HUMPBACK WHALE (*Megaptera novaeangliae*):
California/Oregon/Washington Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

NMFS has conducted a global Status Review of humpback whales and recently revised the ESA listing of the species (Bettridge *et al*. 2015, NOAA 2016a). NMFS is evaluating the stock structure of humpback whales under the MMPA, but no changes to current stock structure are presented at this time. However, effects of the ESA listing final rule on the status of the stock are discussed below.

North Pacific humpback whales (*M. novaeangliae kuzira*) comprise a distinct subspecies based on mtDNA and DNA relationships and distribution compared to North Atlantic humpback whales (*M. n. novaeangliae*) and those in the Southern Hemisphere (*M. n. australis*) (Jackson *et al*. 2014). Humpback whales occur throughout the North Pacific, with multiple populations recognized based on low-latitude winter breeding areas (Baker *et al*. 1998, Calambokidis *et al*. 2001, Calambokidis *et al*. 2008, Barlow *et al*. 2011, Fleming and Jackson 2011). North Pacific breeding areas fall broadly into three regions: 1) western Pacific (Japan and Philippines); 2) central Pacific (Hawaiian Islands); and 3) eastern Pacific (Central America and Mexico) (Calambokidis *et al*. 2008). Exchange of animals between breeding areas occurs rarely, based on photo-identification data of individual whales (Calambokidis *et al*. 2001, Calambokidis *et al*. 2008). Photo-identification evidence also suggests strong site fidelity to feeding areas, but animals from multiple feeding areas converge on
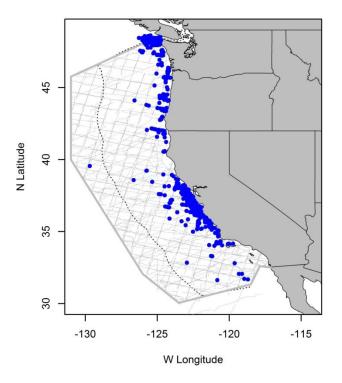

Figure 1. Humpback whale sightings based on shipboard surveys off California, Oregon, and Washington, 1991-2014. Dashed line represents the U.S. EEZ, thin lines indicate completed transect effort of all surveys combined.

common winter breeding areas (Calambokidis *et al*. 2008). Baker *et al*. (2008) reported significant differences in mtDNA haplotype frequencies among different breeding and feeding areas in the North Pacific, reflecting strong matrilineal site fidelity to respective migratory destinations. The most significant differences in haplotype frequencies were found between the California/Oregon feeding area and Russian and Southeastern Alaska feeding areas (Baker *et al*. 2013). Among breeding areas, the greatest level of differentiation was found between Okinawa and Central America and most other breeding grounds (Baker *et al*. 2013). Genetic differences between feeding and breeding grounds were also found, even for areas where regular exchange of animals between feeding and breeding grounds is confirmed by photo-identification (Baker *et al*. 2013).

Along the U.S. west coast, NMFS currently recognizes one humpback whale stock that includes two separate feeding groups: (1) a California and Oregon feeding group of whales that includes whales from the Central American and Mexican distinct population segments (DPSs) defined under the ESA (NOAA 2016a), and (2) a northern Washington and southern British Columbia feeding group that primarily includes whales from the Mexican DPS, but also small numbers of whales from the Hawaii and Central American DPSs (Calambokidis *et al*. 2008, Barlow *et al*. 2011, Wade *et al*. 2016). Very few photographic matches between these feeding groups have been documented (Calambokidis *et al*. 2008). Calambokidis *et al*. (2017a) reported that approximately 70% of whales photographed in the southern Mexico and Central America breeding ground regions have been matched to California and Oregon waters. Seven 'biologically important areas' for humpback whale feeding are identified off the U.S. west coast by

Calambokidis *et al*. (2015), including five in California, one in Oregon, and one in Washington. Humpback whales have increasingly reoccupied areas inside of Puget Sound (the 'Salish Sea'), a region where they were historically abundant prior to whaling (Calambokidis *et al*. 2017). Sightings from large-scale research vessel surveys are largely concentrated near shelf waters (Fig. 1).

