Revised 7/31/2015

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

STOCK DEFINITION AND GEOGRAPHIC RANGE

Once common throughout the Northern Hemisphere, the gray whale was extinct in the Atlantic by the early 1700s (Fraser 1970; Mead and Mitchell 1984), though one anomalous sighting occurred in the Mediterranean Sea in 2010 (Scheinin *et al.* 2011) and another off Namibia in 2013 (Elwen and Gridley 2013). Gray whales are now only commonly found in the North Pacific. Genetic comparisons indicate there are distinct "Eastern North Pacific" (ENP) and "Western North Pacific" (WNP) population stocks, with differentiation in both mtDNA haplotype and microsatellite allele frequencies (LeDuc et al. 2002; Lang et al. 2011a; Weller et al. 2013).

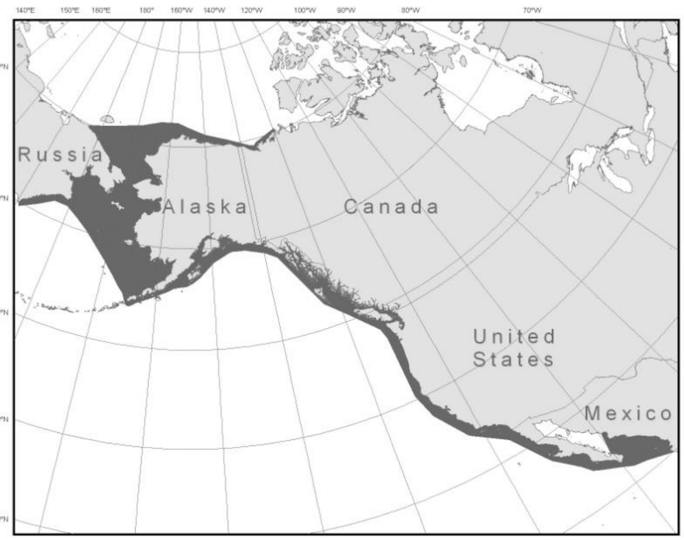

Figure 1. Approximate distribution of the Eastern North Pacific stock of gray whales (shaded area).

During summer and fall, most whales in the ENP population feed in the Chukchi, Beaufort and northwestern Bering Seas (Fig. 1). An exception to this is the relatively small number of whales (approximately 200) that summer and feed along the Pacific coast between Kodiak Island, Alaska and northern California (Darling 1984, Gosho *et al.* 2011, Calambokidis *et al.* 2012), referred to as the "Pacific Coast Feeding Group" (PCFG). Three primary wintering lagoons in Baja California, Mexico are utilized, and some females are known to make repeated returns to specific lagoons (Jones 1990). Genetic substructure on the wintering grounds is indicated by significant differences in mtDNA haplotype frequencies between females (mothers with calves) using two of the primary calving lagoons and females sampled in other areas (Goerlitz *et al*. 2003). Other research identified a small, but significant departure from panmixia between two of the lagoons using nuclear data, although no significant differences were identified using mtDNA (Alter *et al.* 2009).

Tagging, photo-identification and genetic studies show that some whales identified in the WNP off Russia have been observed in the ENP, including coastal waters of Canada, the U.S. and Mexico (Lang 2010; Mate et al. 2011; Weller et al. 2012; Urbán et al. 2013, Mate et al. 2015). In combination, these studies have recorded a total of 27 gray whales observed in both the WNP and ENP. Despite this overlap, significant mtDNA and nDNA differences are found between whales in the WNP and those summering in the ENP (Lang *et al*. 2011a).

In 2010, the IWC Standing Working Group on Aboriginal Whaling Management Procedure noted that different names had been used to refer to gray whales feeding along the Pacific coast, and agreed to designate animals that spend the summer and autumn feeding in coastal waters of the Pacific coast of North America from California to southeast Alaska as the "Pacific Coast Feeding Group" or PCFG (IWC 2012). This definition was further refined for purposes of abundance estimation, limiting the geographic range to the area from northern California to northern British Columbia (from 41°N to 52°N), limiting the temporal range to the period from June 1 to November 30, and counting only those whales seen in more than one year within this geographic and temporal range (IWC 2012). The IWC adopted this definition in 2011, but noted that "not all whales seen within the PCFG area at this time will be PCFG whales and some PCFG whales will be found outside of the PCFG area at various times during the year." (IWC 2012).

