Revised 12/19/07

GRAY WHALE (*Eschrichtius robustus*): Eastern North Pacific Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Gray whales formerly occurred in the North Atlantic Ocean (Fraser 1970, Mead and Mitchell 1984), but this species is currently found only in the North Pacific (Rice et al. 1984, Swartz et al. 2006). The following information was considered in classifying stock structure of gray whales based on the phylogeographic approach of Dizon et al. (1992): 1) Distributional data: two isolated geographic distributions in the North Pacific Ocean; 2) Population response data: the eastern North Pacific population has increased, and no evident increase in the western North Pacific; 3) Phenotypic data: unknown; and 4) Genotypic data: unknown. Based on this limited information, two stocks have been recognized in the North Pacific: the Eastern North Pacific stock, which lives along the west coast of North America (Fig. 35), and the Western North Pacific or "Korean" stock, lives along the coast of eastern Asia (Rice 1981, Rice et al. 1984, Swartz et al. 2006).

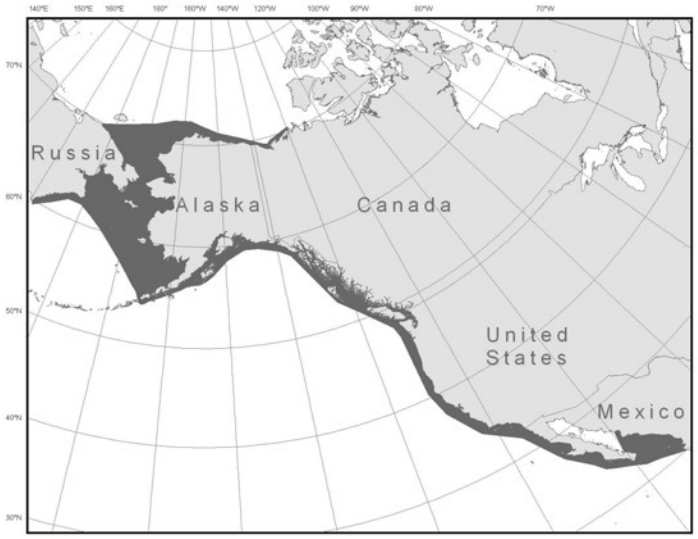

Figure 35. Approximate distribution of the Eastern North Pacific stock of gray whales (shaded area). which

Most of the Eastern North Pacific stock spends the summer feeding in the northern and western Bering and Chukchi Seas (Rice and Wolman 1971, Berzin 1984, Nerini 1984). However, gray whales have been reported feeding in the summer in waters near Kodiak Island, Southeast Alaska, British Columbia, Washington, Oregon, and California (Rice and Wolman 1971, Darling 1984, Nerini 1984, Rice et al. 1984, Moore et al. 2007). Photoidentification studies of these animals indicate that they move widely within and between areas on the Pacific coast, are not always observed in the same area each year, and may have several year gaps between resightings in studied areas (Calambokidis and Quan 1999, Quan 2000, Calambokidis et al. 2002). The so-called “Pacific coast feeding aggregation” defines one of the areas where feeding groups occur. While some animals in this group demonstrate some site-fidelity, available information from sighting records (Calambokidis and Quan 1999, Quan 2000) and genetics (Ramakrishnan et al. 2001, Steeves 1998) indicates that this group is a component of the eastern North Pacific population and is not an isolated population unit. Each fall, the whales migrate south along the coast of North America from Alaska to Baja California, in Mexico (Rice and Wolman 1971), most of them starting in November or December (Rugh et al. 2001). The Eastern North Pacific stock winters mainly along the west coast of Baja California, using certain shallow, nearly landlocked lagoons and bays, and calves are born from early January to mid-February (Rice et al. 1981), often seen on the migration well north of Mexico (Shelden et al. 2004). The northbound migration generally begins in mid-February and continues through May (Rice et al. 1981, 1984; Poole 1984a), with cows and newborn calves migrating northward primarily between March and June along the U.S. West Coast.