For the Marine Mammal Protection Act (MMPA) stock assessment reports, the California/Oregon/Washington Stock is defined to include humpback whales that feed off the west coast of the United States, including animals from both the California-Oregon and Washington-southern British Columbia feeding groups (Calambokidis *et al*. 1996, Calambokidis *et al*. 2008, Barlow *et al*. 2011). Three other stocks are recognized in the Pacific region stock assessment reports: (1) Central North Pacific Stock (with feeding areas from Southeast Alaska to the Alaska Peninsula), (2) Western North Pacific Stock (with feeding areas from the Aleutian Islands, the Bering Sea, and Russia), and (3) American Samoa Stock in the South Pacific (with largely undocumented feeding areas as far south as the Antarctic Peninsula).

POPULATION SIZE

Based on whaling statistics, the pre-1905 population of humpback whales in the North Pacific was estimated to be 15,000 (Rice 1978), but whaling reduced this population to approximately 1,200 whales by 1966 (Johnson and Wolman 1984). A photo-identification study from 2004-2006 estimated the abundance of humpback whales in the entire Pacific Basin to be 21,808 (CV=0.04) (Barlow *et al*. 2011). Barlow (2016) estimated 3,064 (CV= 0.82) humpback whales from a 2014 summer/fall ship line-transect survey of California, Oregon, and Washington waters. Line-transect estimates of humpback whales in this region have less precision than corresponding estimates from mark-recapture studies, and for that reason, estimates of population size for this stock are based on mark-recapture estimates detailed below.

Abundance estimates from photographic mark-recapture surveys conducted in California and Oregon waters every year from 1991 through 2014 represent the most precise estimates (Calambokidis *et al*. 2017). These estimates include only whales photographed in California and Oregon waters and do not include whales that are part of the Washington state and southern British Columbia feeding group (Calambokidis *et al*. 2009, 2017a). California and Oregon estimates range from approximately 1,400 to 2,400 animals, depending on the choice of mark-recapture model and sampling period (Fig. 2). The best estimate of abundance for California and Oregon waters is taken as the 2011-2014 Chao estimate of 2,374 (CV=0.03) whales. This estimate is considered the best of those mark-recapture estimates reported because it accounts for individual capture heterogeneity (Calambokidis *et al*. 2017). This estimate includes virtually the entire Central American DPS, which was estimated to include 411 (CV=0.3) whales based on 2004-2006 photographic mark-recapture data (Wade *et al*. 2016). However, the abundance estimate for the Central American DPS is ≥ 8 years old and is not considered a reliable estimate of current abundance (NOAA 2016b).

Calambokidis *et al*. (2017) estimated the northern Washington and southern British Columbia feeding group population size to be 526 (CV=0.23) animals based on 2013 and 2014 mark-recapture data.

Combining abundance estimates from both the California/Oregon and Washington/southern British Columbia feeding groups (2,374 + 526) yields an estimate of 2,900 animals for the California/Oregon/Washington stock. A coefficient of variation for both feeding groups combined can be calculated as a weighted-mean CV of the 2 estimates, or $CV_{N1+N2} = sqrt((CV_1*N1)^2 + (CV_2*N2)^2 / (N1+N2)$ or CV = 0.048.

Minimum Population Estimate

The minimum population estimate for humpback whales in the California /Oregon /Washington stock is taken as the lower 20th percentile of the log-normal distribution of the combined mark-recapture estimate for both feeding groups given above, or 2,784 whales.

Current Population Trend

Ship surveys provide some indication that humpback whale abundance increased in California waters between 1979/80 and 1991 (Barlow 1994) and between 1991 and 2014 (Barlow 2016), but this increase was not linear, and short-term declines were apparent in 2001 and 2008. Mark-recapture population estimates had shown a long-term increase of approximately 8% per year (Calambokidis *et al*. 2009, Fig. 2), but more recent estimates suggest a possible leveling-off of the population size (Fig. 2), depending on the choice of model and time frame used (Calambokidis and Barlow 2013, Calambokidis *et al*. 2017). Population estimates for the entire North Pacific have also increased substantially from 1,200 in 1966 to approximately 18,000 - 20,000 whales in 2004 to 2006 (Calambokidis *et al*. 2008). Although these estimates are based on different methods and the earlier estimate is extremely uncertain, the growth rate implied by these estimates (6-7%) is consistent with growth rate of the California/Oregon/Washington stock.