Photo-identification studies between northern California and northern British Columbia provide data on the abundance and population structure of PCFG whales (Calambokidis *et al*. 2012). Gray whales using the study area in summer and autumn include two components: **1)** whales that frequently return to the area, display a high degree of intra-seasonal " fidelity" and account for a majority of the sightings between 1 June and 30 November. Despite movement and interchange among sub-regions of the study area, some whales are more likely to return to the same sub-region where they were observed in previous years; **2)**"visitors" from the northbound migration that are sighted only in one year, tend to be seen for shorter time periods in that year, and are encountered in more limited areas. Photo-identification (Gosho *et al*. 2011; Calambokidis *et al*. 2012) and satellite tagging (Mate *et al*. 2010; Ford *et al.*

2012) studies have documented some PCFG whales off Kodiak Island, the Gulf of Alaska and Barrow, Alaska, well to the north of the pre-defined 41°N to 52°N boundaries used in some PCFG-related analyses (e.g. abundance estimation).

Frasier *et al.* (2011) found significant differences in mtDNA haplotype distributions between PCFG and ENP gray whale sequences, in addition to differences in long-term effective population size, and concluded that the PCFG qualifies as a separate management unit under the criteria of Moritz (1994) and Palsbøll *et al.* (2007). The authors noted that PCFG whales probably mate with the rest of the ENP population and that their findings were the result of maternally-directed site fidelity of whales to different feeding grounds.

Lang *et al.* (2011b) assessed stock structure of ENP whales from different feeding grounds using both mtDNA and eight microsatellite markers. Significant mtDNA differentiation was found when samples from individuals (n=71) sighted over two or more years within the seasonal range of the PCFG were compared to samples from whales feeding north of the Aleutians (n=103), and when PCFG samples were compared to samples collected off Chukotka, Russia (n=71). No significant differences were found when these same comparisons were made using microsatellite data. The authors concluded that (1) the significant differences in mtDNA haplotype frequencies between the PCFG and whales sampled in northern areas indicates that use of some feeding areas is being influenced by internal recruitment (e.g., matrilineal fidelity), and (2) the lack of significance in nuclear comparisons suggests that individuals from different feeding grounds may interbreed. The level of mtDNA differentiation identified, while statistically significant, was low and the mtDNA haplotype diversity found within the PCFG was similar to that found in the northern strata. Lang *et al*. (2011b) suggested this could indicate recent colonization of the PCFG but could also be consistent with external recruitment into the PCFG. An additional comparison of whales sampled off Vancouver Island, British Columbia (representing the PCFG) and whales sampled at the calving lagoon at San Ignacio also found no significant differences in microsatellite allele frequencies, providing further support for interbreeding between the PCFG and the rest of the ENP stock (D'Intino et al. 2012). Lang and Martien (2012) investigated potential immigration levels into the PCFG using simulations and produced results consistent with the empirical (mtDNA) analyses of Lang et al. (2011b). Simulations indicated that immigration of >1 and <10 animals per year into the PCFG was plausible, and that annual immigration of 4 animals/year produced results most consistent with the empirical study.

While the PCFG is recognized as a distinct feeding aggregation (Calambokidis et al. 2012; Mate et al. 2010; Frasier et al. 2011; Lang et al. 2011b; IWC 2012), the status of the PCFG as a population stock remains unresolved (Weller et al. 2013). A NMFS gray whale stock identification workshop held in 2012 included a review of available photo-identification, genetic, and satellite tag data. The report of the workshop states "there remains a substantial level of uncertainty in the strength of the lines of evidence supporting demographic independence of the PCFG." (Weller et al. 2013). The NMFS task force, charged with evaluating stock status of the PCFG, noted that "both the photo-identification and genetics data indicate that the levels of internal versus external recruitment are comparable, but these are not quantified well enough to determine if the population dynamics of the PCFG are more a consequence of births and deaths within the group (internal dynamics) rather than related to immigration and/or emigration (external dynamics)." Further, given the lack of significant differences found in nuclear DNA markers between PCFG whales and other ENP whales, the task force found no evidence to suggest that PCFG whales breed exclusively or primarily with each other, but interbreed with ENP whales, including potentially other PCFG whales. Additional research is needed to better identify recruitment levels into the PCFG and further assess the stock status of PCFG whales (Weller et al. 2013). In contrast, the task force noted that WNP gray whales should be recognized as a population stock under the MMPA, and NMFS prepared a separate report for WNP gray whales in 2014. Because the PCFG appears to be a distinct feeding aggregation and may warrant consideration as a distinct stock in the future, separate PBRs are calculated for the PCFG to assess whether levels of human-caused mortality are likely to cause local depletion.

