Revised 12/30/2020

HARBOR PORPOISE (*Phocoena phocoena*): Bering Sea Stock

NOTE – December 2015: In areas outside of Alaska, studies of harbor porpoise distribution have indicated that stock structure is likely more fine-scaled than is reflected in the Alaska Stock Assessment Reports. No data are available to define stock structure for harbor porpoise on a finer scale in Alaska. However, based on comparisons with other regions, it is likely that several regional and sub-regional populations exist. Should new information on harbor porpoise stocks become available, the harbor porpoise Stock Assessment Reports will be updated.

STOCK DEFINITION AND GEOGRAPHIC RANGE

In the eastern North Pacific Ocean, the harbor porpoise ranges from Point Barrow and offshore areas of the Chukchi Sea, along the Alaska coast, and down the west coast of North America to Point Conception, California (Gaskin 1984, Christman and Aerts 2015). Harbor porpoise primarily frequent the coastal waters of the Gulf of Alaska and Southeast Alaska (Dahlheim et al. 2000, 2009), typically occurring in waters less than 100 m deep; however, occasionally they occur in deeper waters (Hobbs and Waite 2010). The average density of harbor porpoise in Alaska appears to be less than that reported off the west coast of the continental U.S., although areas of high densities do occur in Glacier Bay and the adjacent waters of Icy Strait, Yakutat Bay, the Copper River Delta, Sitkalidak Strait (Dahlheim et al. 2000, 2009, 2015; Hobbs and Waite 2010), and lower Cook Inlet (Shelden et al. 2014).

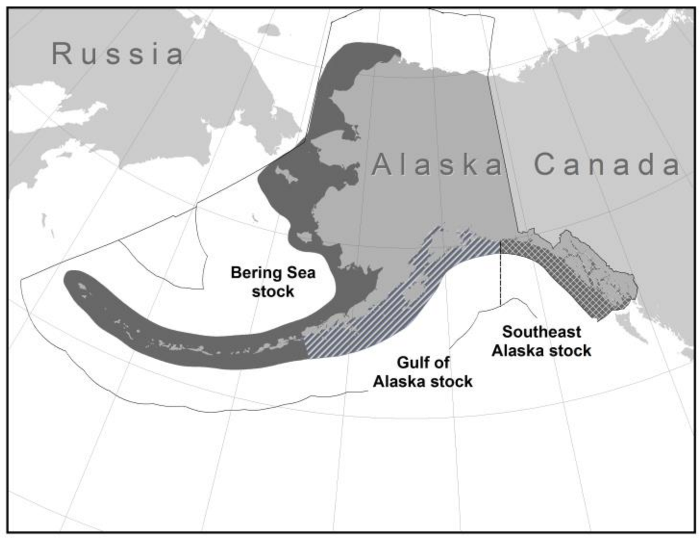

Figure 1. Approximate distribution of harbor porpoise in Alaska waters. The U.S. Exclusive Economic Zone is delineated by a black line.

Stock discreteness in the eastern North Pacific was analyzed using mitochondrial DNA from samples collected along the west coast (Rosel 1992), including one sample from Alaska. Two distinct mitochondrial DNA groupings or clades were found. One clade is present in California, Washington, British Columbia, and the single sample from Alaska (no samples were available from Oregon), while the other is found only in California and Washington. Although these two clades are not geographically distinct by latitude, the results may indicate a low mixing rate for harbor porpoise along the west coast of North America. Investigation of pollutant loads in harbor porpoise ranging from California to the Canadian border also suggests restricted harbor porpoise movements (Calambokidis and Barlow 1991); these results are reinforced by a similar study in the northwest Atlantic (Westgate and Tolley 1999). Further genetic testing of the same samples mentioned above, along with a few additional samples including eight more from Alaska, found differences between some of the four areas investigated, California, Washington, British Columbia, and Alaska, but inference was limited by small sample size (Rosel et al. 1995). Those results demonstrate that harbor porpoise along the west coast of North America are not panmictic and that movement is sufficiently restricted to result in genetic differences (Walton 1997). This is consistent with low movement suggested by genetic analysis of harbor porpoise specimens from the North Atlantic (Rosel et al. 1999). In a genetic analysis of small-scale population structure of eastern North Pacific harbor porpoise, Chivers et al. (2002) included 30 samples from Alaska, 16 of which were from the Copper River Delta, 5 from Barrow, 5 from Southeast Alaska, and 1 sample each from St. Paul, Adak, Kodiak, and Kenai. Unfortunately, no conclusions could be drawn about the genetic structure of harbor porpoise within Alaska because of the insufficient number of samples from each region. Accordingly, harbor porpoise stock structure in Alaska is defined by geographic areas.