POPULATION SIZE

Systematic counts of gray whales migrating south along the central California coast have been conducted by shore-based observers at Granite Canyon most years since 1967 (Fig. 36). The most recent abundance estimates are based on counts made during the 1997-98, 2000-01, and 2001-02 southbound migrations. Analyses of these data resulted in

abundance estimates of 29,758 for 1997-98, 19,448 for 2000-01, and 18,178 for 2001-02 (Rugh et al. 2005). Prior estimates were: 22,263 (CV = 9.25%) whales in 1995-96 (Hobbs et al. 2004), 23,109 (CV = 5.42%) whales in 1993-94 (Laake et al. 1994) and 21,296 (CV = 6.05%) whales in 1987-88 (Buckland et al. 1993).
Variations in estimates may be due in part to undocumented sampling variation or to differences in the proportion of the gray whale stock migrating as far as the central California coast each year (Hobbs and Rugh 1999). The decline in the 2000-01 and 2001-02 abundance estimates may be an indication that the abundance was responding to environmental limitations as the population approaches the carrying capacity of its environment. Low encounter rates in 2000-01 and 2001-02 may have been due to an unusually high number of whales that did not migrate as far south as Granite Canyon or the abundance may have actually declined following high mortality rates observed in 1999 and 2000 (Gulland et al. 2005, Fig. 37). Visibly emaciated whales (LeBoeuf et al. 2000; Moore et al. 2001) suggest a decline in food resources, perhaps associated with unusually high sea temperatures in 1997 (Minobe 2002). Several factors since this mortality event suggest that the high mortality rate was a short-term, acute event and not a chronic situation or trend: 1) counts of stranded dead gray whales dropped to levels below those seen prior to this event, 2) in 2001 living whales no longer appeared to be emaciated, and 3) calf counts in 2001-02, a year after the event ended, were similar to averages for previous years (W. Perryman, NMFS-SWFSC, pers. comm.; Rugh et al. 2005).

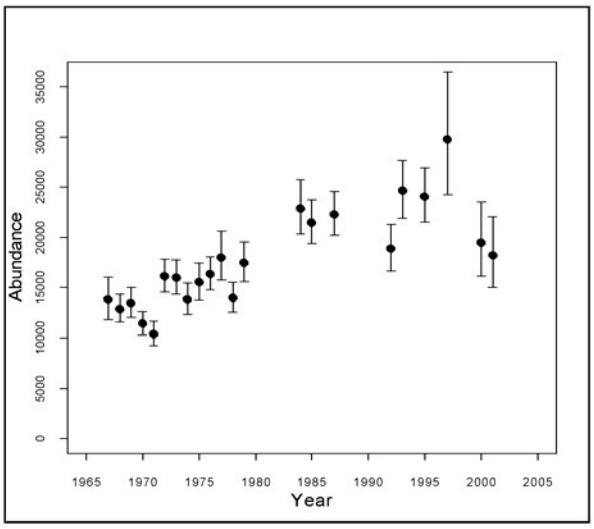

Figure 36. Estimated abundance of Eastern North Pacific gray whales from NMFS counts of migrating whales past Granite Canyon, California. Error bars indicate 95% log-normal CI (after Rugh et al. 2005).

Gray whale calves were counted from Piedras

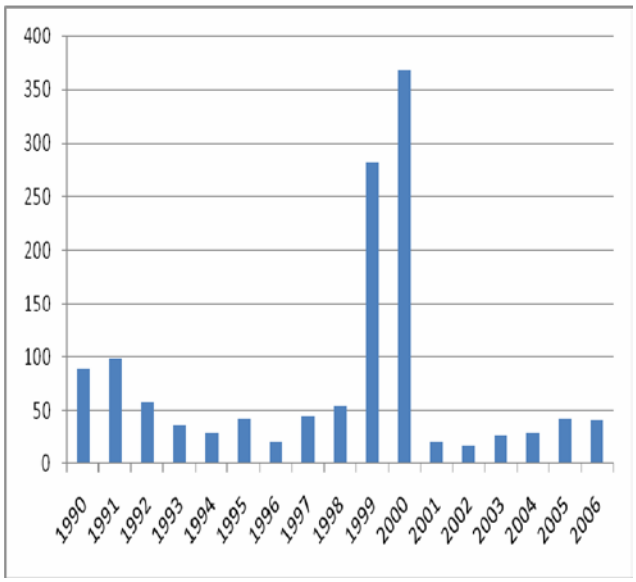

Figure 37. Number of stranded gray whales recorded along the west coast of North America between 1990 and 2006 (data from Brownell et al. 2007).

