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HARBOR PORPOISE (*Phocoena phocoena*): Southeast Alaska Stock

NOTE – March 2008: In areas outside of Alaska, studies of harbor porpoise distribution have shown that stock structure is more finely-scaled than is reflected in the Alaska Stock Assessment Reports. At this time, no data are available to define stock structure for harbor porpoise on a finer scale in Alaska. However, based on comparisons with other regions, smaller stocks are likely. 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, along the Alaska coast, and down the west coast of North America to Point Conception, California (Gaskin 1984). Harbor porpoise primarily frequent coastal waters and in the Gulf of Alaska and Southeast Alaska (Dahlheim et al. 2000, 2009), they occur most frequently in waters less than 100 m deep (Hobbs and Waite 2010). Within the inland waters of Southeast Alaska harbor porpoise distribution is clumped with greatest densities observed in the Glacier Bay/Icy Strait region and near Zarembo and Wrangell Islands and the adjacent waters of Sumner Strait (Dahlheim et al. 2009). 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, and Sitkalidak Strait (Dahlheim et al. 2000, Hobbs and Waite 2010). 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 8 more from Alaska, found significant genetic differences for three of the six pair-wise comparisons between the four areas investigated: California, Washington, British Columbia, and Alaska (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. This is consistent with low movement suggested by genetic analysis of harbor porpoise specimens from the North Atlantic (Rosel et al. 1999). Numerous stocks have been delineated with clinal differences over areas as small as the waters surrounding the British Isles (Walton 1997). In a molecular 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 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 insufficient samples. Accordingly, harbor porpoise stock structure in Alaska is unknown at this time.

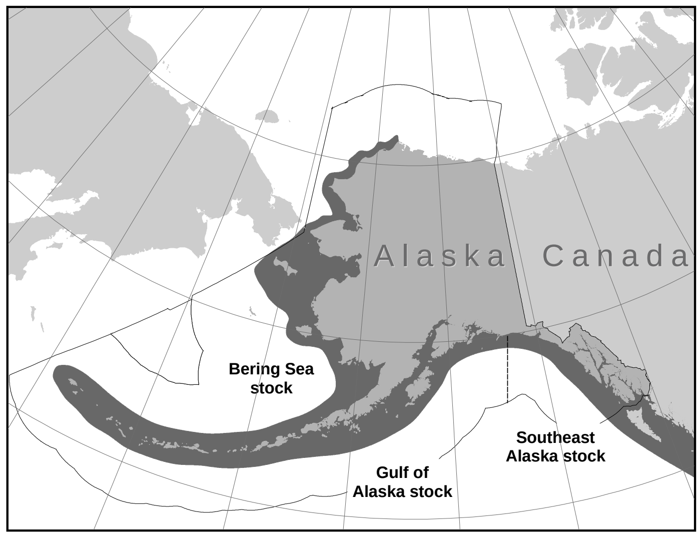

Figure 27. Approximate distribution of harbor porpoise in Alaska waters (shaded area).

Although it is difficult to determine the true stock structure of harbor porpoise populations in the northeast Pacific, from a management standpoint, it would be prudent to assume that regional populations exist and that they should be managed independently (Rosel et al. 1995, Taylor et al. 1996). For example, the porpoise concentrations found in Glacier Bay/Icy Strait and around the Zarembo/Wrangell Islands may represent different subpopulations (M. Dahlheim, pers comm. AFSC-NMML, 7600 Sand Point Way, NE, Seattle, WA 98115). The Alaska Scientific Review Group concurred that while the available data were insufficient to justify recognizing three biological stocks of harbor porpoise in Alaska, instead of only one, it did not recommend against the establishment of three management units in Alaska (DeMaster 1996, 1997). Accordingly, from the above information, three harbor porpoise stocks in Alaska were recommended, recognizing that the boundaries were set based on geography: 1) the Southeast Alaska stock - occurring from the northern border of British Columbia to Cape Suckling, Alaska, 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. 28).

POPULATION SIZE

In June and July of 1997, an aerial survey covering the waters of the eastern Gulf of Alaska from Dixon Entrance to Cape Suckling and offshore to the 1,000 fathom depth contour resulted in an observed abundance estimate of 3,766 (CV = 0.162) animals (Hobbs and Waite 2010). The inside waters of Southeast Alaska, Yakutat Bay, and Icy Bay were included in addition to the offshore waters. The total area surveyed across inside waters, was 106,087 km^2. Only a fraction of the small bays and inlets (< 5.5 km wide) of Southeast Alaska were surveyed and included in this abundance estimate, although the areas omitted represent only a small fraction of the total survey area. Two types of corrections were needed for these aerial surveys: one for observer perception bias and one to correct for porpoise availability/visibility at the surface. The observed abundance estimate includes a correction factor (1.56) for perception bias to correct for animals not counted because they were not observed. Laake et al. (1997) estimated the availability bias for aerial surveys of harbor porpoise in Puget Sound to be 2.96 (CV = 0.180); 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. The estimated corrected abundance from this survey is 11,146 (3,766 × 2.96; CV = 0.242) harbor porpoise for both the coastal and inside waters of Southeast Alaska (Hobbs and Waite, 2010).