Although it is difficult to determine the true stock structure of harbor porpoise populations in the northeast Pacific, from a management standpoint it is prudent to assume that regional populations exist and that they should be managed independently (Rosel et al. 1995, Taylor et al. 1996). Based on the above information, three harbor porpoise stocks in Alaska are currently specified, recognizing that the boundaries of these three stocks are inferred primarily based upon geography or perceived areas of low porpoise density: 1) the Southeast Alaska stock - occurring from Dixon Entrance to Cape Suckling, including inland waters, 2) the Gulf of Alaska stock - occurring from Cape Suckling to Unimak Pass, and 3) the Bering Sea stock - occurring throughout the Aleutian Islands and all waters north of Unimak Pass (Fig. 1). There have been no analyses to assess the validity of these stock designations and research to assess substructure is ongoing only within the Southeast Alaska stock (see the Southeast Alaska harbor porpoise Stock Assessment Report and Parsons et al. 2018).

Harbor porpoise have been sighted during seismic surveys of the Chukchi Sea conducted in the nearshore and offshore waters by the oil and gas industry between July and November from 2006 to 2014 (Funk et al. 2010, 2011; Reiser et al. 2011; Aerts et al. 2013; Christman and Aerts 2015). Harbor porpoise were the third most frequently sighted cetacean species in the Chukchi Sea, after gray and bowhead whales, with most sightings occurring during the September to October monitoring period (Funk et al. 2011, Reiser et al. 2011, Christman and Aerts 2015). Over the 2006 to 2010 industry-sponsored monitoring period, six sightings of 11 harbor porpoise were reported in the Beaufort Sea, suggesting harbor porpoise regularly occur in both the Chukchi and Beaufort seas (Funk et al. 2011).

POPULATION SIZE

In June and July of 1999, an aerial survey covered the waters of Bristol Bay. Two types of corrections were needed for these aerial surveys: one to correct for animals available but not counted because they were missed by the observer (perception bias) and another to correct for porpoise that were submerged and not available at the surface (availability bias). The 1999 survey resulted in an observed abundance estimate for the Bering Sea harbor porpoise stock of 16,289 (coefficient of variation (CV) = 0.13: Hobbs and Waite 2010), which includes the perception bias correction factor (1.337; CV = 0.06) obtained during the survey using an independent belly window observer. Laake et al. (1997) estimated the availability bias correction factor for aerial surveys of harbor porpoise in Puget Sound to be 2.96 (CV = 0.18); the use of this correction factor is preferred to other published correction factors (e.g., Barlow et al. 1988, Calambokidis et al. 1993) because it is an empirical estimate of availability bias. Applying the Laake et al. (1997) correction factor, the corrected abundance estimate is 48,215 porpoise (16,289 × 2.96 = 48,215; CV = 0.22). The estimate for 1999 can be considered conservative for that time period, as the surveyed areas did not include known harbor porpoise range along the Aleutian Island chain, near the Pribilof Islands, or in the waters north of Cape Newenham (approximately 59°N).