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. 2). The most recent estimate of abundance for the ENP population is from the 2010/2011 southbound survey and is 20,990 (CV=0.05) whales (Durban *et al*. 2013) (Fig. 2).

Photographic mark-recapture abundance estimates for PCFG gray whales between 1998 and 2012, including estimates for a number of smaller geographic areas within the IWC-defined PCFG region (41°N to 52°N), are reported in Calambokidis *et al*. (2014). The 2012 abundance estimate for the defined range of the PCFG between 41°N to 52°N is 209 (SE=15.4; CV= 0.07).

Eastern North Pacific gray whales experienced an unusual mortality event (UME) in 1999 and 2000, when large numbers of emaciated animals stranded along the west coast of North America (Moore *et al*., 2001; Gulland *et al*., 2005). Over 60% of the dead whales were adults, compared with previous years when calf strandings were more common. Several factors following this UME suggest that the high mortality rate observed was a short-term, acute event and not a chronic situation or trend: 1) in 2001 and 2002, strandings decreased to levels below UME levels (Gulland *et al*., 2005); 2) average calf production returned to levels seen before 1999; and 3) in 2001, living whales no longer appeared emaciated. Oceanographic factors that limited food availability for gray whales were identified as likely causes of the UME (LeBouef et al. 2000; Moore et al. 2001; Minobe 2002; Gulland et al. 2005), with resulting declines in survival rates of adults during this period (Punt and Wade 2012). The population has recovered to levels seen prior to the UME of 1999-2000 (Fig. 2).

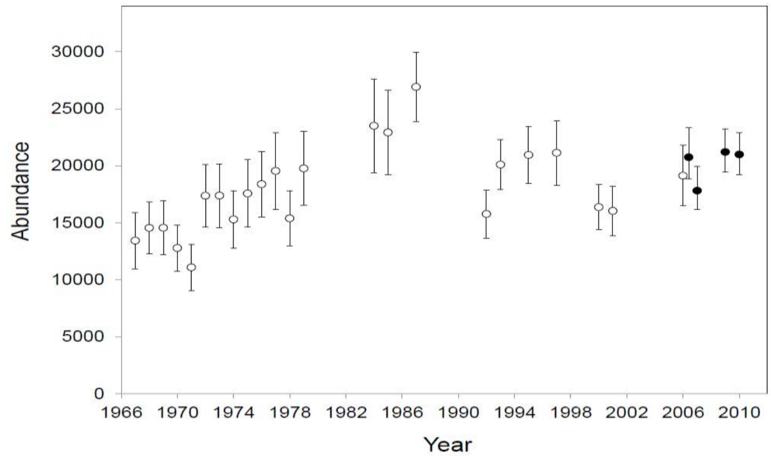

Figure 2. Estimated abundance of Eastern North Pacific gray whales from NMFS counts of migrating whales past Granite Canyon, California. Open circles represent abundance estimates and 95% confidence intervals reported by Laake et al. (2012). Closed circles represent estimates and 95% posterior highest density intervals reported by Durban et al. (2013) for the 2006/7, 2007/8, 2009/10, and 2010/11 migration seasons.

Gray whale calves have been counted from Piedras Blancas, a shore site in central California, in 1980-81 (Poole 1984a) and each year from 1994 to 2012 (Perryman *et al*. 2002; Perryman and Weller 2012). In 1980 and 1981, calves comprised 4.7% to 5.2% of the population (Poole 1984b). Calf production indices, as calculated by dividing northbound calf estimates by estimates of population abundance (Laake *et al*. 2012), ranged between 1.3 - 8.8% (mean=4.2%) during 1994-2012. Annual indices of calf production include impacts of early postnatal mortality but may overestimate recruitment because they exclude possibly significant levels of killer whale predation on gray whale calves north of the survey site (Barrett-Lennard et al. 2011). The relatively low reproductive output reported is consistent with little or no population growth over the time period (Laake *et al*. 2012; Punt and Wade 2012).

Minimum Population Estimate

The minimum population estimate (N_{MIN}) for the ENP 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 2010/11 abundance estimate of 20,990 and its associated CV of 0.05 (Durban et al. 2013), N_{MIN} for this stock is 20,125.

The minimum population estimate for PCFG gray whales is calculated as the lower 20th percentile of the log-normal distribution of the 2012 mark-recapture estimate of 209 (CV=0.07), or 197 animals.

