Revised 5/15/2009

HARBOR SEAL (*Phoca vitulina richardsi*): Southeast Alaska Stock

NOTE – January 2009: NMFS has new genetic information on harbor seals in Alaska which indicates that the current division of Alaskan harbor seals into the Southeast Alaska, Gulf of Alaska, and Bering Sea stocks needs to be reassessed. NMFS, in cooperation with our partners in the Alaskan Native community, is evaluating the new genetic information and hopes to make a joint recommendation regarding stock structure in 2009. In the interim, new information on harbor seal mortality levels is provided within this report. A complete revision of the harbor seal stock assessments will be postponed until new stocks are defined.

STOCK DEFINITION AND GEOGRAPHIC RANGE

Harbor seals inhabit coastal and estuarine waters off Baja California, north along the western coasts of the United States, British Columbia, and Southeast Alaska, west through the Gulf of Alaska and Aleutian Islands, and in the Bering Sea north to Cape Newenham and the Pribilof Islands. They haul out on rocks, reefs, beaches, and drifting glacial ice, and feed in marine, estuarine, and occasionally fresh waters. Harbor seals generally are non-migratory, with local movements associated with such factors as tides, weather, season, food availability, and reproduction (Scheffer and Slipp 1944; Fisher 1952; Bigg 1969, 1981). The results of recent satellite tagging studies in Southeast Alaska, Prince William Sound, and Kodiak are also consistent with the conclusion that harbor seals are non-migratory (Swain et al. 1996, Lowry et al. 2001, Small et al. 2001). However, some long-distance movements of tagged animals in Alaska have been recorded (Pitcher and McAllister 1981, Lowry et al. 2001, Small et al. 2001). Strong fidelity of individuals for haulout sites during the breeding season has been documented in several populations (Härkönen and Harding 2001), including in Alaska (Pitcher and Calkins 1979, Pitcher and McAllister 1981).

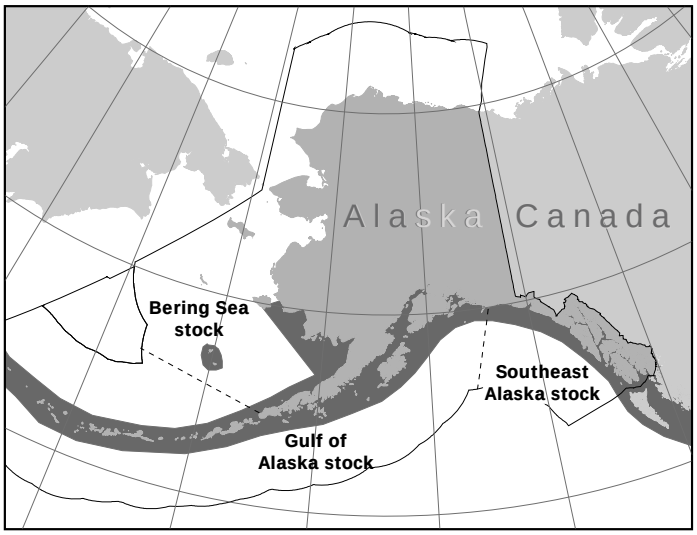

Figure 8. Approximate distribution of harbor seals in Alaska waters (shaded area).

Westlake and O'Corry-Crowe's (2002) analysis of genetic information revealed population subdivisions on a scale of 600-820 km. These results suggest that genetic differences within Alaska, and most likely over their entire North Pacific range, increase with increasing geographic distance. New information revealed substantial genetic differences indicating that female dispersal occurs at region specific spatial scales of 150-540 km. This research identified 12 demographically independent clusters within the range of Alaskan harbor seals; however additional research is required as unsampled areas within the Alaskan harbor seal range remain (O'Corry-Crowe et al. 2003).

Currently there are three stocks of harbor seals identified in Alaska: 1) the Southeast Alaska stock - occurring from the Alaska/British Columbia border to Cape Suckling, Alaska (144°W), 2) the Gulf of Alaska stock - occurring from Cape Suckling to Unimak Pass, including animals throughout the Aleutian Islands, and 3) the Bering Sea stock - including all waters north of Unimak Pass (Fig. 8). Information concerning the three harbor seal stocks recognized along the West Coast of the continental United States can be found in the Stock Assessment Reports for the Pacific Region.