Shipboard visual line-transect surveys for cetaceans were conducted on the eastern Bering Sea shelf in association with pollock stock assessment surveys in June and July of 1999, 2000, 2002, 2004, 2008, and 2010 (Moore et al. 2002; Friday et al. 2012, 2013). The entire range of the survey was completed in three of those years (2002, 2008, and 2010) and harbor porpoise abundance estimates were calculated for each of these surveys as 1,971 porpoise (CV = 0.46) for 2002, 4,056 (CV = 0.40) for 2008, and 833 (CV = 0.66) for 2010 (Friday et al. 2013). The abundance estimates provided above assume the probability of detection directly on the trackline to be unity (g(0) = 1). This assumption is typically violated in harbor porpoise surveys because observers tend to miss animals on the survey trackline. Because no estimate of g(0) was computed for the Bering Sea survey in Friday et al. (2013), their abundance estimates were corrected using an averaged estimate of g(0) (weighted by the inverse of the CV) from ship surveys for harbor porpoise in other areas off the U.S. coast (g[0] = 0.71, CV = 0.052: Barlow 1988; Palka 1995, 2000). Using this value for g(0), corrected abundance estimates for harbor porpoise in the Bering Sea are 2,276 porpoise (CV = 0.46) for 2002, 5,713 (CV = 0.40) for 2008, and 1,173 (CV = 0.66) for 2010. The 2008 ship survey estimate is used below to calculate N_{MIN} because the spatial coverage during the year of the most recent estimate (2010) was limited due to poor weather conditions and missed many habitats where harbor porpoise are known to occur in the Bering Sea (e.g., Fig. 7 in Friday et al. 2013).

Minimum Population Estimate

The minimum population estimate (N_{MIN}) for this stock is calculated using Equation 1 from the potential biological removal (PBR) guidelines (NMFS 2016): $N_{MIN} = N/\exp(0.842\times[\ln(1+[CV(N)]^2)]^{½})$. Using the 2008 ship survey partial population estimate (N) of 5,713 and its associated CV of 0.40, N_{MIN} for the Bering Sea stock of harbor porpoise is 4,130. However, this is an underestimate for the entire stock because it is based on a survey that covered only a small portion of the stock’s range. Because the survey data are more than 8 years old, N_{MIN} is considered unknown.

Current Population Trend

There is no reliable information on trends in abundance for the Bering Sea stock of harbor porpoise.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

A reliable estimate of the maximum net productivity rate (R_{MAX}) is not available for this stock of harbor porpoise. Until additional data become available, the default cetacean maximum theoretical net productivity rate of 4% will be used (NMFS 2016).

POTENTIAL BIOLOGICAL REMOVAL

PBR is defined as the product of the minimum population estimate, one-half the maximum theoretical net productivity rate, and a recovery factor: PBR = $N_{MIN} \times 0.5R_{MAX} \times F_R$. The recovery factor ($F_R$) for this stock is 0.5, the value for cetacean stocks with unknown population status (NMFS 2016). However, the 2016 guidelines for preparing Stock Assessment Reports (NMFS 2016) state that abundance estimates older than 8 years should not be used to calculate PBR due to a decline in confidence in the reliability of an aged abundance estimate. Therefore, the PBR for this stock is considered undetermined.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Information for each human-caused mortality, serious injury, and non-serious injury reported for NMFS-managed Alaska marine mammals between 2014 and 2018 is listed, by marine mammal stock, in Young et al. (2020); however, only the mortality and serious injury data are included in the Stock Assessment Reports. The minimum estimated mean annual level of human-caused mortality and serious injury for Bering Sea harbor porpoise between 2014 and 2018 is 0.4 porpoise in subsistence fisheries; however, this estimate is considered a minimum because most of the fisheries likely to interact with this stock of harbor porpoise have never been monitored. Potential threats most likely to result in direct human-caused mortality or serious injury of this stock include entanglement in fishing gear.

Fisheries Information

Information for federally-managed and state-managed U.S. commercial fisheries in Alaska waters is available in Appendix 3 of the Alaska Stock Assessment Reports (observer coverage) and in the NMFS List of Fisheries (LOF) and the fact sheets linked to fishery names in the LOF (observer coverage and reported incidental takes of marine mammals: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-protection-act-list-fisheries, accessed December 2020).

Harbor porpoise mortality and serious injury is known to occur in gillnet (both drift gillnet and set gillnet) and trawl fisheries. While much of the trawl fleet has observer coverage, there are several gillnet fisheries in the Bering Sea that do not. Given the occurrence of fishery-caused mortality and serious injury of harbor porpoise in other gillnet fisheries in Alaska, it is likely that gillnet fisheries within the range of this stock also incur mortality and serious injury of harbor porpoise.

No mortality or serious injury of Bering Sea harbor porpoise was observed incidental to U.S. federal commercial fisheries between 2014 and 2018. However, a complete estimate of the total mortality and serious injury rate incidental to U.S. commercial fisheries is not available for this stock because of the absence of an observer program for all of the salmon and herring fisheries operating within the range of the stock.