In 1991, researchers from the AFSC National Marine Mammal Laboratory (NMML) initiated harbor porpoise studies aboard the NOAA Ship *John N. Cobb* with survey coverage throughout the inland waters of Southeast Alaska. Between 1991 and 1993, line-transect methodology was used to: 1) obtain population estimates of harbor porpoise, 2) establish a baseline for detecting trends in abundance, and 3) define overall distributional patterns and seasonality of harbor porpoise. Three surveys were carried out each year spanning spring, summer, and fall. Annual surveys were continued between 1994 and 2005; however, only two trips per year were conducted, one either in spring or summer and the other in fall. Although standard line-transect methodology was not used, all cetaceans observed were recorded. During this 12-year period, observers reported fewer overall encounters with harbor porpoise. To fully assess abundance and population trends for harbor porpoise, line-transect methodology was used during the survey cruises in 2006 and 2007 (Dahlheim et al., 2009) and again in 2010, 2011, and 2012. Methods were comparable to those employed during the early 1990s; however, these surveys only cover inland waters and not the entire range of this stock, and therefore are not used to calculate overall abundance. Within each year, greater densities of harbor porpoise were observed in Glacier Bay/Icy Strait region and near Zarembo and Wrangell Islands and adjacent waters of Sumner Strait. Total abundance in the entire study area was highest in 1991 (N = 1293, CV=0.15) and lowest in 2006 (N=485, CV=0.17) with 2010 values at N= 809, CV=0.19 (Dahlheim et al., in prep.). Abundance estimates for 2011 and 2012 are currently being analyzed. The overall abundance estimation assumes g(0) = 1 (the probability of detection directly on the track line), and therefore may be substantially biased low.

Minimum Population Estimate

For the Southeast Alaska stock of harbor porpoise, the minimum population estimate (N_{MIN}) for the aerial surveys is calculated using Equation 1 from the PBR Guidelines (Wade and Angliss 1997): $N_{MIN} = N/\exp(0.842*[\ln(1+[CV(N)]^2)]^{½})$. Using the population estimates (N) of 11,146 from 1997 and its associated CV (0.242), N_{MIN} for this stock is 9,116 (Hobbs and Waite 2010). However, because the survey data are now 15 years old, it is not considered a reliable minimum population estimate for calculating a PBR.

Current Population Trend

The abundance of harbor porpoise in Southeast Alaska was estimated for 1993 and 1997. Abundance estimates were determined from coastal aerial surveys from Prince William Sound to Dixon entrance, and from coastal and inshore aerial surveys in Southeast Alaska (Dahlheim et al. 2000). These surveys produced abundance estimates of 3,982 and 1,586 for the two areas, respectively, giving a combined estimate for the range of the Southeast Alaska harbor porpoise stock of 5,568. The 1997 estimate of 11,146 is double the 1993 estimate (Hobbs and Waite 2010); however, the 1997 surveys included inside waters of Southeast Alaska while the 1993 survey covered only coastal waters. These estimates are not directly comparable because the area surveyed in 1997 was larger than that in 1993, including inside waters, and because the 1997 abundance estimation involved direct calculation of perception bias, while the 1993 estimate used a correction factor based on some untested assumptions about observer behavior and visibility of harbor porpoise.

Preliminary analysis of harbor porpoise trend in Southeast Alaska, as reported in the 2012 SAR, indicated the population declined between 1991 and 2010. However, a new estimate shows that abundance in 2011 was comparable to those from the early 1990s, suggesting the decline was not as steep as previously thought. Data analysis from a new survey (2012) are underway, and a refined estimate of trends in abundance for Southeast Alaska harbor porpoise will be available next year.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

A reliable estimate of the maximum net productivity rate (R_{MAX}) is not currently available for the Southeast Alaska stock of harbor porpoise. Hence, until additional data become available, it is recommended that the cetacean maximum theoretical net productivity rate of 4% be employed (Wade and Angliss 1997).

POTENTIAL BIOLOGICAL REMOVAL

Under the 1994 reauthorized Marine Mammal Protection Act (MMPA), the potential biological removal (PBR) is defined as the product of the minimum population estimate, one-half the maximum theoretical net productivity rate, and a recovery factor: $PBR = N_{MIN} \times 0.5R_{MAX} \times F_R$. The recovery factor ($F_R$) for this stock is 0.5, the value for cetacean stocks with unknown population status (Wade and Angliss 1997). However, the SAR guidelines (Wade and Angliss 1997) 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 (NMFS 2005).

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

New Serious Injury Guidelines

NMFS updated its serious injury designation and reporting process, which uses guidance from previous serious injury workshops, expert opinion, and analysis of historic injury cases to develop new criteria for distinguishing serious 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*." Injury determinations for stock assessments revised in 2013 or later incorporate the new serious injury guidelines, based on the most recent 5-year period for which data are available.

