Revised 12/22/2011

STELLER SEA LION (*Eumetopias jubatus*): Western 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 (Fig. 1). 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 (Sease and York 2003). 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) is low (NMFS 1995).

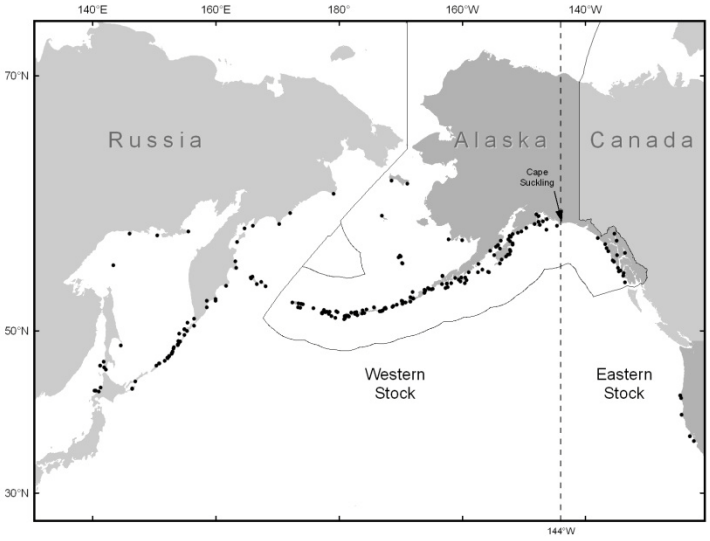

Figure 1. Approximate distribution of Steller sea lions in the North Pacific. Major U.S. haulouts and rookeries (50 CFR 226.202, 27 August 1993) and active Asian haulouts and rookeries (Burkanov and Loughlin, 2005) are depicted (points). Black dashed line (144° W) indicates stock boundary (Loughlin 1997). Note: Haulouts and rookeries in British Columbia are not shown.

Loughlin (1997) considered the following information when classifying stock structure based on 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 were 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. 1).

Steller sea lions that breed in Asia have been considered part of the western stock. While Steller sea lions seasonally inhabit coastal waters of Japan in the winter, breeding rookeries are currently only located in Russia (Burkanov and Loughlin 2005). Analyses of genetic data differ in their interpretation of separation between Asian and Alaskan sea lions. Based on analysis of mitochondrial DNA, Baker et al. (2005) found evidence of a genetic split between the Commander Islands (Russia) and Kamchatka that would include Commander Island sea lions within the western U.S. stock and animals west of there in an Asian stock. However, Hoffman et al. (2006) did not support an Asian/western stock split based on their analysis of nuclear microsatellite markers indicating high rates of male gene flow. All genetic analyses (Baker et al. 2005, Harlin-Cognato et al. 2006, Hoffman et al. 2006, 2009, O'Corry-Crowe et al. 2006) confirm a strong separation between western and eastern stocks, and there may be sufficient morphological differentiation to support elevating the two recognized stocks to subspecies (Phillips et al. 2009). Recent work by Phillips et al. (2011) addressed the effect of climate change in the form of glacial events on the evolution of Steller sea lions and reported that the effective population size at the time of the event determines the outcome. The results suggested that during historic glacial periods dispersal events were correlated with historically low effective population sizes, while range fragmentation type events were correlated with larger effective population sizes. This work again re-inforced the stock delineation concept by noting that ancient population subdivision likely led to the sequestering of most mtDNA haplotypes as DPS, or subspecies-specific (Phillips et al. 2011). Overall, the basis for this distinctiveness is the overwhelming collection of morphological, ecological and behavioral, and genetic evidence for DPS differences. Although the movement of few migrants a year has been documented and that in and of itself may be sufficient to prevent genetic differentiation among

populations within a DPS (such as within the entire eastern DPS), there is no evidence to suggest such a rate of exchange is sufficient to merge distinct populations.

