STELLER SEA LION (*Eumetopias jubatus*): Eastern U. S. Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Steller sea lions range along the North Pacific Rim from northern Japan to California (Loughlin et al. 1984), with centers of abundance and distribution in the Gulf of Alaska and Aleutian Islands, respectively. The species is not known to migrate, but individuals disperse widely outside of the breeding season (late May-early July), thus potentially intermixing with animals from other areas. Despite the wide ranging movements of juveniles and adult males in particular, exchange between rookeries by breeding adult females and males (other than between adjoining rookeries) appears low (NMFS 1995); however, resighting data from branded animals have not yet been analyzed. Loughlin (1997) considered the following information when classifying stock structure based upon the phylogeographic approach of Dizon et al. (1992): 1) Distributional data: geographic distribution continuous, yet a high degree of natal site fidelity and low (<10%) exchange rate of breeding animals between rookeries; 2) Population response data: substantial differences in population dynamics (York et al. 1996); 3) Phenotypic data: unknown; and 4) Genotypic data: substantial differences in mitochondrial DNA (Bickham et al. 1996). Based on this information, two separate stocks of Steller sea lions are now recognized within U. S. waters: an Eastern U. S. stock, which includes animals east of Cape Suckling, Alaska (144°W), and a Western U. S. stock, which includes animals at and west of Cape Suckling (Loughlin 1997, Fig. 3).

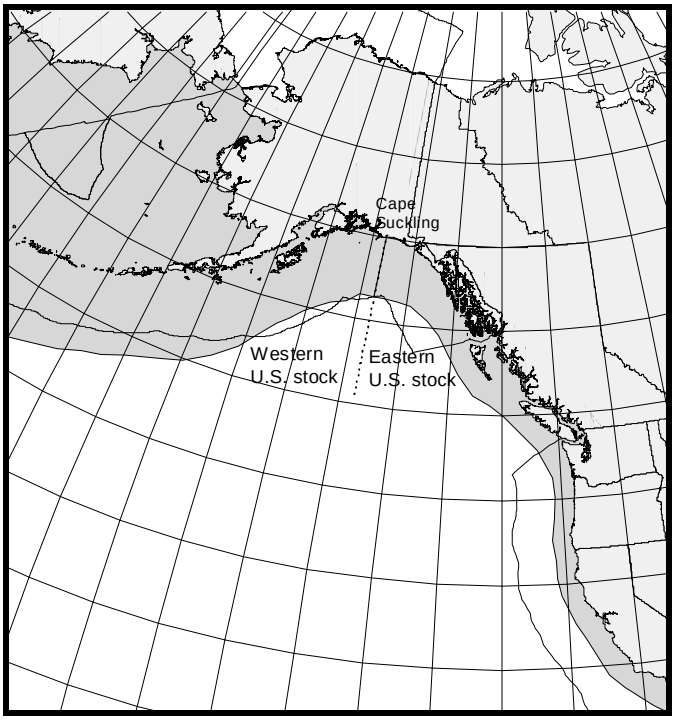

Figure 3. Approximate distribution of Steller sea lions in the eastern North Pacific (shaded area).

POPULATION SIZE

The most recent estimate of Steller sea lion abundance in Southeast Alaska is based on aerial surveys performed in June 1996 (Strick et al. in press). Data from these surveys represent actual counts of pups and nonpups at all rookeries and major haulout sites in Southeast Alaska. In 1996 a total of 14,571 Steller sea lions were counted in Southeast Alaska, including 10,857 nonpups and 3,714 pups. Aerial surveys and ground counts of California, Oregon, and Washington rookeries and major haulout sites were also conducted during the summer of 1996 (NMFS unpubl. data, National Marine Mammal Laboratory, 7600 Sand Point Way NE, Seattle, WA 98115; Southwest Fisheries Science Center, P. O. Box 271, La Jolla, CA 90238; ODF&W unpubl. data, Marine Science Drive, Newport, OR 97365). In 1996 a total of 6,555 Steller sea lions were counted in California (2,042), Oregon (3,990), and Washington (523), including 5,464 nonpups and 1,091 pups.