Reports to the NMFS Alaska Region marine mammal stranding network of harbor porpoise entangled in fishing gear or with injuries caused by interactions with gear are another source of mortality and serious injury data (Table 1; Young et al. 2020). In 2018, two harbor porpoise entanglements were reported in the Kuskokwim, Yukon, Norton Sound, Kotzebue subsistence salmon gillnet fishery, resulting in a minimum mean annual mortality and serious injury rate of 0.4 Bering Sea harbor porpoise in this subsistence fishery between 2014 and 2018 (Table 1; Young et al. 2020). This mortality and serious injury estimate results from an actual count of verified human-caused deaths and serious injuries and is a minimum because not all entangled animals strand nor are all stranded animals found, reported, or have the cause of death determined.

Table 1. Summary of incidental mortality and serious injury of Bering Sea harbor porpoise, by year and type, reported to the NMFS Alaska Region marine mammal stranding network between 2014 and 2018 (Young et al. 2020).

Cause of injury	2014	2015	2016	2017	2018	Mean annual mortality
Entangled in Kuskokwim, Yukon, Norton Sound, Kotzebue subsistence salmon gillnet	0	0	0	0	2	0.4
Total in subsistence fisheries						0.4

Alaska Native Subsistence/Harvest Information

Subsistence hunters in Alaska have not been reported to hunt from this stock of harbor porpoise; however, when porpoise are caught incidental to subsistence or commercial fisheries, subsistence hunters may claim the carcass for subsistence use (R. Suydam, North Slope Borough, pers. comm.).

STATUS OF STOCK

Bering Sea harbor porpoise are not designated as depleted under the Marine Mammal Protection Act or listed as threatened or endangered under the Endangered Species Act. The minimum population estimate for this stock is an underestimate for the entire stock because it is based on a survey that covered only a small portion of the stock's range. Because the existing estimates are more than 8 years old, N_{MIN} is unknown and the PBR level is undetermined. Because the PBR is undetermined and most of the fisheries likely to interact with this stock have never been observed, it is unknown if the minimum estimate of the mean annual mortality and serious injury rate (0.4 porpoise from stranding data) in U.S. commercial fisheries can be considered insignificant and approaching a zero mortality and serious injury rate. NMFS considers this stock strategic because the level of mortality and serious injury would likely exceed the PBR level for this stock if we had accurate information on stock structure, a newer abundance estimate, and complete observer coverage. Population trends and status of this stock relative to its Optimum Sustainable Population are unknown.

There are key uncertainties in the assessment of the Bering Sea stock of harbor porpoise. This stock likely comprises multiple, smaller stocks based on analogy with harbor porpoise populations that have been the focus of specific studies on stock structure. The most recent surveys were more than 8 years ago and covered only a small portion of the stock's range, so N_{MIN} is unknown and the PBR level is undetermined. Several commercial fisheries overlap with the range of this stock and most have never been observed; thus, the estimate of commercial fishery mortality and serious injury is expected to be a minimum estimate. Coastal subsistence fisheries will occasionally cause incidental mortality or serious injury of a harbor porpoise; tracking these subsistence takes is challenging because there is no reporting mechanism. Estimates of human-caused mortality and serious injury from stranding data are underestimates because not all animals strand nor are all stranded animals found, reported, or have the cause of death determined.

HABITAT CONCERNS

Harbor porpoise are found over the shelf waters of the southeastern Bering Sea (Dahlheim et al. 2000, Hobbs and Waite 2010). In the nearshore waters of this region, harbor porpoise are vulnerable to physical modifications of nearshore habitats resulting from urban and industrial development (including waste management and nonpoint source runoff) and activities such as construction of docks and other over-water structures, filling of shallow areas, dredging, and noise (Linnenschmidt et al. 2013). Climate change and changes to sea-ice coverage may be opening up new habitats, or resulting in shifts in distribution, as evident by an increase in the number of reported sightings of harbor porpoise in the Chukchi Sea (Funk et al. 2010, 2011). Shipping and noise from oil and gas activities may also be a habitat concern for harbor porpoise, particularly in the Chukchi Sea.

