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SPOTTED SEAL (*Phoca largha*): Alaska Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Spotted seals are distributed along the continental shelf of the Bering, Chukchi, and Beaufort seas, and the Okhotsk Sea south to the northern Yellow Sea and western Sea of Japan (Shaughnessy and Fay 1977, Fig. 11). This SAR deals only with spotted seals that occur in the Bering, Chukchi, and Beaufort seas. Satellite tagging studies showed that seals tagged in the northeastern Chukchi Sea moved south in October and passed through the Bering Strait in November. Seals overwintered in the Bering Sea along the ice edge and made east-west movements along the edge (Lowry et al. 1998). During spring they tend to prefer small floes (i.e., < 20 m in diameter), and inhabit mainly the southern margin of the ice, with movement to coastal habitats after the retreat of the sea ice (Fay 1974, Shaughnessy and Fay 1977, Lowry et al. 2000, Simpkins et al. 2003). In summer and fall, spotted seals use coastal haulouts regularly (Frost et al. 1993, Lowry et al. 1998), and may be found as far north as 69-72°N in the Chukchi and Beaufort Seas (Porsild 1945, Shaughnessy and Fay 1977). To the south, along the west coast of Alaska, spotted seals are known to occur around the Pribilof Islands, Bristol Bay, and the eastern Aleutian Islands. Of eight known breeding areas, three occur in the Bering Sea, with the remaining five in the Okhotsk Sea and Sea of Japan. There is little morphological difference between seals from these areas. Spotted seals are closely related to and often mistaken for Pacific harbor seals (*Phoca vitulina richardsi*). The two species are often seen together and are partially sympatric, as their ranges overlap in the southern part of the Bering Sea (Quakenbush 1988). Yet, spotted seals breed earlier and are less social during the breeding season, and only spotted seals are strongly associated with pack ice (Shaughnessy and Fay 1977). These and other ecological, behavioral, genetic, and morphological differences support their recognition as two separate species (Quakenbush 1988).

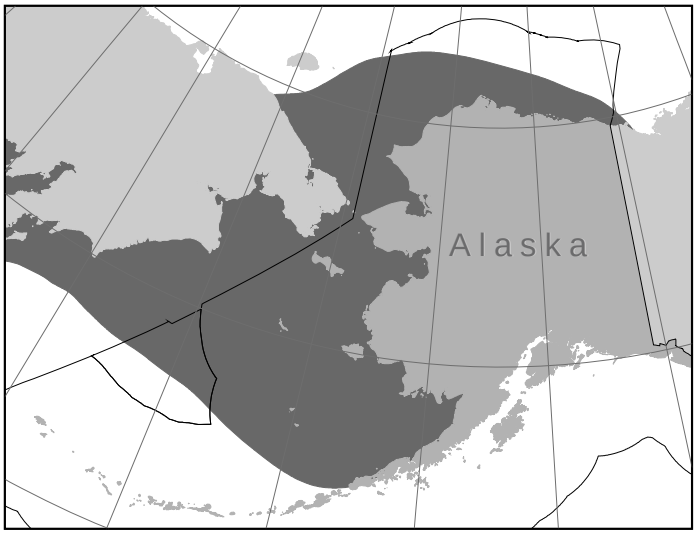

Figure 11. Approximate distribution of spotted seals (shaded area).

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: unknown; 3) Phenotypic data: unknown; 4) Genotypic data: unknown. Based on this limited information, and the absence of any significant fishery interactions, there is currently no strong evidence to suggest splitting the distribution of spotted seals into more than one stock. Therefore, only the Alaska stock is recognized in U.S. waters.

POPULATION SIZE

A reliable estimate of spotted seal population abundance is currently not available (Rugh et al. 1995). However, early estimates of the world population were in the range of 335,000-450,000 animals (Burns 1973). The population of the Bering Sea, including Russian waters, was estimated to be 200,000-250,000 based on the distribution of family groups on ice during the mating season (Burns 1973). Fedoseev (1971) estimated 168,000 seals in the Okhotsk Sea. Aerial surveys were flown in 1992 and 1993 to examine the distribution and abundance of spotted seals in Alaska. In 1992, survey methods were tested and distributional studies were conducted over the Bering Sea pack ice in spring and along the western Alaska coast during summer (Rugh et al. 1993). In 1993, the survey effort concentrated on known haul out sites in summer (Rugh et al. 1994). The sum of maximum counts of hauled out animals were 4,145 and 2,951 in 1992 and 1993, respectively. Using mean counts from days with the highest estimates for all sites visited in either 1992 or 1993, there were 3,570 seals seen, of which 3,356 (CV = 0.06) were hauled out (Rugh et al. 1995).