The Eastern U. S. stock of Steller sea lions is a transboundary stock, including sea lions from British Columbia rookeries (see Wade and Angliss 1997 for discussion of transboundary stocks). Aerial surveys were last conducted in British Columbia during 1994 and produced counts of 8,091 nonpups and 1,186 pups, for a total count of 9,277 (Dept. Fisheries and Oceans, unpubl. data, Pacific Biological Station, Nanaimo, BC, V9R 5K6). Complete count data are not available for British Columbia in 1996. However, because the number of Steller sea lions in British Columbia is

thought to have increased since 1994 (P. Olesiuk, pers. comm., Pacific Biological Station, Nanaimo, BC, V9R 5K6), the 1994 counts represent a conservative estimate for the 1996 counts. Combining the total counts for the three regions results in a minimum estimated abundance of 30,403 (14,571 + 6,555 + 9,277) Steller sea lions in this stock in 1996.

The abundance estimate for the Eastern U. S. stock is based on counts of all animals (pup and nonpup) at all sites and has not corrected for animals missed because they were at sea. A reliable correction factor to account for these animals is currently not available, as it is for the Western U. S. stock (J. Sease, pers. comm., National Marine Mammal Laboratory, 7600 Sand Point Way NE, Seattle, WA 98115). As a result, this represents an underestimate for the total abundance of Steller sea lions in this stock. A range wide survey for Steller sea lions is planned for the summer of 1998. Preliminary results from this survey, along with an appropriate correction factor, will be available in the autumn of 1998.

Minimum Population Estimate

The total count (30,403) will be used as the minimum population estimate (N_{MIN}) for the Eastern U. S. stock of Steller sea lions (Wade and Angliss 1997). Recall that this count has not been corrected for animals which were at sea, and also utilizes the 1994 data from British Columbia where Steller sea lion numbers are thought to have increased since 1994. Note that N_{MIN} is lower than reported in the 1996 stock assessment report (Hill et al. 1997). This is solely an artifact of the manner in which the abundance and N_{MIN} are calculated, as there is no indication that the abundance of the Eastern U. S. stock of Steller sea lions has declined (Fig. 4).

Current Population Trend

Trend counts (an index to examine population trends) for Steller sea lions in Oregon were relatively stable in the 1980s, with uncorrected counts in the range of 2,000-3,000 sea lions (NMFS 1992). Counts in Oregon have shown a gradual increase since 1976, as the adult and juvenile state-wide count for that year was 1,486 compared to 3,443 for 1994 (Brown and Reimer 1992, NMFS 1995). This increase may be an artifact of improved surveys in recent years (NMFS 1995). Steller sea lion numbers in California, especially in southern California, have declined from historic numbers. Counts in California between 1927 and 1947 ranged between 5,000 and 7,000 non-pups with no apparent trend, but have subsequently declined by over 50%, remaining between 1,500 to 2,000 non-pups during 1980-96. Limited information suggests that counts in northern California appear to be stable (NMFS 1995). At Año Nuevo, California, a steady decline in ground counts started around 1970, resulting in a 85% reduction in the breeding population by 1987 (LeBoeuf et al. 1991). In vertical aerial photographic counts conducted at Año Nuevo, pups declined at a rate of 9.9% from 1990 to 1993, while non-pups declined at a rate of 31.5% over the same time period (Westlake et al. 1997). Overall, counts of nonpups at trend sites in California and Oregon have been relatively stable since the 1980s (Table 3, Fig. 4).

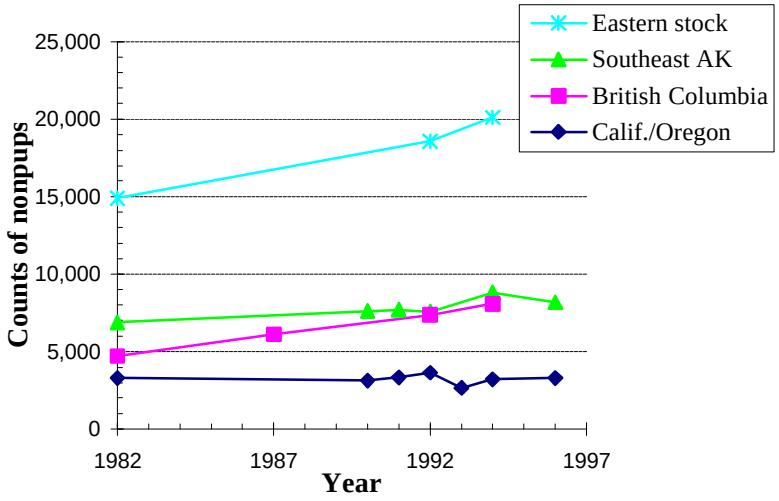

Figure 4. Counts of adult and juvenile Steller sea lions at rookery and haulout trend sites throughout the range of the Eastern U. S. stock, 1982-96. Data from British Columbia include all sites.