Algal toxins are a growing concern in Alaska marine food webs, in particular the neurotoxins domoic acid and saxitoxin. While saxitoxin was not detected in harbor porpoise samples collected in Alaska, domoic acid was found in 40% (2 of 5) of the samples and, notably, in maternal transfer to a fetus (Lefebvre et al. 2016).

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DALL'S PORPOISE (*Phocoenoides dalli*): Alaska Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Dall's porpoise are widely distributed across the entire North Pacific Ocean (Fig. 1). They are found over the continental shelf adjacent to the slope and over deep (2,500+ m) oceanic waters (Hall 1979). They have been sighted throughout the North Pacific as far north as 65°N (Buckland et al. 1993) and as far south as 28°N in the eastern North Pacific (Leatherwood and Fielding 1974). The only apparent distribution gaps in Alaska waters are upper Cook Inlet and the shallow eastern flats of the Bering Sea. Throughout most of the eastern North Pacific they are present during all months of the year, although there may be seasonal onshore-offshore movements along the west coast of the continental U.S. (Loeb 1972, Leatherwood and Fielding 1974) and winter movements of populations out of areas with ice such as Prince William Sound (Hall 1979).

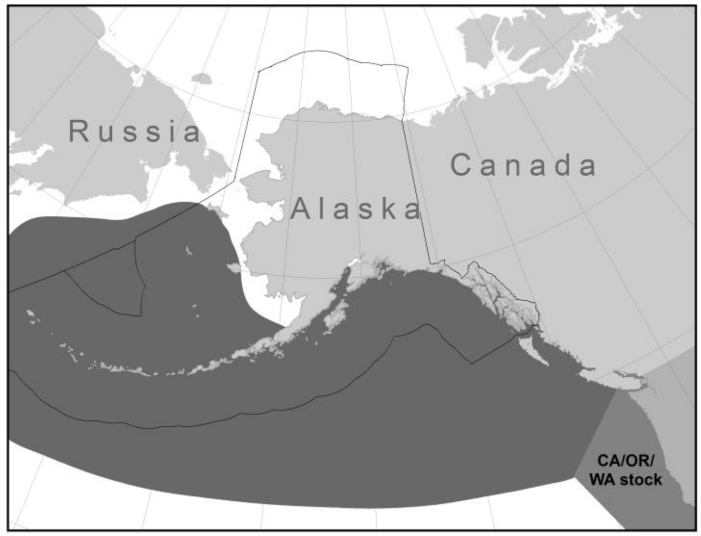

Figure 1. Approximate distribution of Dall's porpoise in the eastern North Pacific Ocean (dark shaded area). The Alaska stock is defined as the portion of the distribution in Alaska waters. The U.S. Exclusive Economic Zone is delineated by the solid black line.

Surveys on the eastern Bering Sea shelf and slope to the 1,000 m isobath in 1999, 2000, 2002, 2004, 2008, and 2010 provided information about the distribution and relative abundance of Dall's porpoise in that area (Moore et al. 2002; Friday et al. 2012, 2013). Dall's porpoise were sighted on the shelf and slope in waters deeper than 100 m in 2002, 2008, and 2010 with greater densities at the shelf break than in shallower waters (Friday et al. 2013). Ship surveys in the northeast Gulf of Alaska in 2013 and 2015 recorded Dall's porpoise throughout the study area, including the continental shelf, the slope, offshore waters, and around seamounts. Higher densities were observed on the shelf and slope (Rone et al. 2017).

The following information was considered in classifying stock structure based on the Dizon et al. (1992) phylogeographic approach: 1) Distributional data: geographic distribution continuous; 2) Population response data: differential timing of reproduction between the Bering Sea and western North Pacific; 3) Phenotypic data: unknown; and 4) Genotypic data: unknown. The stock structure of eastern North Pacific Dall's porpoise is not adequately understood at this time; however, based on patterns of stock differentiation in the western North Pacific, where they have been more intensively studied, it is expected that separate stocks will emerge when data become available (Perrin and Brownell 1994). Based primarily on the population response data (Jones et al. 1986) and preliminary genetic analyses (Winans and Jones 1988), a delineation between Bering Sea and western North Pacific stocks has been recognized. However, similar data are not available for the eastern North Pacific; thus, one stock of Dall's porpoise is currently recognized in Alaska waters. Dall's porpoise along the west coast of the continental U.S. from California to Washington comprise a separate stock and are reported in the Stock Assessment Reports for the U.S. Pacific Region.