Blancas, a shore site in central California, in 1980-81 (Poole 1984a) and each year since 1994 (Perryman et al. 2002, 2004). In 1980 and 1981, calves passing this site comprised 4.7% to 5.2% of the population (Poole 1984b). From 1994-2000, calf production indices (calf estimate/total population estimate) were 4.2%, 2.7%, 4.8%, 5.8%, 5.5%, 1.7% and 1.1%, respectively (Perryman et al. 2002), and in 2004 the index was 9% (Perryman et al. 2004). Gray whale calves have also been counted from shore stations along the California coast during the southbound migration (Shelden et al. 2004). Those results have indicated significant increases in average annual calf counts near San Diego in the mid- to late-1970s compared to the 1950s and 1960s, and near Carmel in the mid-1980s through 2002 compared to late1960s through 1980 (Shelden et al. 2004. This increase may be related to a trend toward later migrations over the observation period (Rugh et al. 2001, Buckland and Breiwick 2002), or it may be due to an increase in spatial and temporal distribution of calving as the population increased (Shelden et al. 2004).

Minimum Population Estimate

The minimum population estimate (N_{MIN}) for this stock is calculated from 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 mean of the 2000/01 and 2001/02 abundance estimates (not significantly different) of 18,813 and its associated CV of 0.069, N_{MIN} for this stock is 17,752.

Current Population Trend

The population size of the Eastern North Pacific gray whale stock has been increasing over the past several decades. The estimated annual rate of increase, based on shore counts of southward migrating gray whales between 1967 and 1988, is 3.3% with a standard error of 0.44% (Buckland et al. 1993). Taking account of the harvest, Wade and DeMaster (1996) estimated an underlying annual rate of increase of 4.4% (95% CI: 3.1%-5.6%) for this same time period. Incorporating the census data through the 1993-94 migration resulted in an annual rate of increase of 2.6% (SE = 0.4%: IWC 1995). Breiwick (1999) estimated the annual rate of increase from 1967-68 to 1997-98 at 2.52% (95% CI: 2.04%-3.12%), and Wade and DeMaster (1996) estimated the annual rate of increase from 1967-68 to 1995-96 at 2.4% (95% CI: 1.6%-3.2%). Rugh et al. (2005) estimated the rate of increase from 1967-69 through 2001-02 at 1.9% (SE = 0.32%). They also fit a discrete logistic model to the abundance estimates resulting in an estimate of K (carrying capacity) of 26,290 (CV = 0.059).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Using abundance data through 1996, an analysis of the Eastern North Pacific gray whale population led to an estimate of R_{max} of 0.072, with a 90% probability the value was between 0.039 and 0.126 (Wade 2002). This estimate came from the best fitting age- and sex-structured model, which was a density-dependent Leslie model including an additional variance term, with females and males modeled separately. This estimate was higher than the estimate of R_{max} from a logistic model (0.053, 90% probability 0.031 to 0.113), which was not age- and sexstructured (Wade 2002). The Alaska Scientific Review Group recommended the use of the 0.053 point estimate for R_{max}. The difference in the two estimates of R_{max} is due to the bias in the harvest towards females, which is not accounted for in the logistic model. Therefore, NMFS has decided to use the estimate from the age- and sexstructured model, which had a lower 10th percentile of 0.047. This has the interpretation that there is a 90% probability that the true value of R_{max} is greater than 0.047. This is sufficient evidence that R_{max} for Eastern North Pacific gray whales is greater than the default value of 0.04. Therefore, NMFS will use an R_{max} of 0.047.

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 1.0, the upper limit of the range (0.5-1.0) of values for non-listed stocks which are increasing while undergoing removals due to subsistence hunters (Wade and Angliss 1997). Thus, for the Eastern North Pacific stock of gray whales, PBR = 417 animals (17,752 × 0.0235 × 1.0).

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fisheries Information

In previous stock assessments, there were six different observed federal commercial fisheries in Alaska that could have had incidental serious injuries or mortalities of gray whales. In 2004, the definitions of these commercial fisheries were changed to reflect target species: these new definitions have resulted in the identification of 22 observed fisheries in the Gulf of Alaska and Bering Sea that use trawl, longline, or pot gear (69 FR 70094, 2 December 2004). There were no observed serious injuries or mortalities of gray whales in any of those fisheries. NMFS observers monitored the northern Washington marine set gillnet fishery (coastal + inland waters), otherwise known as the Makah tribal fishery for Chinook salmon, during 1990-98 and in 2000. There was no observer coverage in this fishery in 1999; however, the total fishing effort was only four net days (in inland waters), and no marine mammals were reported taken. One gray whale was observed taken in 1990 (Gearin et al. 1994) and one in 1995 (P. Gearin, unpubl. data). In July of 1996, one gray whale was entangled in the same tribal set gillnet fishery, but it was released unharmed (P. Gearin, AFSC-NMML, pers. comm.). Data from the most recent 5 years indicates that no gray whales were seriously injured or killed incidental to this fishery.

