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

NOTE – March 2008: In areas outside of Alaska, studies have shown that stock structure is more fine-scale than is reflected in the Alaska Stock Assessment Reports. At this time, no data are available to reflect stock structure for harbor porpoise 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). The harbor porpoise primarily frequents coastal waters and in the Gulf of Alaska and Southeast Alaska, they occur most frequently in waters less than 100 m in depth (Hobbs and Waite unpubl. ms). 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, Yakutat Bay, Copper River Delta, and Sitkalidak Strait (Dahlheim et al. 2000, Hobbs and Waite unpubl. ms). Stock discreteness in the eastern North Pacific was analyzed using mitochondrial DNA from samples collected along the West Coast (Rosel 1992), including 1 sample from Alaska. Two distinct mitochondrial DNA groupings or
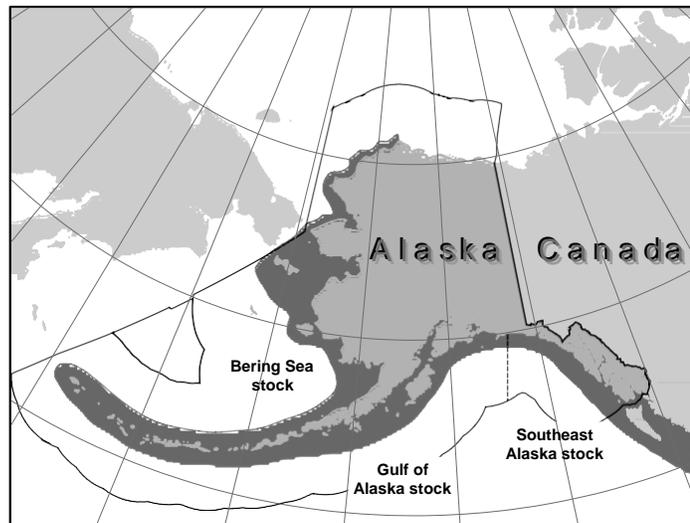
Figure 27. Approximate distribution of harbor porpoise in Alaska waters (shaded area).

clades exist. 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 data mentioned above along with a few additional samples, including 8 more from Alaska, found significant genetic differences for 3 of the 6 pair-wise comparisons between the four areas investigated: California, Washington, British Columbia, and Alaska (Rosel et al. 1995). These results demonstrate that harbor porpoise along the west coast of North America are not panmictic, and that movement is sufficiently restricted to evolve 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 one sample each from St. Paul, Adak, Kodiak, and Kenai. Unfortunately, no conclusions can be drawn about the genetic structure of harbor porpoise within Alaska because of insufficient samples. Accordingly, harbor porpoise stock structure in Alaska remains unknown at this time.

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

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1996, 1997). Accordingly, from the above information, three separate harbor porpoise stocks in Alaska are recommended, recognizing that the boundaries were set arbitrarily: 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. 29). Information concerning the six harbor porpoise stocks occurring along the west coast of the continental United States (Central California, Northern California, Oregon/Washington Coast, and Inland Washington) is in the Stock Assessment Reports for the Pacific Region.

POPULATION SIZE

In June and July of 1999, an aerial survey covering the waters of Bristol Bay resulted in an observed abundance estimate for the Bering Sea harbor porpoise stock of 16,289 (CV = 0.132; Hobbs and Waite unpubl. ms). The observed abundance estimate includes a correction factor (1.337; CV = 0.062) 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 estimate is 48,215 (16,289 $\times$ 2.96 = 48,215; CV = 0.223). The estimate for 1999 can be considered conservative, as the surveyed areas did not include known harbor porpoise range near either the Pribilof Islands or in the waters north of Cape Newenham (approximately 59$\circ$N).

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 48,215 and its associated CV of 0.223), N_{MIN} for the Bering Sea stock of harbor porpoise is 40,039.