Current Population Trend

The population size of the ENP gray whale stock has increased over several decades despite an UME in 1999 and 2000 and has been relatively stable since the mid-1990s (see Fig. 2).

Abundance estimates of PCFG gray whales reported by Calambokidis et al. (2014) show a high rate of increase in the late 1990s and early 2000s, but have been relatively stable since 2003.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Using abundance data through 2006/07, an analysis of the ENP gray whale population led to an estimate of R_{max} of 0.062, with a 90% probability the value was between 0.032 and 0.088 (Punt and Wade 2012). This value of R_{max} is also applied to PCFG gray whales, as it is currently the best estimate of R_{max} available for gray whales in the ENP.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for the ENP stock of gray whales is calculated as the minimum population size (20,125), times one-half of the maximum theoretical net population growth rate (½ x 6.2% = 3.1%), times a recovery factor of 1.0 for a stock above MNPL (Punt and Wade 2012), or 624 animals per year.

The potential biological removal (PBR) level for PCFG gray whales is calculated as the minimum population size (197 animals), times one half the maximum theoretical net population growth rate (½ x 6.2% = 3.1%), times a recovery factor of 0.5 (for a population of unknown status), resulting in a PBR of 3.1 animals per year. Use of the recovery factor of 0.5 for PCFG gray whales, rather than 1.0 used for ENP gray whales, is based on uncertainty regarding stock structure (Weller et al. 2013) and guidelines for preparing marine mammal stock assessments which state that "Recovery factors of 1.0 for stocks of unknown status should be reserved for cases where there is assurance that N_{min}, R_{max}, and the kill are unbiased and where the stock structure is unequivocal" (NMFS 2005). Given uncertainties in the levels of external versus internal recruitment of PCFG whales described above, the equivocal nature of the stock structure, and the small estimated population size of the PCFG, NMFS will continue to use the default recovery factor of 0.5 for PCFG gray whales.

HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Serious Injury Guidelines

NMFS uses guidance from previous serious injury workshops, expert opinion, and analysis of historic injury cases todistinguishserious from non-serious injury (Angliss and DeMaster 1998, Andersen *et al*. 2008, NOAA 2012). NMFS defines serious injury as an "*injury that is more likely than not to result in mortality*".

Fisheries Information

No gray whales were observed entangled in California gillnet fisheries between 2008 and 2012 (Carretta and Enriquez 2009, 2010, 2012a, 2012b, Carretta *et al*., 2014a.), but previous mortality in the swordfish drift gillnet fishery has been observed (Carretta et al. 2004) and there have been recent sightings of free-swimming gray whales entangled in gillnets (Table 1). Alaska gillnet fisheries largely lack observer programs, including those in Bristol Bay known to interact with gray whales. Most data on human-caused mortality and serious injury of gray whales are from strandings, including at-sea reports of entangled animals alive or dead (Carretta et al. 2013, 2014b). Strandings represent only a fraction of actual gray whale deaths (natural or human-caused), as reported by Punt and Wade (2012), who estimated that only 3.9% to 13.0% of gray whales that die in a given year end up stranding and being reported.

A summary of human-caused mortality and serious injury resulting from unknown fishery and marine debris sources (mainly pot/trap or net fisheries) is given in Table 1 for the most recent 5-year period of 2008 to 2012. Total observed human-caused fishery mortality and serious injury for ENP gray whales is 22.25 animals (8 serious injuries, 8.25 prorated serious injuries, and 6 deaths), or 4.45 whales per year (Table 1). Total observed human-caused fishery mortality and serious injury for gray whales observed in the PCFG range and season for the period 2008 to 2012 is 0.75 animals (0.75 prorated serious injuries), or 0.15 whales per year (Table 1). Three gray whales from Table 1 (one death and two serious injuries) were detected in California waters during the known PCFG season, but were south of the area recognized by the IWC as the PCFG management area. It is possible that some of these whales could be PCFG whales, but no photographic identifications were available to establish their identity. They are included in ENP gray whale serious injury and death totals.

Table 1. Human-caused deaths and serious injuries (SI) of gray whales from fishery-related and marine debris sources for the period 2008 to 2012 as recorded by NMFS stranding networks and observer programs.