POPULATION SIZE

Data collected from vessel surveys, performed by both U.S. fishery observers and U.S. researchers from 1987 to 1991, were analyzed to provide population estimates of Dall's porpoise throughout the North Pacific and the Bering Sea (Hobbs and Lerczak 1993). The quality of data used in analyses was determined by the procedures recommended by Boucher and Boaz (1989). Survey effort was not well distributed throughout the U.S. Exclusive Economic Zone (EEZ) in Alaska and, as a result, Bristol Bay and the northern Bering Sea received little survey effort. Only three sightings were reported between 1987 and 1991 in this area by Hobbs and Lerczak (1993), resulting in an estimate of 9,000 porpoise (CV = 0.91). In the U.S. EEZ north and south of the Aleutian Islands, Hobbs and Lerczak (1993) reported an estimated abundance of 302,000 porpoise (CV = 0.11), whereas, for the Gulf of Alaska EEZ, they reported 106,000 (CV = 0.20). Combining these three estimates (9,000 + 302,000 + 106,000) results in a total abundance estimate of 417,000 (CV = 0.097) for the Alaska stock of Dall's porpoise. Turnock and Quinn (1991) estimate that abundance estimates of Dall's porpoise are inflated by as much as five times because of vessel attraction behavior. Therefore, a corrected population estimate from 1987-1991 is 83,400 (417,000 × 0.2) for this stock. Because surveys are more than 8 years old, there are no reliable abundance estimates for the entire Alaska stock of Dall's porpoise.

Sighting surveys for cetaceans were conducted during NMFS pollock stock assessment surveys in 1999, 2000, 2002, 2004, 2008, and 2010 on the eastern Bering Sea shelf (Moore et al. 2002; Friday et al. 2012, 2013). The entire study area of the survey, which corresponded to only a fraction of the range of the Alaska stock, was fully covered in three of those years (2002, 2008, and 2010). Dall's porpoise estimates were calculated for each of these surveys (Friday et al. 2013). The abundance estimates were 35,303 porpoise (CV = 0.53) in 2002, 14,543 (CV = 0.32) in 2008, and 11,143 (CV = 0.32) in 2010. Although the 2010 estimate is the lowest of the three years, it is not statistically different from the 2002 and 2008 estimates (Friday et al. 2013).

Vessel surveys were carried out in and around a Navy Maritime Activity/Training Area in the northwestern Gulf of Alaska to document abundance and density of cetaceans in 2013 and 2015 (Rone et al. 2017). The surveys covered different, but overlapping, areas in the two years and estimated Dall's porpoise abundance as 15,432 (CV = 0.28) in 2013 and 13,110 (CV = 0.22) in 2015.

Estimates of abundance for the NMFS pollock stock assessment surveys in the Bering Sea and the 2013/2015 vessel surveys in the Gulf of Alaska did not cover the whole range of the stock and were not corrected for animals missed on the trackline (perception bias) or for animals submerged when the ship passed (availability bias). These estimates are also uncorrected for potential biases from responsive movements (ship attraction), which is known to result in severe positive bias when calculating abundance of Dall's porpoise (Turnock and Quinn 1991). Therefore, these estimates are not used as minimum population estimates.

Minimum Population Estimate

The minimum population estimate (N_{MIN}) for this stock is calculated using Equation 1 from the potential biological removal (PBR) guidelines (Wade and Angliss 1997): $N_{MIN} = N/\exp(0.842\times[\ln(1+[CV(N)]^2)]^{½})$. However, because the abundance estimate for the entire stock is based on data older than 8 years, the N_{MIN} is considered unknown.

Current Population Trend

There is no reliable information on trends in abundance for the Alaska stock of Dall's porpoise.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

A reliable estimate of the maximum net productivity rate (R_{MAX}) is not available for the Alaska stock of Dall's porpoise. Until additional data become available, the cetacean maximum theoretical net productivity rate of 4% will be used (Wade and Angliss 1997). However, based on life-history analyses by Ferrero and Walker (1999), Dall's porpoise reproductive strategy is not consistent with the delphinid pattern on which the default maximum theoretical net productivity rate for cetaceans is based. In contrast to the delphinids, Dall's porpoise mature earlier and reproduce annually which suggests that a higher R_{MAX} may be warranted.