Current Population Trend

The abundance of harbor porpoise in Bristol Bay was estimated in 1991 and 1999. The 1991 estimate was 10,946 (Dahlheim et al. 2000). The 1999 estimate of 48,215 is higher than the 1991 estimate (Hobbs and Waite unpubl. ms). However, there are some key differences between surveys which complicate direct comparisons. Transect lines were substantially more dense in 1999 than in 1991 and large numbers of porpoise were observed in 1999 in an area which was not surveyed intensely in 1991 (compare sightings in northeast Bristol Bay depicted in Figure 5 in Hobbs and Waite (unpubl. ms) with Figure 4 in Dahlheim et al. 2000). In addition, the use of a second correction factor for the 1999 estimate confounds direct comparison. The density of harbor porpoise resulting from the 1999 surveys was still substantially higher than that reported in Dahlheim et al. (2000), but it is unknown whether the increase in density is a result of a population increase or is a result of survey design. Thus, at present, 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 currently available for this 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). Thus, using the abundance estimate calculated from 1999 surveys, the PBR for the Bering Sea stock of harbor porpoise would be calculated to be 400 animals (40,039 $\times$ 0.02 $\times$ 0.5). However, the 2005 revisions to the SAR guidelines (NMFS 2005) 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

Fisheries Information

Prior to 2003, three different commercial fisheries operating within the range of the Bering Sea stock of harbor porpoise were monitored for incidental take by NMFS observers during 1990-98: Bering Sea (and Aleutian Islands) groundfish trawl, longline, and pot fisheries. As of 2003, changes in fishery definitions in the List of Fisheries resulted in separating these fisheries into 12 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. One harbor porpoise mortality was observed in 2001 in the Bering Sea/Aleutian Islands flatfish trawl. No harbor porpoise mortalities have been observed during the 2002-2006 period. Therefore, the mean annual (total) mortality rate resulting from observed mortalities was zero.

Table 31. Summary of incidental mortality of harbor porpoise (Bering Sea stock) due to commercial fisheries from 2002 through 2006 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
Bering Sea/Aleutian Is. (BSAI) flatfish trawl	2002	obs data	58.4	0	0	0
	2003		64.1	0	0	
	2004		64.3	0	0	
	2005		68.3	0	0	
	2006		67.8	0	0	
Minimum total annual mortality						0

The estimated minimum annual mortality rate incidental to commercial fisheries is 0 animals (Table 31). However, a reliable estimate of the mortality rate incidental to commercial fisheries is currently unavailable because of the absence of observer placements in several salmon gillnet fisheries. Therefore, it is unknown whether the kill rate is insignificant.

Subsistence/Native Harvest Information

Subsistence hunters in Alaska are known to occasionally take from this stock of harbor porpoise. Bee and Hall (1956) reported on two entanglements in subsistence nets in Elson Lagoon in 1952. Subsistence fishermen in Barrow state that it is not uncommon for one or two porpoises to be caught each summer (Suydam and George 1992). In 1991, pack ice may have contributed to the relatively high number (4) of porpoises caught in subsistence nets (Suydam and George 1992).

Other Mortality

There have been historic reports of harbor porpoise mortalities in subsistence gillnets in the area from Nome to Unalakleet (Barlow et al. 1994) and near Point Barrow (Suydam and George 1992). The only reports received between 1999 and 2003 were an unconfirmed report of a subsistence entanglement of two animals near Elim, and a third confirmed report of an entangled animal near Emmonak.

STATUS OF STOCK

Harbor porpoise are not listed as "depleted" under the MMPA or listed as "threatened" or "endangered" under the Endangered Species Act. The lack of surveys in a significant portion of this stock's range results in a conservative PBR for this stock. At present, U.S. commercial fishery-related annual mortality levels less than 40 animals per year (i.e., 10% of PBR) can be considered insignificant and approaching zero mortality and serious injury rate. The estimated level of human-caused mortality and serious injury (0) does not exceed the PBR (400). However, because the abundance estimates are 10 years old and information on incidental mortality in commercial fisheries is sparse, the Bering Sea 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 often concentrate in near-shore areas, bays, tidal areas and river mouths. 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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