Date of observation	Location	PCFG range N 41- N 52 AND season?	Description	Determination (SI Prorate value)
13-Oct-2012	Fort Bragg, CA	No	Entangled animal report; animal reported with rope around the peduncle which wasn't seen in photographs but photos did show green gillnet with cuts to the head; animal disappeared and final status is unknown.	SI
31-Aug-2012	Los Angeles, CA	No	Animal first detected near San Diego. Subadult gray whale reported entangled with small gauge, dark-colored line deeply embedded around its tail stock. Little gear trails. Entanglement was once more involved as indicated by scars on the animal's body. Animal in very poor condition - emaciated, scarred and a heavy load of cyamid	Dead

			amphipods. Black line around peduncle, 20 ft trailing; observed off san San Diego on 8/31, completely disentangled off L.A. 9/6, stranded dead 9/14/12.	
22-Aug-2012	Prince William Sound, AK	No	Whale sighted by tour boat. Few details, other than part of a fishing net was observed being trailed from a gray whale's fin. Photos apparently available, but have not been located. Prince william William Sound. Extent and severity of entanglement unknown.	SI (0.75)
16-Jun-2012	Prince William Sound, AK	No	30' gray whale in prince william Prince William Sound entangled in gear. Thrashing at surface and moving at 4-5 knots. No wounds or chafing was observed. Gillnet, corkline (at least 12 floats), and leadline observed over animal's rostrum, body, and tailstock. Both pectoral flippers appeared pinned to body. Animal later appeared tired and was swimming at 2 knots. It was not relocated. Assigned serious injury because gear appears to be constricting movement of whale's flippers.	SI
13-May-2012	Monterey, CA	No	Animal entangled through mouth in at least two sets of suspected pot gear that that hang below. Animal anchored with a short scope in 28 feet of water to suspected pots. Bundle of gear, including 4 buoys lie under animal. Animal having some difficulty getting to surface. Animal eventually disentangled, but results of entanglement may still be life-threatening.	SI
8-May-2012	Eureka, CA	No	Entangled animal report; deep cuts from rope around peduncle and lacerations at fluke notch and lateral edge of fluke; successfully disentangled but long-term survival noted as questionable. Gear was collected and identified as Dungeness crab pot gear. Animal entirely freed of gear. Animal in fair condition and slightly emaciated. Deep cuts (~ 2 inches) from the rope around the peduncle remained. Gear was recovered. Results of entanglement may still be life threatening.	SI
5-May-2012	Monterey, CA	No	Whale watch vessel noticed from images taken of a 20 - 25 foot gray whale they had been observing earlier in the day, that animal was actually entangled. A small gauge line, likely from right side of mouth goes over the animal's back, and over blowholes, to left side of mouth. No buoys or trailing line were observed. Animal in fair condition. Animal sighted next day by whale watch vessel. Confirmed mouth entanglement, appears to be strapping material.	SI (0.75)
28-Apr-2012	Fort Bragg, CA	No	Small gray whale off fort bragg Fort Bragg, CA, in company of two other animals, trailing two buoys.	SI (0.75)
21-Apr-2012	San Simeon, CA	No	Rope like marks on caudal peduncle. Rope impression on pectoral fin. Photos taken.	Dead
17-Apr-2012	Laguna Beach, CA	No	40-foot gray whale reported entangled with approximately 150 feet of line trailing. Four spongex bullet buoys lie along the left side of the animal. Entanglement involves the mouth, a wrap over the head, and the left pectoral flipper. Entanglement appears recent. Partially disentangled on 5/3/12 by fishermen.	SI (0.75)
24-Mar-2012	San Diego, CA	No	Entangled animal report; gillnet gear around peduncle; response effort resulted in successful disentanglement with >100 ft of pink gillnet removed from animal, but animal subsequently observed dead on 03/27 (floating, skin sample taken, no necropsy). Net removed on 03/24 found to contain one dead ca sea lion and three dead sharks.	Dead
28-Jan-2012	San Diego, CA	No	Entangled animal report; towing two orange buoys and at least 150 feet of line; unknown fishery, reported as possible gillnet; no response effort.	SI (0.75)
17-Jan-2012	Unimak Pass, AK	No	A 40' whale was caught in cod pot gear near Unimak Pass. Lines were cut by boat crew and buoys were recovered, however, the pot and some line remained in the water. Any line possibly remaining on animal thought to be minimal. Gray whale species determination made following extensive questioning by local biologist. Determination: prorated serious injury because gear possibly remains on animal.	SI (0.75)
25-Aug-2011	San Mateo, CA	No	One white "crab pot" buoy next to body by left pectoral fin; float stayed next to body and did not change position; animal remained in same position - possibly anchored; only observed for ~2 min; not resighted, no rescue, outcome unknown.	SI
12-Sep-2010	Central Bering Sea	No	Bering Sea / Aleutian Islands flatfish trawl fishery: 12 m animal caught in gear. Photos taken.	Dead
11-May-2010	Orange County CA	No	Free-swimming animal entangled in gillnet; animal first observed inside Dana Point Harbor on 5/11/10; animal successfully	Dead