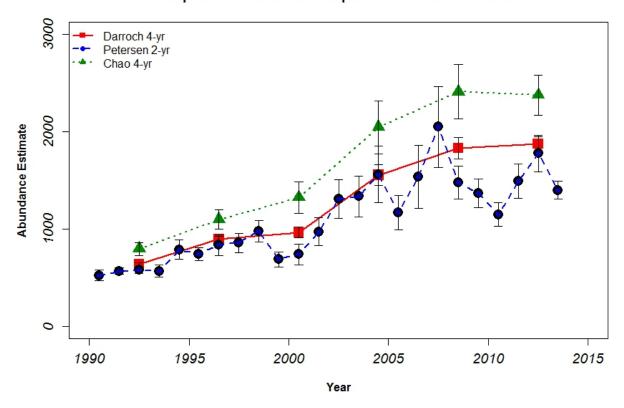## Humpback Whale Mark-Recapture Abundance Estimates

Figure 2. Mark-recapture estimates of humpback whale abundance in California and Oregon, 1991-2014, based on 3 different mark-recapture models and sampling periods (Calambokidis *et al*. 2017). Vertical bars indicate ±2 standard errors of each abundance estimate. Darroch and Chao models use 6 consecutive non-overlapping sample years. Estimates of humpback whale abundance in Washington and southern British Columbia waters are not shown, but the most-recent estimate is 526 (CV=0.23) whales for the 2-year period 2013-2014 (Calambokidis *et al*. 2017).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

The proportion of calves in the California/Oregon/Washington stock from 1986 - 1994 appeared much lower than previously measured for humpback whales in other areas (Calambokidis and Steiger 1994), but in 1995-97 a greater proportion of calves were identified, and the 1997 reproductive rates for this population are closer to those reported for humpback whale populations in other regions (Calambokidis *et al*. 1998). Despite the apparently low proportion of calves, two independent lines of evidence indicate that this stock was growing in the 1980s and early 1990s (Barlow 1994; Calambokidis *et al*. 2003) with a best estimate of 8% growth per year (Calambokidis *et al*. 1999). The current net productivity rate is unknown.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for this stock is calculated as the minimum population size (2,784) <u>times</u> one half the estimated population growth rate for this stock of humpback whales (½ of 8%) <u>times</u> a recovery factor of 0.3 (for an endangered species; with $N_{min} > 1,500$ and $CV(N_{min}) < 0.50$, Taylor *et al*. 2003), resulting in a PBR of 33.4. Because this stock spends approximately half its time outside the U.S. EEZ, the PBR in for U.S. waters is 16.7 whales per year.

HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

A total of 123 human-related interactions involving humpback whales are summarized for the 5-year period 2012-2016 by Carretta *et al*. (2018a). These records include serious injuries, non-serious injuries, and mortality involving pot/trap fisheries (n= 57), unidentified fishery interactions (49), vessel strikes (13), gillnet fisheries (3) and marine moorings (1). The number of serious injuries and mortalities in each category are summarized below. In

addition to interactions with humpback whales, 21 entanglements and one vessel strike involving 'unidentified whales' (totaling 17 serious injuries and mortalities) occurred from 2012-2016, some of which were certainly humpback whales (Carretta *et al.* 2018a, Carretta 2018). The number of human-related deaths and injuries for each humpback whale feeding group are unknown, but based on the proportion of the overall abundance (2,900 whales) belonging to the California-Oregon (82%) and Washington and southern British Columbia (18%) feeding groups, a majority of cases likely involve whales from the California-Oregon feeding group that includes nearly all of the Central American DPS (Calambokidis *et al.* 2017).