Studies to determine a correction factor for the number of spotted seals at sea missed during surveys have been initiated, but only preliminary results are currently available. The Alaska Department of Fish and Game placed satellite transmitters on four spotted seals in Kasegaluk Lagoon and estimated the ratio of time hauled out versus time at sea. Preliminary results indicated that the proportion hauled out averaged about 6.8% (CV = 0.85) (Lowry et al. 1994). Using this correction factor with the maximum count of 4,145 from 1992 results in an estimate of 59,214.

Minimum Population Estimate

A reliable minimum population estimate (N_{MIN}) for this stock can not presently be determined because current reliable estimates of abundance are not available.

Current Population Trend

Frost et al. (1993) report that counts of spotted seals were relatively stable at Kasegaluk Lagoon from the mid-1970s through 1991. As this represents only a fraction of the stock's range, reliable data on trends in population abundance for the Alaska stock of spotted seals are considered unavailable.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

A reliable estimate of the maximum net productivity rate is currently unavailable for the Alaska stock of spotted seals. Hence, 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 population status (Wade and Angliss 1997). However, because a reliable estimate of N_{MIN} is currently not available, the PBR for this stock is unknown.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fisheries Information

Until 2003, there were six different federally-regulated commercial fisheries in Alaska that could have interacted with spotted seals. These fisheries were monitored for incidental mortality by fishery observers. As of 2003, changes in fishery definitions in the List of Fisheries have resulted in separating these six fisheries into 22 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. Prior to 2004, there were no incidental serious injuries and mortalities of spotted seals in any of the observed fisheries. However, in 2004, the Bering Sea/Aleutian Islands flatfish trawl fishery incurred three mortalities of spotted seals, resulting in a total estimated take of 4.4 spotted seals for that year and an average of 1.18 seals per year for the period 2002-2006 (Table 15a; Perez 2006, Perez unpubl. ms a, Perez unpubl. ms b). 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 mortality rate incidental to commercial fisheries is 1.18 animals per year. However, serious injury and mortality of harbor seals incidental to commercial fisheries has occurred within the past five years, and because it is virtually impossible to distinguish between these two species, some of the reported harbor seal takes may actually have been spotted seals. Further, no observers have been assigned to the Bristol Bay drift gillnet fisheries that are known to interact with this stock, making the estimated mortality unreliable.

Table 15a. Summary of incidental mortality of spotted seals (Alaska stock) due to commercial fisheries from 2002 through 2006 and calculation of the mean annual mortality rate. Details of how percent observer coverage is measured is included in Appendix 6.

Fishery name	Years	Data type	Range of Observer coverage	Reported mortality (in given yrs.)	Estimated mortality (in given yrs.)	Mean annual mortality
Bering Sea flatfish trawl	2002	obs data	58.4	0	0	1.18
	2003		64.1	0	0	(CV = 0.28)
	2004		64.3	3	4.4	
	2005		68.3	1	1.5	
	2006		67.8	0	0	
Minimum total annual mortality						1.18 (CV = 0.28)

Subsistence/Native Harvest Information

Spotted seals are an important species for Alaskan subsistence hunters, primarily in the Bering Strait and Yukon-Kuskokwim regions, with estimated annual harvests ranging from 850 to 3,600 seals (averaging about 2,400 annually) taken during 1966-76 (Lowry 1984). From September 1985 to June 1986 the combined harvest from five Alaska villages was 986 (Quakenbush 1988). In a study designed to assess the subsistence harvest of harbor seals and Steller sea lions in Alaska, Wolfe and Mishler (1993, 1994, 1995, 1996) estimated subsistence takes of spotted seals in the northern part of Bristol Bay. The spotted seal take (including struck and lost) was estimated to be 437 in 1992, 265 in 1993, 270 in 1994, and 197 in 1995. Variance estimates for these values are not available. The mean annual subsistence take of spotted seals in this region during the 3-year period from 1993 to 1995 was 244 animals.

The Division of Subsistence, Alaska Department of Fish and Game and the Alaska Native Harbor Seal Commission reports subsistence harvest levels of harbor seals and sea lions annually (e.g., Wolfe et al. 2008). Harvest data are reported from 63 coastal communities, including 6 communities from north Bristol Bay. Due to seasonal geographic overlap in species distribution in north Bristol Bay in combination with the difficulty in distinguishing the two species from external morphology, reports of harvest levels of spotted seals were differentiated from harbor seals based on ecological features of the kill, primarily degree of association with seasonal ice (Wolfe et al. 2008). The estimates given in Table 15b represent the best estimate of the subsistence harvest of spotted seals, although species identifications were not confirmed; therefore, the harvest estimates for spotted seals may include some harbor seals, and some spotted seals may actually have been recorded as harbor seals (Wolfe et al. 2008).

