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HARBOR PORPOISE (*Phocoena phocoena*): Gulf of 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). 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.

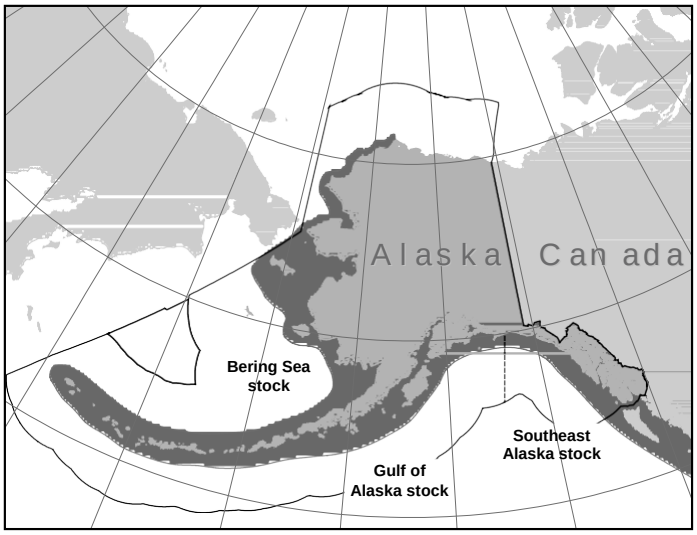

Figure 28. Approximate distribution of harbor porpoise in Alaska waters (shaded area).

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). The Alaska Scientific Review Group concurred that while the available data were insufficient to justify recognizing three biological stocks of harbor

porpoise in Alaska, 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 are 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 1998 an aerial survey covered the waters of the western Gulf of Alaska from Cape Suckling to Sutwik Island, offshore to the 1,000 fathom depth contour. 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 1998 survey resulted in an abundance estimate for the Gulf of Alaska harbor porpoise stock of 10,489 (CV = 0.115) animals (Hobbs and Waite 2010), which includes a correction factor (1.372; CV = 0.066) for perception bias to correct for animals that were present but not counted because they were not detected by observers. 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 estimate from the 1998 survey is 31,046 (10,489 × 2.96 = 31,046; CV = 0.214) (Hobbs and Waite 2010).

This latest estimate of abundance (31,046) is considerably higher than the estimate reported in the 1999 stock assessment (8,271; CV = 0.309), which was based on surveys in 1991-1993. This disparity largely stems from changes in the area covered by the two surveys and differences in harbor porpoise density encountered in areas added to, or dropped from, the 1998 survey, relative to the 1991-93 surveys. The survey area in 1998 (119,183 km^2) was greater than the area covered in the combined portions of the 1991, 1992, and 1993 surveys (106,600 km^2). The 1998 survey included selected bays, channels, and inlets in Prince William Sound, the outer Kenai Peninsula, the south side of the Alaska Peninsula, and the Kodiak Archipelago whereas the earlier survey included only open water areas. Several of the bays and inlets covered by the 1998 survey had higher harbor porpoise densities than observed in the open waters. In addition, the 1998 estimate provided by Hobbs and Waite (2010) empirically estimates the perception bias, and uses this in addition to the correction factor for availability bias. Finally, the 1998 estimate extrapolates available densities to estimate the number of porpoise which would likely be found in unsurveyed inlets within the study area. For these reasons, the 1998 survey result is probably more representative of the size of the Gulf of Alaska harbor porpoise stock.

Minimum Population Estimate

The minimum population estimate (N_{MIN}) for this stock 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 estimate (N) of 31,046 and its associated CV of 0.214, N_{MIN} for the Gulf of Alaska stock of harbor porpoise is 25,987 (Hobbs and Waite 2010). However, because the survey data are now 14 years old, it is not considered a reliable minimum population estimate for calculating a PBR.

Current Population Trend

At present, there is no reliable information on trends in abundance for the Gulf of Alaska stock of harbor porpoise since survey methods and results are not comparable.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

A reliable estimate of the maximum net productivity rate (R_{MAX}) is not currently available for the Gulf of 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 2005 revisions to 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