In Southeast Alaska, counts (no correction factors applied) of non-pups at trend sites increased by 28% during 1979-96 from 6,376 to 8,181 (NMFS 1995, Strick et al. in press). In British Columbia, counts (no correction factors applied) of non-pups throughout the Province increased at a rate greater than 5% annually during 1982-94 (Table 3, Fig. 4). Counts of nonpups at trend sites throughout the range of the Eastern U. S. Steller sea lion stock are shown in Figure 4.

Table 3. Counts of adult and juvenile Steller sea lions observed at rookery and haulout trend sites by year and geographical area for the Eastern U. S. stock from the 1982 through 1996 (NMFS 1995, Strick et al. 1997, Strick et al. in press; P. Olesiuk, unpubl. data, Pacific Biological Station, Nanaimo, BC, V9R 5K6). Trend site counts in California include only Año Nuevo Island and St. George Reef. Trend site counts in Oregon include only Rogue and Orford Reefs. British Columbia data include counts from all sites.

Area	1982	1990	1991	1992	1994	1996
California/Oregon	3,286	3,128	3,358	3,631	3,221	3,294
British Columbia	4,711	6,109*	no data	7,376	8,091	no data
Southeast Alaska	6,898	7,629	7,715	7,558	8,826	8,181
Total	14,895	--	--	18,565	20,176	--

*This count was conducted in 1987.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

There are no estimates of maximum net productivity rates for Steller sea lions. 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 re-authorized 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 default recovery factor (F_R) for stocks listed as threatened under the Endangered Species Act (ESA) is 0.5 (Wade and Angliss 1997). However, as total population estimates for the Eastern U.S. stock have remained stable or increased over the last 20 years, the recovery factor is set at 0.75; midway between 0.5 (recovery factor for a "threatened" stock) and 1.0 (recovery factor for a stock within its optimal sustainable population level). This approach is consistent with recommendations of the Alaska Scientific Review Group. Thus, for the Eastern U. S. stock of Steller sea lions, PBR =1,368 animals (30,403 × 0.06 × 0.75).

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fisheries Information

Fishery observers monitored three commercial fisheries during the period from 1990 to 1996 in which Steller sea lions from this stock were taken incidentally: the California/Oregon thresher shark and swordfish drift gillnet, WA/OR/CA groundfish trawl, and Northern Washington marine set gillnet fisheries. In 1992 and 1994, 1 Steller sea lion mortality was observed incidental to the California/Oregon thresher shark and swordfish drift gillnet fishery. These mortalities extrapolate to estimated total kills of 7 and 6 animals, respectively (Julian 1997, Julian and Beeson 1998), and result in a mean annual mortality of 2.6 sea lions (CV=0.62) for that fishery (Table 4). One Steller sea lion mortality was observed in the WA/OR/CA groundfish trawl fishery during the 1994 season (53% observer coverage in 1994). As that mortality occurred in an unmonitored haul, it could not be used to calculate the estimated mortality for the fishery. Therefore, 1 mortality was used as both the observed mortality and estimated mortality in 1994 for that fishery, and is considered a minimum estimate. This single mortality results in a mean annual mortality of 0.2 (CV=1.0) Steller sea lions for the WA/OR/CA groundfish trawl fishery. During 1996, one Steller sea lion mortality was observed in the Northern Washington marine set gillnet fishery. The mortality was not extrapolated because the coastal portion of the fishery (the portion of the fishery most likely to interact with Steller sea lions) was monitored with 100% observer coverage during 1996. This single observed mortality results in a mean annual mortality of 0.2 (CV=1.0) Steller sea lions for the Northern Washington marine set gillnet fishery. No observer program occurred during 1994 for this fishery. For the fisheries with observed takes, the ranges of observer coverage over the 7-year period, as well as the annual observed and estimated mortalities, are presented in Table 4. Averaging the incidental

take data from these three observed fisheries results in an estimated incidental mortality rate of 3.0 (CV=0.55) Steller sea lions per year from this stock. No mortalities were reported by fishery observers monitoring drift gillnet and set gillnet fisheries in Washington and Oregon this decade; though, mortalities have been reported in the past.