POPULATION SIZE

The most recent comprehensive estimate (pups and non-pups) of abundance of the western stock of Steller sea lions in Alaska is based on aerial surveys of non-pups conducted in June-July 2008-2011 (DeMaster 2011) and aerial and ground-based pup counts conducted in June-July 2009-2011 (DeMaster 2011). Data from these surveys represent actual counts of pups and non-pups at all rookeries and major haulout sites. During the 2008-2011 non-pup surveys, a total of 34,314 non-pups was counted at 274 terrestrial rookery and haulout sites; 19,593 in the Gulf of Alaska and 14,721 in the Bering Sea/Aleutian Islands. Most of the data represented in the aggregate 2008-11 non-pup count was collected during the most recent 2011 survey (30,590 non-pups on 127 of the largest sites). Sites that were not surveyed in 2011 contributed less to the aggregate 2008-11 total: 553 non-pups on 54 sites last surveyed in 2008, 644 non-pups on 6 sites last surveyed in 2009, and 2,526 non-pups on 87 sites last surveyed in 2010. The composite pup count from 2009-2011 of 11,602 from the western stock in Alaska includes counts from 7 sites in 2009 (274 pups), 7 sites in 2010 (724 pups), and 65 sites in 2011 (10,604 pups). This composite 2009-2011 total of 11,602 pups differs from the 2011 pup production estimate of DeMaster (2011), 11,547 pups, because DeMaster (2011) estimated pup production at sites that were missed in the 2011 survey (estimates were based on recent regional trends). Here, the total of 11,602 pups is based on the most recent counts at each site in the 2009-2011 period. There were 5,036 pups counted in the Gulf of Alaska and 5,566 pups counted in the Bering Sea/Aleutian Islands. Combining the pup count data from 2009-2011 (11,602) and non-pup count data from 2008-2011 (34,314) results in a minimum abundance estimate of 45,916 Steller sea lions in the western U.S. stock in 2008-2011.

An estimate of the total population size of western Steller sea lion in Alaska may be obtained by multiplying the best estimate of total pup production (11,602) by 4.5 (Calkins and Pitcher 1982), which equals 52,209. This is not a minimum abundance estimate since it is an extrapolated total population size from pup counts based on survival and fecundity estimates in a life table. The 4.5 multiplier may not be appropriate for use in estimating the abundance of the western stock, as it is based on a life history table using age-specific fecundity and survival for the stable, mid-1970s population. The demographics of central Gulf of Alaska populations suggest that these rates have changed since the mid-1970s (Holmes and York 2003; Holmes et al. 2007).

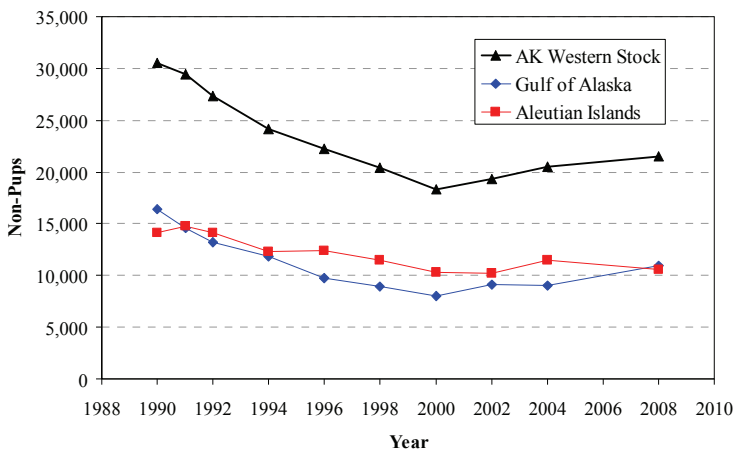

Figure 2. Counts of adult and juvenile Steller sea lions at rookery and haulout trend sites throughout the range of the western U.S. stock in Alaska, 1990-2008. Correction factor applied to 2004 and 2008 counts for film format differences (Fritz and Stinchcomb 2005).

Holmes and York (2003) and Holmes et al. (2007) estimated changes in adult and juvenile survival and natality in the female segment of the population that were consistent with time series of pup and non-pup counts, and changes in the juvenile proportion of the population in the central Gulf of Alaska (Kodiak archipelago). They found that the rapid decline of the central Gulf sea lion population in the 1980s was associated with a large drop in juvenile survival and smaller declines in adult survival and natality. As the rate of population decline lessened in the 1990s, rates of juvenile and adult survival increased to pre-decline levels in the 1998-2004 period. Rates of natality, however, continued to decline throughout the 1990s and into the 2000s. Thus, the authors concluded that factors that caused the population decline (those contributing to lower rates of juvenile survival) were likely quite different from those that are now affecting recovery (those contributing to lower reproductive rates of adult females).

In 2006-2009, over 18,000 Steller sea lions were counted in Russia. Methods used to survey Steller sea lions in Russia differ from those used in Alaska, with less use of aerial photography and more use of skiff surveys and ground counts. Burkanov and Loughlin (2005) estimated that the size of the Steller sea lion population (pups

and non-pups) in Russia was 16,000 in 2005. Data collected since then indicate that Steller sea lion numbers in the Kuril Islands and the Sea of Okhotsk increased while those in the western Bering Sea, eastern Kamchatka and Commander Islands have remained stable or declined.