Prior to 2003, three different federally-managed commercial fisheries operating within the range of the Gulf of Alaska stock of harbor porpoise were monitored by NMFS observers for incidental take: Gulf of Alaska groundfish trawl, longline, and pot fisheries. As of 2003, changes in fishery definitions in the List of Fisheries resulted in separating these 3 GOA fisheries into 10 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 that is responsible for the incidental serious injury or mortality of marine mammal stocks in Alaska. No incidental mortality of harbor porpoise was observed in these fisheries. Observers also monitored the State of Alaska-managed Prince William Sound salmon drift gillnet fishery in 1990 and 1991, recording one mortality in 1990 and three mortalities in 1991. These mortalities extrapolated to 8 (95% CI: 1-23) and 32 (95% CI: 3-103) kills for the entire fishery, resulting in a mean kill rate of 20 (CV = 0.60) animals per year for 1990 and 1991. In 1990, observers boarded 300 (57.3%) of the 524 vessels that fished in the Prince William Sound salmon drift gillnet fishery, monitoring a total of 3,166 sets, or roughly 4% of the estimated number of sets made by the fleet (Wynne et al. 1991). In 1991, observers boarded 531 (86.9%) of the 611 registered vessels and monitored a total of 5,875 sets, or roughly 5% of the estimated sets made by the fleet (Wynne et al. 1992). The Prince William Sound salmon drift gillnet fishery has not been observed since 1991; therefore, no additional data are available for that fishery.

In 1999 and 2000, observers were placed on the state-managed Cook Inlet salmon set and drift gillnet vessels primarily because of the potential for these fisheries to cause incidental mortalities of beluga whales. One harbor porpoise mortality was observed in 2000 (Manly 2006). This single mortality extrapolates to an estimated mortality level of 31.2 for that year, and an average of 15.6 per year when averaged over the 2 years of observer data.

In 2002 and 2005, observers were placed on state-managed Kodiak Island set gillnet vessels. Two harbor porpoise mortalities were observed in both 2002 and 2005 in this fishery. These mortalities extrapolate to an estimated mortality level of 35.8 animals per year (Manly 2007).

Table 37. Summary of incidental mortality of harbor porpoise (Gulf of Alaska stock) due to fisheries from 1990 through 2005, and calculation of the mean annual mortality rate.

Fishery name	Years	Data type	Range of observer coverage	Observed mortality (in given yrs.)	Estimated mortality (in given yrs.)	Mean annual mortality
Prince William Sound salmon drift gillnet	1990-1991	obs data	4-5%	1, 3	8, 32	20 (CV = 0.60)
Cook Inlet salmon drift gillnet	1999 2000	obs data	1.6[1]% 3.6[1]%	0 1	0 31.2	15.6
Cook Inlet salmon set gillnet	1999 2000	obs data	0.16-1.1[1]% 2.7[1]%	0 0	0 0	0
Kodiak Island set gillnet	2002 2005	obs data	6.0% 4.9%	2 2	32.2 39.4	35.8 (CV = 0.68)
Minimum total annual mortality						71.4

[1] Manley, 2006.

Between 2007-2011, the NMFS stranding network received one report of a Gulf of Alaska harbor porpoise entanglement in Cook Inlet, a self-report by a fisher of a mortality that occurred in a commercial silver salmon fishing net off Kalgin Island in 2008. An estimate of annual mortality and serious injury occurring in the commercial Cook Inlet gillnet fisheries has been derived from observer data; therefore, this single event is considered to be accounted for in the extrapolated estimate of mortality for these fisheries.

Strandings of marine mammals with fishing gear attached or with injuries caused by interactions with fishing gear are another source of mortality data. In the period from 1990 to 1994, 12 harbor porpoise scarred with gillnet marks were discovered stranded in Prince William Sound (Copper River Delta; NMFS Alaska Regional Office, Marine Mammal Stranding Database). Based on scar patterns, temporal-spatial analysis, and necropsy findings, these strandings were likely the result of the Prince William Sound salmon drift gillnet fishery. The extrapolated (estimated) observer mortality for this fishery accounts for these mortalities, so they do not appear in Table 37. There were no confirmed reports of strandings of fishery-related mortalities of harbor porpoise in this area during 1999-2003.

A reliable estimate of the total number of mortalities incidental to commercial fisheries is unavailable because of the absence of observer placements in several salmon gillnet fisheries. However, the estimated minimum annual mortality rate incidental to U. S. commercial fisheries is 71.4 (Table 36).

Subsistence/Native Harvest Information

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

Other Mortality

Harbor porpoises occasionally become entangled in subsistence gillnets, although the frequency of occurrence is not well known. In 1995, two harbor porpoise were taken incidentally in subsistence gillnets, one near Homer Spit and the other near Port Graham.

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 level of human-caused mortality and serious injury is 71.4. Because the most recent abundance estimate is 14 years old and information on incidental harbor porpoise mortality in commercial fisheries is not well understood, the Gulf of 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 100 m in depth and they often concentrate in near-shore areas, bays, tidal areas, and river mouths. As a result, 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 and dredging.

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