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: $PBR = N_{MIN} \times 0.5R_{MAX} \times F_R$. However, the 2016 guidelines for preparing Stock Assessment Reports (NMFS 2016) state that abundance estimates older than 8 years should not be used to calculate PBR due to a decline in confidence in the reliability of an aged abundance estimate. Therefore, the PBR for this stock is considered undetermined.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Information for each human-caused mortality, serious injury, and non-serious injury reported for NMFS-managed Alaska marine mammals in 2012-2016 is listed, by marine mammal stock, in Helker et al. (in press); however, only the mortality and serious injury data are included in the Stock Assessment Reports. The total estimated annual level of human-caused mortality and serious injury for the Alaska stock of Dall's porpoise in 2012-2016 is 38 Dall's porpoise in U.S. commercial fisheries (37 from observer data and 0.6 from fisherman self-reports). This estimate is considered a minimum because not all of the salmon and herring fisheries operating within the range of this stock have been observed. Potential threats most likely to result in direct human-caused mortality or serious injury of this stock include entanglement in fishing gear.

Fisheries Information

Information (including observer programs, observer coverage, and observed incidental takes of marine mammals) for federally-managed and state-managed U.S. commercial fisheries in Alaska waters is presented in Appendices 3-6 of the Alaska Stock Assessment Reports.

No mortality or serious injury of the Alaska stock of Dall's porpoise was observed incidental to federally-managed U.S. commercial fisheries in 2012-2016 (Breiwick 2013; MML, unpubl. data).

The state-managed Alaska Peninsula/Aleutian Islands salmon drift gillnet fishery was monitored by Alaska Marine Mammal Observer Program (AMMOP) observers in 1990 (Wynne et al. 1991). One Dall's porpoise mortality was observed, which extrapolated to an annual (total) incidental mortality and serious injury rate of 28 Dall's porpoise (Table 1). Although these observer data are dated, they are considered the best available data on mortality and serious injury levels in this fishery.

In 2012 and 2013, the AMMOP placed observers on independent vessels in the state-managed Southeast Alaska salmon drift gillnet fishery to assess mortality and serious injury of marine mammals. Areas around and adjacent to Wrangell and Zarembo Islands (ADF&G Districts 6, 7, and 8) were observed during the 2012-2013 program (Manly 2015). In 2012, one Dall's porpoise was seriously injured. Based on the one observed serious injury, 18 serious injuries were estimated for Districts 6, 7, and 8 in 2012, resulting in an estimated mean annual mortality and serious injury rate of 9 Dall's porpoise in 2012-2013 (Table 1). Since these three districts represent only a portion of the overall fishing effort in this fishery, we expect this to be a minimum estimate of mortality for the fishery. Note that the AMMOP has not observed the Southeast Alaska salmon drift gillnet fishery in the other districts; additionally, NMFS has not observed several other gillnet fisheries that are known to interact with this stock, therefore, the total estimated mortality and serious injury is unavailable. Combining the estimates from the Alaska Peninsula/Aleutian Islands salmon drift gillnet fishery (28) and the Southeast Alaska salmon drift gillnet fishery (9) results in an estimated average annual mortality and serious injury rate of 37 Dall's porpoise from this stock.

Table 1. Summary of incidental mortality and serious injury of the Alaska stock of Dall's porpoise due to U.S. commercial fisheries in 2012-2016 (or the most recent data available) and calculation of the mean annual mortality and serious injury rate (Wynne et al. 1991; Breiwick 2013; Manly 2015; MML, unpubl. data). Methods for calculating percent observer coverage are described in Appendix 6 of the Alaska Stock Assessment Reports.