Minimum Population Estimate

The 2008-2011 aggregate total count of non-pups (34,314) plus the number of pups in 2009-2011 (11,602) is 45,916, which will be used as the minimum population estimate (N_{MIN}) for the U.S. portion of the western stock of Steller sea lion (Wade and Angliss 1997). This is considered a minimum estimate because it has not been corrected to account for animals that were at sea during the surveys.

Current Population Trend

The first reported trend counts (an index to examine population trends) of Steller sea lions in Alaska were made in 1956-60. Those counts indicated that there were at least 140,000 (no correction factors applied) sea lions in the Gulf of Alaska and Aleutian Islands (Merrick et al. 1987). Subsequent surveys indicated a major population decrease, first detected in the eastern Aleutian Islands in the mid-1970s (Braham et al. 1980). Counts from 1976 to 1979 indicated about 110,000 sea lions (no correction factors applied, Table 1). The decline appears to have spread eastward to the Kodiak Island area during the late 1970s and early 1980s, and then westward to the central and western Aleutian Islands during the early and mid-1980s (Merrick et al. 1987, Byrd 1989). The greatest declines since the 1970s occurred in the eastern Aleutian Islands and western Gulf of Alaska, but declines also occurred in the central Gulf of Alaska and central Aleutian Islands. Counts of Steller sea lions at trend sites for the western U. S. stock decreased 40% from 1991 to 2000 (Table 1), an average annual decline of 5.4% (Loughlin and York 2000).

Counts of non-pup Steller sea lions at trend sites in the AK western stock increased 11% from 2000 to 2004 (Table 1, Fig. 2). These were the first region-wide increases for the western stock since standardized surveys began in the 1970s and were due to increased or stable counts in all regions except the western Aleutian Islands. Between 2004 and 2008, AK western non-pup counts increased only 3%: eastern Gulf of Alaska (Prince William Sound area) counts were higher and Kenai Peninsula through Kiska Island counts were stable, but western Aleutian counts continued to decline. Johnson (2010) analyzed western Steller sea lion population trends in AK and concluded that the overall 2000-2008 trend was 1.5% y^{-1} (with 90% confidence bounds of -0.3% y^{-1} and 3.3% y^{-1}). NMFS has not been able to complete a non-pup survey of the AK western stock since 2008, due largely to weather and closure of the Air Force base on Shemya in 2009 and 2010. However, the data collected through 2011 indicate the following regional trends in non-pup counts (DeMaster 2011):

- Significant decline in the western Aleutians, 1991-2011: -8.5% y^{-1} ($P<0.001$)
- Improvement in trend from west to east in the central Aleutians, with counts declining west of Tanaga Pass (Kiska through the Delarof Islands) and either stable or increasing between Tanaga and Samalga Passes:
    - Significant decline from Kiska through Amchitka Islands, 1991-2008: -5.5% y^{-1} ($P<0.001$)
    - Significant decline in the Delarof Islands, 1991-2010: -3.1% y^{-1} ($P<0.001$)
    - Stable from Tanaga through Atka Islands, 2000-2011: -0.4% y^{-1} ($P=0.756$)
    - Significant increase from Amlia Island to Samalga Pass, 2000-2011: 2.2% y^{-1} ($P=0.027$)
- Significant increase in both the eastern Aleutians (2.6% y^{-1}, $P=0.005$) and the western Gulf of Alaska (4.8% y^{-1}, $P<0.001$), 2000-2011
- Stable in the central Gulf of Alaska, 2000-2010: 0.0% y^{-1} ($P=0.980$), and
- Significant increase in the eastern Gulf of Alaska, 2000-2011: 5.8% y^{-1} ($P=0.002$).

Pup production at the 31 major western stock rookeries used to estimate trend increased at an average rate of 1.8% y^{-1} ($P=0.02$) between 2001/02 and 2011. However, the strong regional differences noted in the trends in non-pup counts are also reflected in pup production, which declined in the western (-9.2% y^{-1}; $P<0.01$) and central Aleutian Islands (-1.5% y^{-1}; $P=0.05$) between 2001/02 and 2011, but increased in the eastern Aleutian Islands (4.8% y^{-1}; $P<0.01$) and in the western (3.5% y^{-1}; $P=0.02$) and eastern Gulf of Alaska (4.7% y^{-1}; $P<0.01$); pup production in the central Gulf of Alaska has increased in the 2000s (2.2% y^{-1}) but not significantly ($P=0.08$).