Fishery Information

Pot and trap fishery entanglements are the most frequently-documented source of serious injury and mortality of humpback whales in U.S. west coast waters and reported entanglements increased considerably in 2014 (Carretta *et al.* 2013, 2015, 2016a, 2018a). From 2012 to 2016, 57 observed interactions with pot and trap fisheries were observed (Carretta *et al.* 2018a). One pot/trap record includes a prorated serious injury (0.75) in a recreational Dungeness crab pot, which is excluded from Table 1 commercial fishery totals and is detailed in the 'Other Mortality' section of this report. Eighteen records involved non-serious injuries resulting from human intervention to remove gear, or cases where animals were able to free themselves. Two records involved dead whales, including one humpback recovered in sablefish pot gear in Oregon and one case where severed humpback flukes were found entangled in California Dungeness crab gear in southern California (Carretta *et al.* 2016, 2017a, 2018a). The remaining 36 pot/trap fishery injury cases, once evaluated per the NMFS serious injury policy, resulted in a total of 31.75 serious injuries / 5 years, or 6.4 humpback whales annually (Table 1). Documented 5-year mortality, serious injury, plus prorated injury totals (*i.e.* entangled humpback whales with an injury score < 1) for pot/trap fisheries, in order of frequency are: California Dungeness crab pot (16.75), unidentified pot/trap fishery (7.75), Washington/Oregon/California sablefish pot fishery (2.5), Washington Dungeness crab pot (0.75), California spot prawn (2.5), unknown commercial Dungeness crab pot fishery (0.75), and Oregon Dungeness crab pot (0.75) (Table 1). The totals above represent minimum observed cases from opportunistic at-sea sightings or stranding records, except for bycatch estimates based on systematic observer program data. It is recognized that entanglement totals do not represent all cases due to incomplete detection of incidents and there is currently no method available to correct for the number of undetected entanglements. An effort is made where possible to account for this negative bias. For example, total entanglement mortality and serious injury in the WA/OR/CA sablefish pot fishery is parsed out into statistical estimates from observer program data and opportunistically-detected records derived from strandings and at-sea sightings linked to the same fishery. In this case, the annual statistical bycatch estimates and at-sea and stranding observations are nearly-equal, despite the fact that the latter category is uncorrected for undetected cases. The sum of observer program-derived statistical estimates corrected for unobserved cases (9.7) and opportunistically-detected at-sea sightings and strandings (68.75) in Table 1 totals 78.4 whales, or an annual average over the period of 2012-2016 of 15.7 whales.

Table 1. Summary of observed and estimated incidental mortality and serious injury of humpback whales (California/Oregon/Washington stock) for commercial fisheries that are likely to take this species (Carretta *et al.*, 2018a, 2018b, Jannot *et al.* 2018). Mean annual takes are based on 2012-2016 data unless noted otherwise. Serious injuries may include prorated serious injuries with values less than one (NOAA 2012), thus the sum of serious injury and mortality may not be a whole number.

Fishery Name	Year(s)	Data Type	Percent Observer Coverage	Observed Mortality + serious injury	Estimated mortality and serious injury (CV)	Mean Annual mortality and serious injury (CV)
WA/OR/CA Sablefish Pot	2012	observer	35%	0	0.12 (n/a)	0.32 (n/a)
	2013		14%	0	0.19 (n/a)	
	2014		31%	1	1.15 (n/a)	
	2015		61%	0	0.08 (n/a)	
	2016		71%	0	0.06 (n/a)	
WA/OR/CA Sablefish Pot	2012-2016	Strandings / sightings	n/a	0 + 1.5	n/a	≥ 0.30 (n/a)
Open Access Fixed Gear Pot	2012	observer	7%	0	1.12 (n/a)	1.58 (n/a)
	2013		9%	0	0.67 (n/a)	
	2014		8%	0	1.3 (n/a)	
	2015		6%	0	2.03 (n/a)	

Fishery Name	Year(s)	Data Type	Percent Observer Coverage	Observed Mortality + serious injury	Estimated mortality and serious injury (CV)	Mean Annual mortality and serious injury (CV)
	2016		7%	1	2.76 (n/a)	
CA swordfish and thresher shark drift gillnet fishery	2012-2016	observer	23%	0	0.2 (2.5)	0.04 (2.5)
CA halibut/white seabass and other species large mesh (≥3.5") set gillnet fishery	2012-2016	observer	<10%	0	0	0 (n/a)
CA spot prawn pot	2012-2016	Strandings / sightings	n/a	0 + 2.5	n/a	≥ 0.50 (n/a)
Unspecified pot or trap fisheries (includes generic 'Dungeness' crab gear not attributed to a specific state fishery)	2012-2016	Strandings / sightings	n/a	0 + 7.75	n/a	≥ 1.6 (n/a)
CA Dungeness crab pot	2012-2016	Strandings / sightings	n/a	1 + 15.75	n/a	≥ 3.4 (n/a)
OR Dungeness crab pot	2012-2016	Strandings / sightings	n/a	0 + 0.75	n/a	≥ 0.15 (n/a)
WA Dungeness crab pot	2012-2016	Strandings / sightings	n/a	0 + 0.75	n/a	≥ 0.15 (n/a)
unidentified fisheries (includes 'unidentified gillnet')	2012-2016	Strandings / sightings	n/a	3 + 35.75	n/a	≥ 7.75 (n/a)
Total Annual Takes						≥ 15.7 (n/a)