An additional source of information on the number of Steller sea lions killed or injured incidental to commercial fishery operations is the self-reported fisheries information required of vessel operators by the MMPA. During the period between 1990 and 1996, fisher self-reports from the Southeast Alaska salmon drift gillnet fishery (Table 4) resulted in an annual mean of 1.25 mortalities from interactions with commercial fishing gear. This total is based on all available fisher self-reports for U. S. fisheries within the range of the stock, except the three fisheries for which observer data were presented above. However, because logbook records (fisher self-reports required during 1990-94) are most likely negatively biased (Credle et al. 1994), these are considered to be minimum estimates. During 1990, 11 Steller sea lion injuries incidental to the Alaska salmon troll fishery and 1 Steller sea lion injury incidental to the CA/OR/WA salmon troll fishery were reported. These injuries were not deemed serious (Angliss and DeMaster 1998) and have not been included in the Table 4. Self-reported fisheries data are incomplete for 1994, not available for 1995, and considered unreliable for 1996 (see Appendix 4).

Strandings of Steller sea lions entangled in fishing gear or with injuries caused by interactions with gear are another source of mortality data. During the 5-year period from 1992 to 1996 the only fishery-related Steller sea lion stranding was reported in August of 1995 in Southeast Alaska. The mortality has been attributed to the Alaska salmon troll fishery and has been included in Table 4. Fishery-related strandings during 1992-96 result in an estimated annual mortality of 0.2 animals from this stock. This estimate is considered a minimum because not all entangled animals strand and not all stranded animals are found or reported.

Table 4. Summary of incidental mortality of Steller sea lions (Eastern U. S. stock) due to commercial fisheries from 1990 through 1996 and calculation of the mean annual mortality rate. Mean annual mortality in brackets represents a minimum estimate from self-reported fisheries information. Data from 1992 to 1996 (or the most recent 5 years of available data) are used in the mortality calculation when more than 5 years of data are provided for a particular fishery. n/a indicates that data are not available.

Fishery name	Years	Data type	Range of observer coverage	Observed mortality (in given yrs.)	Estimated mortality (in given yrs.)	Mean annual mortality
CA/OR thresher shark and swordfish drift gillnet	90-96	obs data	4-18%	0, 0, 1, 0, 1, 0, 0	0, 0, 7, 0, 6, 0, 0	2.6 (CV=0.62)
WA/OR/CA groundfish trawl (Pacific whiting component)	90-96	obs data	44-72%	0, 0, 0, 0, 1, 0, 0	0, 0, 0, 0, 1, 0, 0	0.2 (CV=1.0)
Northern WA marine set gillnet	90-96	obs data	47-87%	0, 0, 0, 0, n/a, 0, 1	0, 0, 0, 0, n/a, 0, 1	0.2 (CV=1.0)
Observer program total						3.0 (CV=0.55)
				Reported mortalities		
Southeast Alaska salmon drift gillnet	90-96	self reports	n/a	0, 1, 2, 2, n/a, n/a, n/a	n/a	[≥1.25]
Alaska salmon troll	92-96	strand data	n/a	0, 0, 0, 0, 1	n/a	[≥0.2]
British Columbia aquaculture predator control program	91-96	permit reports	n/a	14, 8, 10, 11, 6, 13	n/a	9.6
Minimum total annual mortality						≥14.05 (CV=0.55)

Steller sea lions are taken in British Columbia incidental to commercial salmon farming operations (Table 4). Preliminary figures from the British Columbia Aquaculture Predator Control Program resulted in a mean annual mortality of 9.6 Steller sea lions from this stock over the period from 1992 to 1996 (P. Olesiuk, pers. comm., Pacific Biological Station, Nanaimo, BC, V9R 5K6). Note that the 1995 estimate includes one animal reported as an unidentified sea lion and the 1996 estimate is based upon data from only the first three-quarters of 1996. Due to a lack of observer programs, there are few data concerning the mortality of marine mammals incidental to other commercial fisheries in Canadian waters which are analogous to U.S. fisheries that are known to take Steller sea lions. As a result, the number of Steller sea lions taken in Canadian waters is not known.