			disentangled on 5/12/10 & swam out of harbor; animal observed alive in surf zone for several hours on 5/14/10 off Doheny State Beach before washing up dead on beach	
7-May-2010	Cape Foulweather OR	No	Entangled in 3 crab pots, whale not relocated.	SI (0.75)
16-Apr-2010	Seaside OR	No	27-ft long gray whale stranded dead, entangled in crab pot gear	Dead
8-Apr-2010	San Francisco CA	No	Rope wrapped around caudal peduncle; identified as gray whale from photo. Free-swimming, diving. No rescue effort, no resightings, final status unknown	SI
5-Mar-2010	San Diego	No	Free-swimming entangled whale reported by member of the public; no rescue effort initiated; no resightings reported; final status unknown.	SI (0.75)
21-Jul-2009	Trinidad Head CA	Yes	Free-swimming animal with green gillnet, rope & small black floats wrapped around caudal peduncle; report received via HSU researcher on scene during research cruise; animal resighted on 3 Aug; no rescue effort initiated. Photos show rope cutting into caudal peduncle. This whale was re-sighted in 2010 and 2011, still trailing gear. Whale was resighted in 2013 and had shed gear, and was apparently in good health (Jeff Jacobsen, pers. comm.).	NSI
24-Jun-2009	Clallam County, WA	Yes	Whale found entangled in tribal set gillnet in morning. Net had been set 8 pm previous day. Whale able to breath, but not swim freely and was stationary in net. Right pectoral flipper and head were well-wrapped in net webbing. In response to disentanglement attempts, whale reacted violently and swam away. The net was retrieved and found to be torn in two. No confirmation on whether whale was completely free of netting.	SI (0.75)
9-Apr-2009	Sitka, AK	No	Thick black line wrapped twice around whale's body posterior to the eyes was cut and pulled away by private citizen. Animal swam away and dove.	SI (0.75)
25-Mar-2009	Seal Beach CA	No	Free-swimming animal with pink gillnet wrapped around head, trailing 4 feet of visible netting; report received via naturalist on local whale watch vessel; no rescue effort initiated; final status unknown	SI (0.75)
31-Jan-2009	San Diego CA	No	Free-swimming animal towing unidentified pot/trap gear; report received via USCG on scene; USCG reported gear as 4 lobster pots; final status unknown	SI (0.75)
16-Apr-2008	Eel River CA	No	Observed 12 miles west of Eel River by Humboldt State University personnel. It was unknown sex, with an estimated length of 20 ft and in emaciated condition. The animal was described as towing 40-50 feet of line & 3 crab pot buoys from the caudal peduncle and moving very slowly. Vessel retrieved the buoys, pulled them and ~20 ft of line onto the deck and cut it loose from the whale. The whale swam away slowly with 20-30 feet of line still entangling the peduncle, outcome unknown. Identification numbers on buoy traced to crab pot fishery gear that was last fished in Bering Sea in December 2007.	SI

Subsistence/Native Harvest Information

Subsistence hunters in Russia and the United States have traditionally harvested whales from the ENP stock in the Bering Sea, although only the Russian hunt has persisted in recent years (Huelsbeck 1988; Reeves 2002). In 2005, the Makah Indian Tribe requested authorization from NOAA/NMFS, under the MMPA and the Whaling Convention Act, to resume limited hunting of gray whales for ceremonial and subsistence purposes in the coastal portion of their usual and accustomed (U&A) fishing grounds off Washington State (NMFS 2008). The spatial overlap of the Makah U&A and the summer distribution of PCFG whales has management implications. The proposal by the Makah Tribe includes time/area restrictions designed to reduce the probability of killing a PCFG whale and to focus the hunt on whales migrating to/from feeding areas to the north. The Makah proposal also includes catch limits for PCFG whales that result in the hunt being terminated if these limits are met. Also, observations of gray whales moving between the WNP and ENP highlight the need to estimate the probability of a gray whale observed in the WNP being taken during a hunt by the Makah Tribe (Moore and Weller 2013). NMFS has published a notice of intent to prepare an environmental impact statement (EIS) on the proposed hunt (NMFS 2012) and the IWC has evaluated the potential impacts of the proposed hunt and other sources of human-caused mortality on PCFG whales and concluded, with certain qualifications, that the proposed hunt meets the Commission's conservation objectives (IWC 2013). The Scientific Committee has not scheduled an implementation review of the impacts of the Makah hunt on whales using summering feeding areas in the WNP, but is continuing to investigate stock structure of north Pacific gray whales and may schedule such a review in the future (IWC 2013). In 2012, the IWC approved a 6-year quota (2013-2018) of 744 gray whales, with an annual cap of 140, for Russian and U.S. (Makah Indian Tribe) aboriginals based on the joint request and needs statements submitted by the U.S. and Russian federation. 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. Total takes by the Russian hunt during the past five years were: 130 in 2008,116 in 2009, 118 in 2010, 128 in 2011, and 143 in 2012 (source: http://iwc.int/table_aboriginal). Based on this information, the annual subsistence take averaged 127 whales during the 5-year period from 2008 to 2012.