Gillnet (n= 3) and unidentified fisheries (n= 49) accounted for 52 interactions with humpback whales between 2012 and 2016 (Carretta *et al.* 2018a). Based on the proportion of humpback whale records where the type of fishing gear is positively identified, it is likely that most cases involving 'unidentified fisheries' represent pot and/or trap fisheries (Carretta *et al.* 2017a, 2018a). Three records involved dead whales. The remaining 49 records, once evaluated per the NMFS serious injury policy, resulted in four non-serious injuries and 35.75 serious injuries. The total annual mortality and serious injury due to unidentified and gillnet fisheries from 2012 to 2016 sightings reports is 38.75 whales. The 5-year annual mean serious injury and mortality due to unidentified fisheries during this period is therefore 38.75/ 5 = 7.75 whales.

Three humpback whale entanglements (all released alive) were observed in the CA swordfish drift gillnet fishery from 8,845 fishing sets monitored between 1990 and 2016 (Carretta *et al.* 2018b). Some opportunistic sightings of free-swimming humpback whales entangled in gillnets may originate from this fishery. The most recent model-based estimate of humpback whale bycatch in this fishery for 2012-2016 is 0.2 whales (CV=2.5), but it is estimated that only one-quarter of these entanglements represent serious injuries (Carretta *et al.* 2018b). The corresponding ratio estimate of bycatch for the same time period is zero (Carretta *et al.* 2018b). The model-based estimate is considered superior because it utilizes all 27 years of data for estimation, in contrast to the ratio estimate that uses only 2012-2016 data. The average annual estimated serious injury and mortality in the CA swordfish drift gillnet fishery is 0.04 whales 0.2 whales / 5 years).

Unidentified whales represent approximately 15% of entanglement cases along the U.S. West Coast, (Carretta 2018). Observed entanglements may lack species IDs due to rough seas, distance from whales, or a lack of cetacean identification expertise. In previous stock assessments, these unidentified entanglements were not assigned to species, which results in underestimation of entanglement risk, especially for commonly-entangled species. To remedy this negative bias, a cross-validated species identification model was developed from known-species entanglements ('model data'). The model is based on several variables (location + depth + season + gear type + sea surface temperature) collectively found to be statistically-significant predictors of known-species entanglement cases (Carretta 2018). The species model was used to assign species ID probabilities for 21 unidentified whale entanglement cases ('novel data') during 2012-2016. The sum of species assignment probabilities for this 5-year period result in an additional 14.4 humpback whale entanglements for 2012-2016. Unidentified whale entanglements typically involve

whales seen at-sea with unknown gear configurations that are prorated to represent 0.75 serious injuries per entanglement case. Thus it is estimated that at least 14.4 x 0.75 = 10.8 additional humpback serious injuries are represented from the 21 unidentified whale entanglement cases during 2012-2016, or 2.2 humpback whales annually.

Total commercial fishery serious injury and mortality of humpback whales for the period 2012-2016 is the sum of pot/trap fishery records (31.75), plus unidentified fishery records (38.75), plus estimates from the CA swordfish drift gillnet fishery (0.2), or 70.7 total whales. The mean annual serious injury and mortality (observed and estimated) from commercial fisheries during 2012-2016 is 78.4 whales / 5 years = 15.7 whales (Table 1). Most serious injury and mortality records from commercial fisheries reflect opportunistic stranding and at-sea sighting data and thus, represent minimum counts of impacts, for which no correction factor is currently available.