No observers have been assigned to Canadian fisheries and several U.S. fisheries that are known to interact with this stock, making the estimated mortality unreliable. The minimum estimated mortality rate incidental to commercial fisheries is 15 (rounded from 14.05) sea lions per year, based on observer data (3.0) and self-reported fisheries information (1.25), stranding data (0.2), or permit reports (9.6) where observer data were not available.

Subsistence/Native Harvest Information

The 1992-96 subsistence harvest of Steller sea lions in Alaska was estimated by the Alaska Department of Fish and Game, under contract with NMFS (Wolfe and Mishler 1993, 1994, 1995, 1996, 1997). In each year, data were collected through systematic interviews with hunters and users of marine mammals in approximately 2,100 households in about 60 coastal communities within the geographic range of the Steller sea lion in Alaska. Between 1992-96, approximately 16 of the interviewed communities lie within the range of the Eastern U. S. stock. Only a very small percentage (<1%) of the statewide subsistence take was typically from the Eastern U. S. stock. The total subsistence take of Steller sea lions from this stock was estimated at 6, 1, 5, 0, and 0 animals in 1992-96, respectively. These values for total take include 1 animal per year during 1992-94 that was reported struck and lost. The mean annual subsistence take from this stock over the 3-year period from 1994 to 1996 was 2 sea lions (rounded from 1.67).

An unknown number of Steller sea lions from this stock are harvested by subsistence hunters in Canada. The magnitude of the Canadian subsistence harvest is believed to be small. Alaska Native subsistence hunters have initiated discussions with Canadian hunters to quantify their respective subsistence harvests, and to identify any effect these harvests may have on the cooperative management process.

Other Mortality

Shooting of sea lions was thought to be a potentially significant source of mortality prior to the listing of sea lions as "threatened" under the ESA in 1990. Such shooting has been illegal since the species was listed as threatened. (Note: the 1994 Amendments to the MMPA made intentional lethal take of any marine mammal illegal except where imminently necessary to protect human life). Strandings of Steller sea lions with gunshot wounds do still occur. During the period from 1990 to 1996 strandings of animals with gunshot wounds from this stock occurred in Oregon and Washington in 1990 (1 animal), 1993 (9 animals), and 1996 (2 animals), resulting in an estimated annual mortality of 2.2 Steller sea lions from this stock during 1992-96. This estimate is considered a minimum because not all stranded animals are found, reported, or cause of death determined (via necropsy by trained personnel). Reports of stranded animals in Alaska with gunshot wounds have not been included because it is not possible to tell if such a report was the result of an animal struck and lost by subsistence hunters (in which case the mortality would have been accounted for in the subsistence harvest estimate). However, one of the two 1996 reports was from Alaska and has been included because there were no subsistence struck and lost reports during that year.

STATUS OF STOCK

Based on currently available data, the minimum estimated fishery mortality and serious injury for this stock (15) is less that 10% of the calculated PBR (137) and, therefore, can be considered to be insignificant and approaching a zero mortality and serious injury rate. The estimated annual level of total human-caused mortality and serious injury from fishery interactions, subsistence harvests, and shootings (15 + 2 + 2 = 19) does not exceed the PBR (1,368) for this stock. The Eastern U. S. stock of Steller sea lion is currently listed as "threatened" under the ESA, and therefore designated as "depleted" under the MMPA. As a result, this stock is classified as a strategic stock. Although the stock size has increased in recent years, the status of this stock relative to OSP is unknown.

Habitat Concerns

Unlike the observed decline in the Western U. S. stock of Steller sea lion there has not been a concomitant decline in the Eastern U. S. stock. However, the predicted El Niño of 1997 is showing signs of affecting the environment in Alaska waters that may not be favorable to Steller sea lions. El Niño may affect this stock differentially throughout its range, perhaps being particularly severe towards the southern end of the range where the stock has been declining (see Current Population Trend). At this time it is unclear what affect, if any, this will have on the Eastern U. S. Steller sea lion stock.

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