NMFS observers monitored the California/Oregon thresher shark/swordfish drift gillnet fishery from 1993 to 2003 (Table 34; Julian 1997; Cameron 1998; Julian and Beeson 1998; Cameron and Forney 1999, 2000; Carretta 2001, 2002; Carretta and Chivers 2003, 2004). One gray whale mortality was observed in this fishery in both 1998 and 1999. Overall entanglement rates in the California/Oregon thresher shark/swordfish drift gillnet fishery dropped considerably after the 1997 implementation of a Take Reduction Plan, which included skipper education workshops and required the use of pingers and minimum 6-fathom extenders on buoy lines (Barlow and Cameron 1999). Data from the most recent 5 years indicates that no gray whales were seriously injured or killed incidental to this fishery. It should be noted that no observers have been assigned to most Alaska gillnet fisheries, including those in Bristol Bay that are known to interact with this stock, making the estimated mortality from U.S. fisheries a minimum figure. Further, due to a lack of observer programs there are few data concerning the mortality of marine mammals incidental to Canadian commercial fisheries, which are analogous to U.S. fisheries that are known to interact with gray whales. Data regarding the level of gray whale mortality related to commercial fisheries in Canadian waters, though thought to be small, are not readily available or reliable which results in an underestimate of the annual mortality for this stock. However, the large stock size and observed rate of increase over the past 20 years makes it unlikely that unreported

mortalities from those fisheries would be a significant source of mortality for the stock. The estimated minimum annual mortality rate incidental to U. S. commercial fisheries (6.7 whales) is not known to exceed 10% of the PBR (44.2) and, therefore, can be considered to be insignificant and approaching zero mortality and serious injury rate.

Table 34. Summary of incidental mortality of Eastern North Pacific gray whales due to commercial fisheries from 1993-2003 and calculation of the mean annual mortality rate. Mean annual mortality in brackets represents a minimum estimate from stranding data. Data from 1999-2003 (or the most recent 5 years of available data) are used in the mortality calculation. 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
Unknown west coast fisheries	1993-2003	strand data	N/A	0, 5, 3, 3, 6, 4, 3, 3, N/A, 2, N/A	N/A	[$3.6]
AK salmon purse seine	1999-2003	strand data	N/A	1, N/A, N/A, N/A, N/A	N/A	[$0.5]
Pot fisheries	1999-2003	strand data	N/A	1, 2, N/A, N/A, 3	N/A	[$1.2]
CA yellowtail/ barracuda/white seabass gillnet fishery	1999-2003	strand data	N/A	N/A, 1, N/A, N/A, N/A	N/A	[$0.2]
Other entanglements	1999-2003	strand data	N/A	1, 2, N/A, 2, 1	N/A	[$1.2]
Minimum total annual mortality						$6.7

Strandings and Entanglements

Reports of entangled gray whales found swimming, floating, or stranded with fishing gear attached occur along the U.S. West Coast and British Columbia. Details of strandings that occurred in 1993-95 and 1996-98 in the United States and British Columbia are described in Hill and DeMaster (1999) and Angliss et al. (2002), respectively. Table 35 presents data on strandings that occurred on the U. S. west coast from 1999 to 2003; these data are summarized in Table 34. The strandings resulting from commercial fishing are listed as unknown west coast fisheries in Table 35, unless they could be attributed to particular fisheries. During the 5-year period from 1999 to 2003, stranding network data indicate a minimum annual mean of 6.7 gray whale mortalities resulting from interactions with commercial fishing gear.

Table 35. Human-related gray whale strandings and entanglements, 1999-2003. An asterisk in the "number" column indicates cases that were not considered serious injuries. Note: NMFS convened a workshop in 2007 to review and update the guidelines for what constitutes "serious injury". Changes to the agency's guidelines resulting from this workshop may affect whether injured animals identified are considered "seriously injured" in future SARs.