The mean annual subsistence harvest in north Bristol Bay from this stock over the 5-year period from 2002 through 2006 was 166 spotted seals per year (Table 15b).

Table 15b. Summary of the subsistence harvest data for spotted seals from 6 coastal villages in north Bristol Bay, 2002-2006.

Year	Estimated total number taken	Number harvested	Number struck and lost
2002	229[1]	184	45
2003	62[2]	52	10
2004	170[3]	124	46
2005	201[4]	170	31
2006	170[5]	140	30
Mean annual take (2002-2006)	166	134	32

[1] Wolfe et al. 2003; [2] Wolfe et al. 2004; [3] Wolfe et al. 2005; [4] Wolfe et al. 2006; [5] Wolfe et al. 2008.

The Division of Subsistence, Alaska Department of Fish and Game, maintains a database that provides additional information on the subsistence harvest of ice seals in different regions of Alaska (ADFG 2000a, b). Information on subsistence harvest of spotted seals has been compiled for 135 villages from reports from the Division of Subsistence (Coffing et al. 1998, Georgette et al. 1998, Wolfe and Hutchinson-Scarbrough 1999) and a report from the Eskimo Walrus Commission (Sherrod 1982). Data were lacking for 22 villages; their harvests were estimated using the annual per capita rates of subsistence harvest from a nearby village. Harvest levels were

estimated from data gathered in the 1980s for 16 villages; otherwise, data gathered from 1990-98 were used. As of August 2000; the subsistence harvest database indicated that the estimated number of spotted seals harvested for subsistence use per year is 5,265.

At this time, there are no efforts to quantify the current level of harvest of spotted seals by all Alaska communities. However, the U.S. Fish and Wildlife Service collects information on the level of spotted seal harvest in five villages during their Walrus Harvest Monitoring Program. Results from this program indicated that an average of 37 spotted seals were harvested annually in Little Diomede, Gambell, Savoonga, Shishmaref, and Wales from 2000-2004 (U.S. Fish and Wildlife Service, Marine Mammals Management, Walrus Harvest Monitoring Project). Because this represents only 5 of the over 100 villages that may harvest spotted seals, this level of harvest underestimates the actual harvest level for these years. Since 2005, harvest data are only available from St. Lawrence Island (Gambell and Savoonga) due to lack of walrus harvest monitoring in areas previously monitored. One spotted seal was reported as being harvested in 2005 from St. Lawrence Island.

Table 15c. Summary of the 2000-2004 subsistence harvest data for spotted seals from Little Diomede, Gambell, Savoonga, Shishmaref, and Wales. Data were collected by the U.S. Fish and Wildlife Service during the Walrus Harvest Monitoring Project. These counts only reflect the number of seals harvested during the spring walrus harvest and do not indicate total annual harvest.

Year	Estimated number harvested
2000	18
2001	1
2002	26
2003	98
2004	44
Mean annual harvest (2000-2004)	37

A report on ice seal subsistence harvest in three Alaskan communities indicated that the number and species of ice seals harvested in a particular village may vary considerably between years (Coffing et al. 1999). These interannual differences are likely due to differences in ice and wind conditions that change the hunters' access to different ice habitats frequented by different types of seals. Although some of the more recent entries in the ADFG database have associated measures of uncertainty (Coffing et al. 1999, Georgette et al. 1998), the overall total does not. The estimate of 5,265 spotted seals is the best estimate of harvest level currently available.

STATUS OF STOCK

Spotted seals are not listed as "depleted" under the MMPA or listed as "threatened" or "endangered" under the Endangered Species Act. Reliable estimates of the minimum population, PBR, and human-caused mortality and serious injury are currently not available. Because the PBR for spotted seals 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. No information is available on the status of spotted seals. Due to a minimal level of interactions between U.S. commercial fisheries and spotted seals, the Alaska stock of spotted seals is not considered a strategic stock.

NMFS received a petition on 28 May 2008 to list spotted seals under the ESA due to loss of sea ice habitat caused by climate change in the Arctic. NMFS published a Federal Register notice (73 FR 51615, 4 September 2008) indicating that there were sufficient data to warrant a review of the status of the species.

Habitat Concerns

Evidence indicates that the Arctic climate is changing significantly and that one result of the change is a reduction in the extent of sea ice in at least some regions of the Arctic (ACIA 2004, Johannessen et al. 2004). Spotted seals, along with other seals that are dependent on sea ice for at least part of their life history, will be vulnerable to reductions in sea ice (Boveng et al. 2008). There are insufficient data to make reliable predictions of the effects of Arctic climate change on the Alaska spotted seal stock.

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