Table 1. Counts of adult and juvenile Steller sea lions observed at rookery and haulout trend sites surveyed consistently since the late 1970s by year and geographical area for the western U. S. stock (NMFS 1995, Sease et al. 2001, Fritz et al. 2008, NMFS 2008). Counts from 1976 to 1979 (NMFS 1995) were combined to produce complete regional counts that are comparable to the 1990-2008 data. Data from 2004 and 2008 reflect a 3.64% reduction from actual counts to account for improvements in survey protocol in 2004 relative to previous years (Fritz and Stinchcomb 2005).

Area	late 1970s	1990	1991	1992	1994	1996	1998	2000	2002	2004	2008
Gulf of Alaska	65,296	16,409	14,598	13,193	11,862	9,784	8,937[1]	7,995	9,087	8,993	10,931
Bering Sea/Aleutians	44,584	14,116	14,807	14,106	12,274	12.426	11,501	10,330	10,253	11,507	10,559
Total	109,880	30,525	29,405	27,299	24,136	22,210	20,438[1]	18,325	19,340	20,500	21,489

[1] Identifies 637 non-pups counted at six trend sites in 1999 in the eastern Gulf of Alaska which were not surveyed in 1998.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

There are no estimates of maximum net productivity rate for Steller sea lions. Hence, until additional data become available, it is recommended that the theoretical maximum net productivity rate (R_{MAX}) for pinnipeds 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 0.1, the default value for stocks listed as "endangered" under the Endangered Species Act (Wade and Angliss 1997). Thus, for the U.S. portion of the western stock of Steller sea lions, PBR = 275 animals (45,916 × 0.06 × 0.1).

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 Steller sea lions. 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 6 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. Between 2007-2009, there were incidental serious injuries and mortalities of western Steller sea lions in the following fisheries: Bering Sea/Aleutian Islands Atka mackerel trawl, Bering Sea/Aleutian Islands flatfish trawl, Bering Sea/Aleutian Islands Pacific cod trawl, Bering Sea/Aleutian Islands pollock trawl, Gulf of Alaska Pacific cod trawl, Gulf of Alaska pollock trawl, Bering Sea/Aleutian Islands Pacific cod longline, and Gulf of Alaska Pacific cod longline (Table 2).

Observers also monitored the Prince William Sound salmon drift gillnet fishery in 1990 and 1991, recording 2 mortalities in 1991, extrapolated to 29 (95% CI: 1-108) kills for the entire fishery (Wynne et al. 1992). No mortalities were observed during 1990 for this fishery (Wynne et al. 1991), resulting in a mean kill rate of 14.5 (CV = 1.0) 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. 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 Alaska Peninsula and Aleutian Islands salmon drift gillnet fishery was also monitored during 1990 (roughly 4% observer coverage) and no Steller sea lion mortalities were observed. It is not known whether these incidental mortality levels are representative of the current incidental mortality levels in these fisheries.

An observer program for the Cook Inlet salmon set and drift gillnet fisheries was implemented in 1999 and 2000 in response to the concern that there may be significant numbers of marine mammal injuries and mortalities that occur incidental to these fisheries. Observer coverage in the Cook Inlet drift gillnet fishery was 1.75% and 3.73% in 1999 and 2000, respectively. The observer coverage in the Cook Inlet set gillnet fishery was 7.3% and 8.3% in 1999 and 2000, respectively (Manly 2006). There were no mortalities of Steller sea lions observed in the set or drift gillnet fisheries in either 1999 or 2000 (Manly 2006). An observer program conducted for a portion of the Kodiak drift gillnet fishery in 2002 did not observe any serious injuries or mortalities of Steller sea lions, although Steller sea lions were frequently observed in the vicinity of the gear (Manly et al. 2003).

Combining the mortality estimates from the Bering Sea and Gulf of Alaska groundfish trawl and Gulf of Alaska longline fisheries presented above (14.6) with the mortality estimate from the Prince William Sound salmon drift gillnet fishery (14.5) results in an estimated mean annual mortality rate in the observed fisheries of 29.1 (CV = 0.50) sea lions per year from this stock (Table 2).

Table 2. Summary of incidental mortality of Steller sea lions (western U. S. stock) due to fisheries from 2007 through 2010 (or most recent data available) and calculation of the mean annual mortality rate. Mean annual mortality in brackets represents a minimum estimate from stranding data. The most recent 4 years of available data are used in the mortality for a particular fishery. N/A indicates that data are not available. Details of how percent observer coverage is measured is included in Appendix 6.