Year	Number	Area	Condition	Description
1999	1	Port Gravina, PWS, AK	Dead	Entangled in AK salmon purse seine net
1999	1	Bristol Bay, AK	Dead	Entangled
1999	1	Offshore North Coronado Is., CA	Non-fatal injury	Ship strike
1999	1	Wreck Creek, WA	Dead	Net wrapped around flukes

1999	1	Twin Harbors State Park, WA (Grayland)	Dead	Rope through mouth
1999	1	1.5 mi. offshore Rancho Palos Verdes, CA	Injury; status unknown	Pink gillnet & attached float wrapped around flukes; swimming w/difficulty; unable to dive

1999	1	10 mi. offshore Port Hueneme, CA	Dead	Wrapped in pot gear & associated floats
1999	1*	2 mi. offshore Crescent City, CA	Non-fatal injury	Crab pot line wrapped around flukes & mouth; disentangled by rescue team
1999	1*	3 mi. offshore Crescent City, CA	Released alive	Crab pot line wrapped around body; released from entangling gear
1999	1	Pt. Loma, CA	Dead	18 in. harpoon tip embedded in left dorsum
1999	1	Muir Beach, CA	Dead	Ship strike
2000	1	Depoe Bay, OR	Alive	Trailing fish line with longline buoys attached
2000	1	Brookings, OR	Alive	Head entangled in line
2000	1	Offshore Pt. Loma, CA	Status unknown	Trailing lobster pot gear
2000	1	Offshore San Clemente, CA	Status unknown	Yellow polypropylene line wrapped around flukes of free swimming whale
2000	1	Redwood National Park, CA	Dead	Ship strike
2000	1	Offshore Pt. Dume, CA	Status unknown	Line & buoys wrapped around flukes of free swimming whale
2000	1	Vandenberg AFB, CA	Dead	Lobster trap & rope wrapped around flukes
2000	1	Seal Beach, CA	Dead	White sea-bass gillnet wrapped around flukes
2000	1	Offshore Shelter Cove, CA	Injury; status unknown	Free-swimming whale with harpoon in back
2000	1	Offshore Aptos, CA	Status unknown	Fishing gear & floats wrapped around right pectoral flipper of free-swimming whale
2001	1	3 miles offshore Morro Bay	Live, likely mortality	Vessel collision with free-swimming abandoned calf; major injuries to caudal peduncle; flukes completely severed
2002	1*	Offshore Santa Barbara	Live, unknown	Free-swimming animal observed with yellow line wrapped around torso; no disentanglement initiated
2002	1	Offshore Pt. Vicente	Live, unknown	Free-swimming animal observed with yellow line wrapped around caudal peduncle; no disentanglement initiated
2002	1	Grays Harbor, WA	Dead	Yellow fishing gear (lines and net) wrapped around peduncle

2003	1	Offshore Morro Bay	Live, unknown	Free-swimming animal observed with crab pot gear trailing from right side of mouth (crab pot, 75 ft of yellow polypropylene line & 2 buoys); USCG vessel on site; no disentanglement initiated
2003	1	North Island Naval Air Station	Dead	15 foot calf with 3 foot length of yellow polypropylene line lodged in baleen
2003	1	2.5 miles off San Mateo Point	Live	Free-swimming animal observed with 150 ft of crab pot line and associated crab pot wrapped around head, torso & flukes; crew of commercial sportfishing vessel cut most of line and crab pot away; small amount of line remained wrapped around flukes (approximately 4 wraps); animal observed swimming strongly away after disentanglement
2003	1	Lands End Beach	Dead	25 ft calf; probable vessel collision; 2 propeller-like slashes through bone and baleen on right side of rostrum; broken rostrum
2003	1	Tillamook, OR	Dead	Crab pot line and buoy wrapped around flukes and caudal peduncle