Fisheries Information

Until 2003, there were three different federally-regulated commercial fisheries in Alaska that could have interacted with the Southeast Alaska stock of harbor porpoise. As of 2003, changes in fishery definitions in the List of Fisheries resulted in separating the GOA groundfish fisheries into many fisheries (69 FR 70094, 2 December 2004). This change does not represent a change in fishing effort, but provides managers with better information on the component of each fishery responsible for the incidental serious injury or mortality of marine mammal stocks in Alaska. These fisheries (Pacific cod longline, Pacific halibut longline, rockfish longline, and sablefish longline) were monitored for incidental mortality by fishery observers from 2007 to 2011, although observer coverage has been very low in the offshore waters of Southeast Alaska. No mortalities from this stock of harbor porpoise incidental to commercial groundfish fisheries have been observed. There is no consistent observer coverage for fisheries operating within the inside waters of Southeast Alaska. A reliable estimate of the mortality rate incidental to commercial fisheries is currently unavailable because of the near-absence of observer placements in Southeast Alaska fisheries. Therefore, it is unknown whether the kill rate is insignificant.

In 2007 and 2008, the Alaska Marine Mammal Observer Program (AMMOP) placed observers in four regions where the Yakutat salmon set gillnet fishery operates. These regions included the Alsek River area, the Situk area, the Yakutat Bay area, and the Kaliakh River and Tsiu River areas. Overall observer coverage was 5.3%

in 2007 and 7.6% in 2008. Based on observed mortalities during these two years, the estimated mean annual mortality of harbor porpoise in the Yakutat salmon set gillnet fishery was 21.8.

Table 36. Summary of incidental mortality of harbor porpoise from the Southeast Alaska stock due to commercial fisheries from 2007 and 2008 and calculation of the mean annual mortality rate (Manly 2009). Details of how percent observer coverage is measured are included in Appendix 6.

Fishery name	Years	Data type	Observer coverage	Observed mortality (in given yrs.)	Estimated mortality (in given yrs.)	Mean annual mortality
Yakutat salmon set gillnet	2007- 2008	obs data	5.3% 7.6%	1 3	16.1 27.5	21.8 (CV = 0.54)
Minimum total annual mortality						21.8 (CV = 0.54)

In 2011, an observer pilot study began within the inland waters of Southeast Alaska. This effort was based out of Wrangell and Petersburg Alaska. In 2012, the AMMOP placed observers on independent vessels to assess harbor porpoise mortality associated with gillnet fisheries. Areas around and adjacent to Wrangell and Zarembo Islands were targeted during the 2012 program however overall coverage was low. In 2012, there were no incidental takes of harbor porpoises reported through this observer program. This program will continue during the summer/fall of 2013.

There were 3 mortalities of harbor porpoises due to entanglement in fishing gear near Yakutat reported to the NMFS stranding network between 2007-2011. Two mortalities occurred in 2009, one in a set gillnet and one in a subsistence king salmon gillnet. A single porpoise entangled in an unspecified gillnet fishery was reported to the stranding network in 2010; this animal died after a disentanglement attempt by the fisher. The estimated minimum mean annual mortality of harbor porpoises in Southeast Alaska based on incidental catch reported to the stranding network is 0.6 for the 5-year period from 2007-2011.

Subsistence/Native Harvest Information

Subsistence hunters in Alaska have not been reported to take from this stock of harbor porpoise.

Other Mortality

Stranding data may also provide information on additional sources of potential human-related mortality. In 2008, there was one report to NOAA's Office of Law Enforcement of a harbor porpoise that had been found floating dead with multiple stab wounds and chaffing on fins suggesting possible net entanglement. This event is likely a result of fishery interaction; however, since the cause of death was not confirmed to be due to incidental catch in commercial fisheries, this human-caused mortality is being summarized within the "other mortality" section. The average minmum annual human-caused mortality and serious injury of Southeast Alaska harbor porpoises based on unconfirmed incidental catch and other human-caused activity reported to the stranding network is 0.2 for the 5-year period from 2007-2011.

STATUS OF STOCK

Harbor porpoise are not designated as "depleted" under the MMPA or listed as "threatened" or "endangered" under the Endangered Species Act. Because the PBR is unknown, the level of annual U.S. commercial fishery-related mortality that can be considered insignificant and approaching zero mortality and serious injury rate is unknown. The estimated annual level of human-caused mortality and serious injury based on observer data (21.8) and stranding data (0.8) is 22.6. Because the abundance estimates are 12 years old and the frequency of incidental mortality in commercial fisheries is not known, the Southeast Alaska stock of harbor porpoise is classified as a strategic stock. Population trends and status of this stock relative to OSP are currently unknown.

HABITAT CONCERNS

Most harbor porpoise are found in waters less than 100m in depth and often concentrate in near-shore areas and inland waters, including bays, tidal areas and river mouths (Dahlheim et al. 2009). As a result, harbor porpoise are more vulnerable to nearshore physical habitat modifications resulting from urban and industrial development, including waste management, nonpoint source runoff; and physical habitat modifications including construction of docks and other over water structures, filling of shallow areas and dredging.

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