Fishery name	Years	Data type	Percent observer coverage	Observed mortality	Estimated mortality	Mean estimated annual mortality
Southeast Alaska salmon drift gillnet (Districts 6, 7, 8)	2012 2013	obs data	6.4 6.6	1 0	18 0	9 (CV = 1.0)
Alaska Peninsula/Aleutian Is. salmon drift gillnet	1990	obs data	4	1	28	28 (CV = 0.585)
Minimum total estimated annual mortality						37 (CV = 0.505)

Mortality and serious injury of Dall's porpoise due to entanglements in Prince William Sound commercial salmon drift gillnet (1 in 2013), Southeast Alaska commercial salmon drift gillnet (1 in 2014 in District 15C), and Kodiak Island commercial salmon purse seine gear (1 in 2013) was reported by Marine Mammal Authorization Program (MMAP) fisherman self-reports in 2012-2016 (Table 2; Helker et al. in press). Because observer data are not available for these fisheries, this mortality and serious injury is used to calculate mean annual mortality and serious injury rates of 0.2 Dall's porpoise for each of these fisheries (Table 2). These mortality and serious injury estimates result from an actual count of verified human-caused deaths and serious injuries and are minimums because not all entangled animals strand or are self-reported nor are all stranded animals found, reported, or have the cause of death determined.

Table 2. Summary of Alaska Dall's porpoise mortality and serious injury, by year and type, reported to the NMFS Alaska Region marine mammal stranding network and by Marine Mammal Authorization Program (MMAP) fisherman self-reports in 2012-2016 (Helker et al. in press). Only cases of serious injury were recorded in this table; animals with non-serious injuries have been excluded.

Cause of injury	**2012**	**2013**	**2014**	**2015**	**2016**	**Mean annual mortality**
Entangled in Prince William Sound commercial salmon drift gillnet	0	1[a]	0	0	0	0.2
Entangled in Southeast Alaska commercial salmon drift gillnet (District 15C)	0	0	1[a]	0	0	0.2
Entangled in Kodiak Island commercial salmon purse seine gear	0	1[a]	0	0	0	0.2
Total in commercial fisheries						0.6

[a]MMAP fisherman self-report.

A complete estimate of the total mortality and serious injury incidental to U.S. commercial fisheries is unavailable for this stock because not all of the salmon and herring fisheries operating within the range of this stock have been observed. Based on observed mortality and serious injury in two commercial fisheries (Table 1) and by MMAP fisherman self-reports (Table 2), the minimum estimated mean annual mortality and serious injury rate incidental to commercial fisheries in 2012-2016 is 38 Dall's porpoise from this stock.

Alaska Native Subsistence/Harvest Information

There are no reports of subsistence take of Dall's porpoise in Alaska.

STATUS OF STOCK

Dall's porpoise are not designated as depleted under the Marine Mammal Protection Act or listed as threatened or endangered under the Endangered Species Act. The minimum abundance estimate for this stock is unknown because the most recent abundance estimate is more than 8 years old and so the PBR level is considered undetermined. Because the PBR is undetermined and fisheries observer coverage is limited and aged, it is unknown if the minimum estimate of the mean annual mortality and serious injury rate (38 porpoise) in U.S. commercial fisheries can be considered insignificant and approaching zero mortality and serious injury rate. The Alaska stock of Dall's porpoise is not classified as a strategic stock. Population trends and status of this stock relative to its Optimum Sustainable Population are unknown.

There are key uncertainties in the assessment of the Alaska stock of Dall's porpoise. The most recent surveys of the entire range of this stock were more than 8 years ago, so the related abundance estimates are not used to calculate an N_{MIN} and the PBR level is undetermined. There is no information on population trend. Several commercial fisheries overlap with the range of this stock and are not observed or have not been observed in a long time; thus, the estimate of commercial fishery mortality and serious injury is expected to be a minimum estimate. Estimates of human-caused mortality and serious injury from stranding data and fisherman self-reports are underestimates because not all animals strand or are self-reported nor are all stranded animals found, reported, or have the cause of death determined.

HABITAT CONCERNS

While the majority of Dall's porpoise are found throughout the North Pacific, there are also significant numbers found in shelf break and deeper nearshore areas. Thus, they are subject to a variety of habitat impacts. Of particular concern are nearshore areas, bays, channels, and inlets where some Dall's porpoise are vulnerable to physical modifications of nearshore habitats and noise (Linnenschmidt et al. 2013). Climate change and changes to sea-ice coverage may be opening up new habitats, or resulting in shifts in habitat, as evident by an increase in the number of reported sightings of Dall's porpoise in the Chukchi Sea (Funk et al. 2010, 2011). Shipping and noise from oil and gas activities may also be a habitat concern for Dall's porpoise, particularly in the Chukchi Sea.

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