moscow.