Other Mortality

Ship strikes are a source of mortality for gray whales (Table 2). For the most recent five-year period, 2008-2012, the total serious injury and mortality of ENP gray whales attributed to ship strikes is 9.8 animals (including 7 deaths, 2 serious injuries, and 0.8 prorated serious injuries, or 2.0 whales per year (Table 2, Carretta et al. 2013, Carretta et al. 2014b.). The total ship strike serious injury and mortality of gray whales observed in the PCFG range and season during this same period is 0.52 animals, or 0.1 whales per year (Table 2). One gray whale ship strike in Table 2 was detected in California waters during the known PCFG season, but was south of the area recognized by the IWC as the PCFG management area. It is possible that this animal could be a PCFG whale, but no photographic identification was available to establish its identity. It is included in ENP gray whale serious injury and death totals. Additional mortality from ship strikes probably goes unreported because the whales either do not strand or do not have obvious signs of trauma.

In February 2010, a gray whale stranded dead near Humboldt, CA with parts of two harpoons embedded in the body. Since this whale was likely harpooned during the aboriginal hunt in Russian waters, it would have been counted as “struck and lost” in the harvest data.

HABITAT CONCERNS

Near shore industrialization and shipping congestion throughout the migratory corridors of the ENP gray whale stock represent risks by increasing the likelihood of exposure to pollutants and ship strikes, as well as a general degradation of the habitat.

Evidence indicates that the Arctic climate is changing significantly, resulting in a reductions in sea ice cover (Johannessen et al. 2004, Comiso et al. 2008). These changes are likely to affect gray whales. For example, the summer range of gray whales has greatly expanded in the past decade (Rugh et al. 2001). Bluhm and Gradinger (2008) examined the availability of pelagic and benthic prey in the Arctic and concluded that pelagic prey is likely to increase while benthic prey is likely to decrease in response to climate change. They noted that marine mammal species that exhibit trophic plasticity (such as gray whales which feed on both benthic and pelagic prey) will adapt better than trophic specialists.

Global climate change is also likely to increase human activity in the Arctic as sea ice decreases, including oil and gas exploration and shipping (Hovelsrud et al. 2008). Such activity will increase the chance of oil spills and ship strikes in this region. Gray whales have demonstrated avoidance behavior to anthropogenic sounds associated with oil and gas exploration (Malme et al. 1983, 1984) and low-frequency active sonar during acoustic playback experiments (Buck and Tyack 2000, Tyack 2009). Ocean acidification could reduce the abundance of shell-forming organisms (Fabry et al. 2008, Hall-Spencer et al. 2008), many of which are important in the gray whales’ diet (Nerini 1984).

Table 2. Summary of gray whale serious injuries (SI) and deaths attributed to vessel strikes for the five-year period 2008-2012. No vessel strikes were reported in 2012.