POPULATION SIZE

The National Marine Mammal Laboratory (Alaska Fisheries Science Center) routinely conducts aerial surveys of harbor seals across the entire range of harbor seals in Alaska. Each of five survey regions was surveyed,

with one region surveyed per year. To derive an accurate estimate of population size from these surveys, a method was developed to address the influence of external conditions on the number of seals hauled out on shore, and counted, during the surveys. Many factors influence the propensity of seals to haul out, including tides, weather, time of day, and date in the seals' annual life history cycle. A statistical model defining the relationship between these factors and the number of seals hauled out was developed for each survey region. Based on those models, the survey counts for each year were adjusted to the number of seals that would have been ashore during a hypothetical survey conducted under ideal conditions for hauling out (Boveng et al. 2003). In a separate analysis of radio-tagged seals, a similar statistical model was used to estimate the proportion of seals that were hauled out under those ideal conditions (Simpkins et al. 2003). The results from these two analyses were combined for each region to estimate the population size of harbor seals in Alaska. Discussions of estimates from a previous survey (1993) can be found in earlier stock assessment reports.

The statewide abundance estimate for Alaskan harbor seals as of 2000 is 180,017 (CV = 0.03 NMFS, unpublished data). This estimate is based on 1996-2000 surveys that had incomplete coverage of terrestrial sites in Prince William Sound and of glacial sites in the Gulf of Alaska and the Southeast Alaska regions. Those omissions have been addressed in a more recent survey (2001-2005). Prince William Sound was surveyed completely in 2001, and new methods have been developed and used for surveying glacial sites in 2001-2002. Analyses are currently underway, and a manuscript describing the regional and statewide population estimates is in preparation; the analytical methods are described in Boveng et al. (2003) and Simpkins et al. (2003). The current abundance estimate for the SE Alaska stock (112,391; CV=0.04) was calculated from northern southeast Alaska surveys (32,454; 27,090 $\times$ 1.198; CV = 0.06) in 1997 and southern southeast Alaska surveys (79,937; 66,725 $\times$ 1.198; CV = 0.05) in 1998 (NMFS, unpublished data).

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): $N_{MIN} = N/\exp(0.842\times[\ln(1+[CV(N)]^2)]^{½})$. Using the population estimate (N) of 112,391 and its associated CV(N) of 0.04, N_{MIN} for this stock of harbor seals is 108,670.

Current Population Trend

Population trend data have been collected in the vicinity of Sitka and Ketchikan since 1983. Based on counts near Ketchikan, abundance has increased 7.4% annually (95% CI: 6.1-8.7) from 1983 to 1998, but at a lower rate of 5.6% during the latter portion between 1994 and 1998 (Small et al. 2003). Counts near Sitka failed to show a significant trend either between 1984 and 2001 or 1995 and 2001 (Small et al. 2003). It should be emphasized that these data are from selected 'trend' sites and not complete census surveys. Further, both of these trend routes are for terrestrial haulouts, which may not be representative of animals that use glacial haulouts. Alaska Natives who hunt for seals in Yakutat Bay believe the local harbor seal population has declined over the past 10-15 years, as determined by less successful hunting trips over time (Yakutat Tlingit Tribe, pers. comm., cited in Jansen et al. 2006).

Additional information concerning trend counts in Southeast Alaska come from Glacier Bay. The number of harbor seals in Johns Hopkins Inlet (a tidewater glacial fjord in Glacier Bay) increased steeply (30.7% annually) between 1975 and 1978, and then at a slower rate (2.6% annually) for the period from 1983 to 1996 (Mathews and Pendleton 1997). Immigration and reduced mortality may have contributed to the steep growth between 1975 and 1978. During 1992-96, the number of seals in Johns Hopkins Inlet (glacial ice haul out) increased 7.1% annually (95% CI: 1.7%-12.4%), whereas the number of seals using terrestrial haul outs decreased 8.6% annually (95% CI: 5.6%-11.7%) over the same period. A sharp overall decline of 63-75% in harbor seal abundance was observed in Glacier Bay from 1992 to 2002 (Mathews and Pendleton 2006). Although the full cause of the decline is unknown, there is some evidence for predation and competition (Taggart et al. 2005). The decline in harbor seals in Glacier Bay has continued at rates comparable to those since 1992 (Womble et al. in review). Results from trend analyses among trend routes within Southeast Alaska are variable, and therefore provide an uncertain basis for inferring trends in the Southeast Alaska stock as a whole.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Reliable rates of maximum net productivity have not been estimated for the Southeast Alaska harbor seal stock. A population growth rate of 7.4% was observed in Ketchikan between 1983 and 1998 (Small et al. 2003). Harbor seals have been protected in British Columbia since 1970, and the population has responded with an annual rate of increase of approximately 12.5% since 1973 (Olesiuk et al. 1990). However, until additional data become

available, it is recommended that the pinniped maximum theoretical net productivity rate (R_{MAX}) of 12% be employed for this stock (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 pinniped stocks with unknown status (Wade and Angliss 1997). Thus, for this stock of harbor seals, PBR = 3,260 animals (108,670 × 0.06 × 0.5).