In 1999 and 2000, a large number of gray whale strandings occurred along the west coast of North America between Baja California, Mexico, and the Bering Sea (Norman et al. 2000, Pérez-Cortés et al. 2000, Brownell et al. 2001, Gulland et al. 2005). A total of 273 gray whale strandings was reported in 1999 and 355 in 2000, compared to an average of 38 per year during the previous 4 years (Fig. 36). Gray whale strandings occurred throughout the year in both 1999 and 2000, but regional peaks of strandings occurred where and when the whales were in their migration cycle. Since then, stranding rates have been low (21, 18, 27, 30, 43, and 42 whales in 2001-2006, respectively; Brownell et al. 2007). Hypothesized reasons for the high stranding rate in 1999 and 2000 include starvation, effects of chemical contaminants, natural toxins, disease, direct anthropogenic factors (fishery interactions and ship strikes), increased survey/reporting effort, and effects of wind and currents on carcass deposition (Norman et al. 2000). Since only 16 animals showed conclusive evidence of direct human interaction in 1999-2000, it seems unreasonable that direct anthropogenic factors were responsible for the increase in strandings. In addition, although survey effort has varied considerably in Mexico and Alaska, it has been relatively constant in Washington, Oregon, and California, so the high rates were not a function of increased observational effort. The other hypotheses have not yet been conclusively eliminated. However, assuming a 5% mortality rate for gray whales (Wade and DeMaster 1996), it would be reasonable to expect that approximately 1,300 gray whales would die annually of natural causes; therefore, the high rate of strandings does not seem to be an area of concern.

Subsistence/Native Harvest Information

Subsistence hunters in Alaska and Russia have traditionally harvested whales from this stock. The only reported takes by subsistence hunters in Alaska during this decade occurred in 1995, with the take of two gray whales by Alaska Natives (IWC 1997). Russian subsistence hunters reported taking 43 whales from this stock in 1996 (IWC 1998a) and 79 in 1997 (IWC 1999). In 1997, the IWC approved a 5-year quota (1998-2002) of 620 gray whales, with an annual cap of 140, for Russian and U.S. (Makah Indian Tribe) aboriginals based on the aboriginal needs statements from each country (IWC 1998b). The U.S. and Russia have agreed that the quota will be shared with an average annual harvest of 120 whales by the Russian Chukotka people and 4 whales by the Makah Indian Tribe. Russian aboriginals harvested

121 (+2 struck and lost) in 1999 (IWC 2001), 113 (+2 struck and lost) in 2000 (Borodin 2001), 112 in 2001 (Borodin et al. 2002), 131 in 2002 (Borodin 2003), 126 (+2 struck and lost) in 2003 (Borodin 2004), and 115 in 2005(IWC 2007), while the Makah Tribe harvested 1 whale in 1999 (IWC 2001). Based on this information, the annual subsistence take averaged 122 whales during the 5-year period from 1999 to 2003.

Other Mortality

The nearshore migration route used by gray whales makes ship strikes another potential source of mortality. Between 1999 and 2003, the California stranding network reported 4 serious injuries or mortalities of gray whales caused by ship strikes: 1 each in 1999, 2000, 2001, and 2003 (J. Cordaro, NMFS-SWR, pers. comm.). One ship strike mortality was reported in Alaska in 1997 (B. Fadely, AFSC-NMML, pers. comm.). Additional mortality from ship strikes probably goes unreported because the whales either do not strand or do not have obvious signs of trauma. Therefore, it is not possible to quantify the actual mortality of gray whales from this source, and the annual mortality rate of 1.2 gray whales per year due to collisions with vessels represents a minimum estimate from this source of mortality.

In 1999 and 2000, the California stranding network reported gray whale strandings due to harpoon injuries (Table 35). A Russian harpoon tip was found in a dead whale that stranded in 1999 (R. Brownell, NMFS-SWFSC, pers. comm.), and an injured whale with a harpoon in its back was sighted in 2000. Since these whales were likely harpooned during the aboriginal hunt in Russian waters, they would have been counted as "struck and lost" whales in the harvest data.

STATUS OF STOCK

In 1994, due to steady increases in population abundance, the eastern North Pacific stock of gray whales was removed from the List of Endangered and Threatened Wildlife (the List), as it was no longer considered endangered or threatened under the Endangered Species Act (ESA). As required by the ESA, NMFS monitored the status of this stock for 5 years following delisting. A workshop convened by NMFS on 16-17 March 1999 at the AFSC's National Marine Mammal Laboratory in Seattle, WA, reviewed the status of the stock based on research conducted during the 5-year period following delisting. Invited workshop participants determined that the stock was neither in danger of extinction, nor likely to become endangered within the foreseeable future, therefore there was no apparent reason to reverse the previous decision to remove this stock from the List (Rugh et al. 1999). This recommendation was subsequently adopted by NMFS.