Date of observation	Location	PCFG range N 41 - N 52 AND season?	Description	Determination (SI prorate value)
6-Jun-2011	San Mateo CA	No	Massive hemorrhage into the thorax, blood clots around lungs. Lesions indicate massive trauma. Due to carcass position, the skeleton could not be completely examined (lying on back, top of skull in sand).	Dead
8-Apr-2011	San Francisco CA	No	Crushed mandible.	Dead
12-Feb-2011	Los Angeles CA	No	Private recreational vessel collided with free-swimming animal; animal breached just prior to contact, bouncing off side of vessel; dove immediately following contact & was not resighted; no blood observed in water; final status unknown; skin sample collected from vessel and genetically identified	SI (0.14)

			as a female gray whale. Vessel size assumed less than 65 ft and speed unknown.	
22-Jan-2011	San Diego CA	No	Pleasure sailboat collided with free-swimming animal; animal dove immediately following contact & was not resighted; no blood observed in water; final status unknown. Vessel size assumed less than 65 ft. And speed unknown.	SI (0.14)
12-Mar-2010	Santa Barbara CA	No	21 meter sailboat underway at 13 kts collided with free-swimming animal; whale breached shortly after collision; no blood observed in water; minor damage to lower portion of boat's keel; final status unknown; DNA analysis of skin sample confirmed species.	SI
16-Feb-2010	San Diego CA	No	Free-swimming animal with propeller-like wounds to dorsum.	SI (0.52)
9-Sep-2009	Quileute River WA	Yes	USCG vessel reported to be traveling at 10 knots when they hit the gray whale at noon on 9/9/2009. The animal was hit with the prop and was reported alive after being hit, blood observed in water.	SI (0.52)
1-May-2009	Los Angeles CA	No	Catalina island transport vessel collided with free-swimming calf accompanied by adult animal; calf was submerged at time of collision; pieces of flesh & blood observed in water; calf never surfaced; presumed mortality.	SI
27-Apr-2009	Whidbey Is. WA	No	Large amount of blood in body cavity, bruising in some areas of blubber layer and in some internal organs. Findings suggestive of blunt force trauma likely caused by collision with a large ship.	Dead
5-Apr-2009	Sunset Beach CA	No	Dead stranding; 3 deep propeller-like cuts on right side, just anterior of genital opening; carcass towed out to sea	Dead
4-Apr-2009	Ilwaco WA	No	Necropsied, broken bones in skull; extensive hemorrhage head and thorax; sub-adult male	Dead
1-Mar-2008	Mexico	No	Carcass brought into port on bow of cruise ship; collision occurred betweeen ports of San Diego and Cabo San Lucas between 5:00 p.m. On 2/28 & 7:20 a.m. On 3/1	Dead
7-Feb-2008	Orange County CA	No	Carcass; propeller-like wounds to left dorsum from mid-body to caudal peduncle; deep external bruising on right side of head; field necropsy revealed multiple cranial fractures	Dead

STATUS OF STOCK

In 1994, the ENP 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 (NMFS 1994). Punt and Wade (2012) estimated the ENP population was at 85% of carrying capacity (K) and at 129% of the maximum net productivity level (MNPL), with a probability of 0.884 that the population is above MNPL and therefore within the range of its optimum sustainable population (OSP).

Even though the stock is within OSP, abundance will fluctuate as the population adjusts to natural and human-caused factors affecting carrying capacity (Punt and Wade 2012). It is expected that a population close to or at carrying capacity will be more susceptible to environmental fluctuations (Moore et al. 2001). The correlation between gray whale calf production and environmental conditions in the Bering Sea may reflect this (Perryman et al. 2002; Perryman and Weller 2012). Overall, the population nearly doubled in size over the first 20 years of monitoring and has fluctuated for the last 30 years around its average carrying capacity. This is consistent with a population approaching K.

Based on 2008-2012 data, the estimated annual level of human-caused mortality and serious injury for ENP gray whales includes Russian harvest (127), mortality and serious injury from commercial fisheries (4.45), and ship strikes (2.0), totals 133 whales per year, which does not exceed the PBR (624). The IWC completed an implementation review for ENP gray whales (including the PCFG) in 2012 (IWC 2013) and concluded that harvest levels (including the proposed Makah hunt) and other human caused mortality are sustainable, given the current population abundance (Laake et al. 2012, Punt and Wade 2012). Therefore, the ENP stock of gray whales is not classified as a strategic stock.

PCFG gray whales do not currently have a formal status under the MMPA, though the population size appears to have been stable since 2003, based on photo-ID studies (Calambokidis et al. 2014, IWC 2012). Total annual human-caused mortality of PCFG gray whales during the period 2008 to 2012 includes deaths due to commercial fisheries (0.15/yr), and ship strikes (0.1/yr), or 0.25 whales annually. This does not exceed the PBR level of 3.1 whales for this population. Levels of human-caused mortality and serious injury resulting from commercial fisheries and ship strikes for both ENP and PCFG whales represent minimum estimates as recorded by stranding networks or at-sea sightings.

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