Despite an overall increase in the number of reported entanglements in recent years, increasing efforts to disentangle humpback whales from fisheries has led to an increase in the fraction of cases reported as non-serious injuries, due to the removal of gear from humpback whales that otherwise appear healthy. In the absence of human intervention, these records would have represented at least 14.75 additional serious injuries over the 5-year period 2012-2016, or an additional 2.9 humpback whales annually (Carretta *et al.* 2018a).

Ship Strikes

Thirteen humpback whales (8 deaths, 2.6 serious injuries, and 2 non-serious injuries) were reported struck by vessels between 2012 and 2016 (Carretta *et al.* 2018a). In addition, there was one serious injury to an unidentified large whale from a ship strike during this time (Carretta *et al.* 2018a). The observed average annual serious injury and mortality of humpback whales attributable to ship strikes during 2012-2016 is 2.1 whales per year (8 deaths, plus 2.6 serious injuries = 10.6 /5 years). Ship strike mortality was recently estimated for humpback whales in the U.S. West Coast EEZ (Rockwood *et al.* 2017), using an encounter theory model (Martin *et al.* 2016) that combined species distribution models of whale density (Becker *et al.* 2016), vessel traffic characteristics (size + speed + spatial use), along with whale movement patterns obtained from satellite-tagged animals in the region to estimate whale/vessel interactions that would result in mortality. The estimated number of annual ship strike deaths was 22 humpback whales, though this includes only the period July – November when whales are most likely to be present in the U.S. West Coast EEZ and the time of year that overlaps with cetacean habitat models generated from line-transect surveys (Becker *et al.* 2016, Rockwood *et al.* 2017). This estimate was based on an assumption of a moderate level of vessel avoidance (55%) by humpback whales, as measured by the behavior of satellite-tagged whales in the presence of vessels (McKenna *et al.* 2015). The estimated mortality of 22 humpback whales annually due to ship strikes represents approximately 0.7% of the estimated population size of the stock (22 deaths / 2,900 whales). The results of Rockwood et al. (2017) also include a no-avoidance encounter model that results in a worst-case estimate of 48 humpback whale ship strike deaths per year, which represents 1.6% of the estimated population size. The number of vessel strikes attributable to each breeding ground DPS (Central America, Mexico) are unknown. Using the moderate level of avoidance model from Rockwood *et al.* (2017), estimated vessel strike deaths of humpback whales are 22 per year. A comparison of average annual vessel strikes reported over the period 2012-2016 (2.6/yr) *versus* estimated vessel strikes (22/yr) indicates that the rate of reporting for humpback whale vessel strikes is approximately 12%.

Vessel traffic within the U.S. West Coast EEZ represents a ship strike threat to all large whale populations (Redfern *et al.* 2013, Moore *et al.* 2018). However, a complex of vessel types, speeds, and destination ports all contribute to variability in ship traffic and these factors may be influenced by economic and regulatory changes. For example, Moore *et al.* (2018) found that primary routes travelled by ships changed when emission control areas (ECAs) were established off the U.S. West Coast. They also found that large vessels typically reduced their speed by 3-6 kts in ECAs between 2008 and 2015. The speed reductions are thought to be a strategy to reduce operating costs associated with more expensive, cleaner burning fuels required within the ECAs. In contrast, Moore *et al.* (2018) noted that some vessels increased their speed when they transited longer routes to avoid the ECAs. Further research is necessary to understand how variability in vessel traffic affects ship strike risk and mitigation strategies.

Other human-caused mortality and serious injury

A humpback whale was entangled in a research wave rider buoy in 2014. The whale is estimated to have been entangled for 3 weeks and had substantial necrotic tissue around the caudal peduncle. Although the whale was fully disentangled, this animal was categorized as a serious injury because of the necrotic condition of the caudal peduncle and the possibility that the whale would lose its flukes due to the severity of the entanglement (NOAA 2012, Carretta *et al.* 2016, 2017a). Additionally, one humpback whale was entangled in 2015 in recreational Dungeness crab pot gear, resulting in a prorated serious injury (0.75) (Carretta *et al.* 2018a). The total number of serious injuries from marine moorings sources (1) and recreational fisheries (0.75) for 2012-2016 is 1.75 whales, or 0.35 whales annually.