Wade (2002) conducted an assessment of the Eastern North Pacific gray whale stock using survey data through 1995-96. Wade and Perryman (2002) updated the assessment in Wade (2002) to incorporate the abundance estimates from 1997-1998, 2000-2001, and 2001-2002, as well as calf production estimates from the northward migration (1994 to 2001), into a more complete analysis that further increased the precision of the results. All analyses concluded that the population was within the stock's optimum sustainable population (OSP) level (i.e., there was essentially zero probability that the population was below the stock's maximum net population level), and estimated the population in 2002 was between 71% and 102% of current carrying capacity. Similar results were found in a separate assessment (Punt et al. 2004). The Scientific Committee of the International Whaling Commission reviewed both assessments and agreed that management advice could be formulated from the results. Both assessments indicated that the population was above MSYL, and was likely close to or above its unexploited equilibrium level (IWC 2003).

Even though the stock is within OSP, abundance will rise and fall as the population adjusts to natural and man-caused factors affecting the carrying capacity of the environment (Rugh et al. 2005). In fact, it is expected that a population close to or at the carrying capacity of the environment will be more susceptible to fluctuations in the environment (Moore et al. 2001). The recent correlation between gray whale calf production and environmental conditions in the Bering Sea (Perryman et al. 2002) may be an example of this. For this reason, it can be predicted that the population will undergo fluctuations in the future that may be similar to the 2-year event that occurred in 1999-2000 (Norman et al. 2000, Pérez-Cortés et al. 2000, Brownell et al. 2001, Gulland et al. 2005). Overall, the population increased (nearly doubled in size) over approximately the first 20 years of monitoring, and then has been roughly stable for the last 20 years (since the mid-1980s). This is entirely consistent with a population approaching K, and is the interpretation of the trend data and assessment that is accepted by the Scientific Committee of the IWC. Alter et al. (2007) used estimates of genetic diversity to infer that North Pacific gray whales may have numbered ~96,000, including animals

in both the western and eastern populations, 1100-1600 years ago. The authors recommend that because the current estimate of the eastern stock of gray whales is at most 28-56% of this historic abundance, that the stock should be designed as "depleted" under the MMPA. NMFS does not accept the recommendation made by Alter et al (2007) for the following reasons. First, the interpretation of the findings of Alter et al. (2007) are under debate in the scientific literature (Palsboll et al. 2007) and by the International Whaling Commission (IWC) Scientific Committee. Second, the lower range of the confidence interval in Alter et al. (2007) is consistent with a historic abundance of about 30,000 whales each for the western and eastern North Pacific stocks of gray whales. An abundance of 30,000 gray whales in the Eastern North Pacific stock is well within the confidence limits for estimates of carrying capacity reported by Wade (2002). Finally, because it is likely that an abundance estimate 1,100-1,600 years ago is not relevant to the ocean's current carrying capacity, it is not reasonable to compare the current abundance estimate to an estimate that far in the past to assess current status under the MMPA.

At present, U.S. commercial fishery-related annual mortality levels less than 41.7 animals per year (i.e., 10% of PBR) can be considered insignificant and approaching zero mortality and serious injury rate. Based on currently available data, the estimated annual level of human-caused mortality and serious injury (130), which includes mortalities from commercial fisheries (6.7), Russian harvest (122), and ship strikes (1.2), does not exceed the PBR (417). Therefore, the Eastern North Pacific stock of gray whales is not classified as a strategic stock.

HABITAT CONCERNS

Eastern North Pacific gray whales range from subtropical lagoons in Baja Mexico to arctic seas around Alaska and eastern Russia (Braham 1984). Evidence indicates that the Arctic climate is changing significantly and that one result of the change is a reduction in the extent of sea ice in at least some regions of the Arctic (ACIA 2004, Johannessen et al 2004). These changes are likely to affect marine mammal species in the Arctic, including the gray whale, due to the impacts of a changing Arctic environment on the species' benthic food supply. With the increase in numbers of gray whales (Rugh et al. 2005), in combination with changes in prey distribution (Grebmeier et al. 2006; Moore et al. 2007), some gray whales have moved into new feeding areas, spreading their summer range (Rugh et al. 2001). There are insufficient data to make reliable predictions of the effects of Arctic climate change on gray whales.

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