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fisheries Information

The previous stock assessment for harbor seals indicated that there were three observed commercial fisheries that operated within the range of the Southeast Alaska stock of harbor seals. As of 2003, changes in how fisheries are defined in the List of Fisheries have resulted in separating these fisheries into nine fisheries based on both gear type and target species (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. During the 5-year period from 2002 to 2006 there were no observed incidental takes in any of these fisheries (Perez 2006, Perez unpubl. ms.). More current data on estimated fishery-related serious injury and mortality are being analyzed and will be available for inclusion in the 2010 SARs.

The estimated minimum annual mortality rate incidental to commercial fisheries is 0. A reliable estimate of the mortality rate incidental to commercial fisheries is currently unavailable because of the absence of observer placements in the gillnet fisheries known to interact with this stock.

Subsistence/Native Harvest Information

The Alaska Native subsistence harvest of harbor seals has been estimated by the Alaska Native Harbor Seal Commission (ANHSC) and the Alaska Department of Fish and Game (ADFG). The previous stock assessment reported that the estimated average harvest of the Southeast Alaska stock of harbor seals for 1994-1996 was 1,749 animals per year (including struck and lost). Recent information from the ANHSC and ADFG indicates the average harvest level from 2003 to 2007, including struck and lost, was 782 harbor seals per year (Table 10). The subsistence harvest level in southeastern Alaska has declined over the same period of time that harbor seal numbers in the area have declined, but it is not known if this is due to reduced effort, or fewer seals available to hunt (Mathews and Pendleton 2006).

Table 10. Summary of the subsistence harvest data for the Southeast Alaska stock of harbor seals, 2003-2007. Data are from Wolfe et al. 2004; Wolfe et al. 2006; Wolfe et al. 2008; J. Fall, ADFG, pers. comm., 04 February 2009.

Year	Estimated total number taken	Number harvested	Number struck and lost
2003	1,069	945	124
2004	845	743	102
2005	634	545	89
2006	708	593	115
2007	654	586	68
Mean annual harvest (2002-2006)	782	682	100

Other Mortality

Illegal intentional killing of harbor seals occurs, but the magnitude of this mortality is unknown (Note: the 1994 Amendments to the MMPA made intentional lethal take of any marine mammal illegal except where imminently necessary to protect human life). The Alaska Region stranding records from 1998 to 2002 documents five reports of stranded harbor seals that had been shot, for an average of 1 per year over 5 years. It is not known

whether these animals were killed illegally or if they were struck but lost in the subsistence harvest. Because the reason for the shooting is not known, these animals are added to the total number of human-related mortalities.

The Alaska Region stranding records document one Southeast Alaska harbor seal was killed by a vessel collision between 1998 and 2002. One Southeast Alaska harbor seal was entangled in a non-commercial hatchery seine net and released without injury.

Mortalities may occasionally occur incidental to marine mammal research activities authorized under MMPA permits issued to a variety of government, academic, and other research organizations. Between 2003-2007, there was 1 mortality resulting from research on the Southeast Alaska stock of harbor seals, which results in an average of 0.2 mortalities per year from this stock (Tammy Adams, Permits, Conservation, and Education Division, Office of Protected Resources, NMFS, 1315 East-West Highway, Silver Spring, MD 20910).

STATUS OF STOCK

Harbor seals are not listed as "depleted" under the MMPA or listed as "threatened" or "endangered" under the Endangered Species Act. At present, annual U.S. commercial fishery-related mortality levels less than 326 animals per year (i.e., 10% of PBR) can be considered insignificant and approaching zero mortality and serious injury rate. A reliable estimate of the annual rate of mortality incidental to commercial fisheries is unavailable. Therefore, it is unknown whether the kill rate is insignificant. Based on the best scientific information available, the estimated annual level of total human-caused mortality (782 + 0.2 + 1 + 0.2 = 783) is not known to exceed the PBR (3,260) for this stock. Therefore, the Southeast Alaska stock of harbor seals is not classified as a strategic stock. The status of this stock relative to its Optimum Sustainable Population size is unknown.

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