Habitat Concerns

Increasing levels of anthropogenic sound in the world's oceans (Andrew *et al*. 2002), such as those produced by shipping traffic, or LFA (Low Frequency Active) sonar, is a habitat concern for whales, as it can reduce acoustic space used for communication (masking) (Clark *et al.* 2009, NOAA 2016c). This can be particularly problematic for baleen whales that may communicate using low-frequency sound (Erbe 2016). Based on vocalizations (Richardson *et al*. 1995; Au *et al*. 2006), reactions to sound sources (Lien *et al*. 1990, 1992; Maybaum 1993), and anatomical studies (Hauser *et al*. 2001), humpback whales also appear to be sensitive to mid-frequency sounds, including those used in active sonar military exercises (U.S. Navy 2007).

STATUS OF STOCK

Approximately 15,000 humpback whales were taken from the North Pacific from 1919 to 1987 (Tonnessen and Johnsen 1982), and, of these, approximately 8,000 were taken from the west coast of Baja California, California, Oregon and Washington (Rice 1978), presumably from this stock. Shore-based whaling apparently depleted the humpback whale stock off California twice: once prior to 1925 (Clapham *et al*. 1997) and again between 1956 and 1965 (Rice 1974). There has been a prohibition on taking humpback whales since 1966. As a result of commercial whaling, humpback whales were listed as "endangered" under the Endangered Species Conservation Act of 1969. This protection was transferred to the Endangered Species Act (ESA) in 1973. The humpback whale ESA listing final rule (81 FR 62259, September 8, 2016) established 14 distinct population segments (DPSs) with different listing statuses. The CA/OR/WA humpback whale stock primarily includes whales from the endangered Central American DPS and the threatened Mexico DPS, plus a small number of whales from the non-listed Hawaii DPS. Humpback whale stock delineation under the MMPA is currently under review, and until this review is complete, the CA/OR/WA stock will continue to be considered endangered and depleted for MMPA management purposes (e.g., selection of a recovery factor, stock status). Consequently, the California/Oregon/ Washington stock is automatically considered as a "strategic" stock under the MMPA. The observed annual mortality and serious injury due to commercial fishery entanglements in 2012-2016 (15.7/yr) (Table 1), non-fishery entanglements (0.2/yr), recreational crab pot fisheries (0.15/yr), serious injuries assigned to unidentified whale entanglements (2.2/yr), plus observed ship strikes (2.1/yr), equals 20.4 animals, which exceeds the PBR of 16.7 animals. *Estimated* vessel strike deaths are 22 humpback whales annually (Rockwood *et al*. 2017), but this does not include vessel strikes that occur outside of the U.S. West Coast EEZ. The total observed + estimated annual human-caused mortality of humpback whales is the sum of commercial fishery (15.7) + recreational fishery (0.15) + non-fishery entanglements (0.2/yr) + serious injuries assigned to unidentified whale entanglements (2.2/yr) + vessel strikes (22/yr) or 40.2 humpback whales annually. This exceeds the range-wide PBR estimate of 33.4 humpback whales. Other than the vessel strike estimates, most data on human-caused serious injury and mortality for this population is based on opportunistic stranding and at-sea sighting data and represents a minimum count of total impacts. There is currently no estimate of the fraction of anthropogenic injuries and deaths to humpback whales that are undocumented on the U.S. west coast, but for vessel strikes, a comparison of observed vs. estimated annual vessel strikes suggests that approximately 12% of vessel strikes are documented. In addition to incidents involving humpback whales, an additional number of 'unidentified whales' (n=21) were seriously injured or killed between 2012-2016 (Carretta *et al*. 2018a). Prorating these unidentified entanglements to species results in an additional 10.8 serious injuries / deaths over this period (Carretta 2018). Based on strandings and at sea observations, observed annual humpback whale mortality and serious injury in commercial fisheries (15.7/yr) is greater than 10% of the PBR; therefore, total fishery mortality and serious injury is not approaching zero mortality and serious injury rate. The California/Oregon/Washington stock showed a long-term increase in abundance from 1990 through approximately 2008 (Figure 2), but more recent estimates through 2014 indicate a leveling-off of the population size (Calambokidis *et al.* 2017).

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