Fishery name	Years	Data type	Observer coverage	Observed mortality (in given yrs.)	Estimated mortality (in given yrs.)	Mean annual mortality
Bering Sea/Aleutian Is. Atka mackerel trawl	2007 2008 2009 2010	obs data	94 100 99 100	0 0 0 1	0 0 0 1	0.25 (CV = 0.23)
Bering Sea/Aleutian Is. flatfish trawl	2007 2008 2009 2010	obs data	72 100 100 100	4 11 3 5	5.5 11.0 3.0 5.0	6.14 (CV = 0.07)
Bering Sea/Aleutian Is. Pacific cod trawl	2007 2008 2009 2010	obs data	53 59 63 66	3 0 0 1	4.0 0 0 1.3	1.32 (CV = 0.29)
Bering Sea/Aleutian Is. pollock trawl	2007 2008 2009 2010	obs data	85 85 86 86	2 8 6 5	2.2 9.2 7.1 6.1	6.16 (CV = 0.11)
Gulf of Alaska pollock trawl	2007 2008 2009 2010	obs data	21 24 29 20	0 0 0 0	0 0 0 0	0
Bering Sea/Aleutian Is. Pacific cod longline	2007 2008 2009 2010	obs data	63 63 61 64	0 0 0 0	0 0 0 0	0
Gulf of Alaska Pacific cod longline	2007 2008 2009 2010	obs data	20 15 21 28	0 1 0 1	0 2.9 0 14.7	4.40 (CV = 0.67)
Prince William Sound salmon drift gillnet	1990-1991	obs data	4-5%	0 2	0 29	14.5 (CV = 1.0)
Prince William Sound salmon set gillnet	1990	obs data	3%	0	0	0
Alaska Peninsula/Aleutian Islands salmon drift gillnet	1990	obs data	4%	0	0	0
Cook Inlet salmon set gillnet[1]	1999-2000	obs data	2-5%	0 0	0, 0	0
Cook Inlet salmon drift gillnet[1]	1999-2000	obs data	2-5%	0 0	0, 0	0
Kodiak Island salmon set gillnet	2002	obs data	6.0%	0	0	0

Fishery name	Years	Data type	Observer coverage	Observed mortality (in given yrs.)	Estimated mortality (in given yrs.)	Mean annual mortality
Observer program total						32.77 (CV = 0.45)
				Reported mortalities		
Alaska sport salmon troll (non-commercial)	2006-2010	strand	N/A	0, 0, 0, 1, 1	N/A	[0.4]
Miscellaneous fishing gear	2006-2010	strand	N/A	0, 0, 0, 1, 2	N/A	[0.6]
Minimum total annual mortality						33.77 (CV = 0.45)

[1] Data from the 1999 Cook Inlet observer program are preliminary.

Reports from the NMFS stranding database 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 2006 to 2010, there were five confirmed fishery-related Steller sea lion strandings in the range of the western stock. Two sightings involved a Steller sea lion that was reported to be in bad body condition and observed with a flasher lure hanging from its mouth; it was believed to have the hooks inside the mouth (Table 2). The other four events involved one animal found on a Bering Sea/ Aleutian Islands pollock trawl vessel while offloading the catch, which is accounted for in the estimated mortality for this fishery, one animal entangled in unidentified gear on the Pribilof Islands, an animal observed with a band around its neck, and another with a string leader line hanging out its mouth with a hook apparently inside the mouth. Fishery-related strandings during 2006-2010 result in an estimated annual mortality of 1.0 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. Steller sea lions reported in the stranding database as shot are not included in this estimate, as they may result from animals struck and lost in the Alaska Native subsistence harvest.

NMFS studies using satellite tracking devices attached to Steller sea lions suggest that they rarely go beyond the U.S. Exclusive Economic Zone into international waters. Given that the high-seas gillnet fisheries have been prohibited and other net fisheries in international waters are minimal, the probability that Steller sea lions are taken incidentally in commercial fisheries in international waters is very low. NMFS concludes that the number of Steller sea lions taken incidental to commercial fisheries in international waters is insignificant.

The minimum estimated mortality rate incidental to U. S. commercial fisheries is 33.8 sea lions per year, based on observer data (32.8) and stranding data (1.0) where observer data were not available. Observer data on state fisheries dates as far back as 1990; however, these are the best data available to estimate takes in these fisheries. No observers have been assigned to several fisheries that are known to interact with this stock making the estimated mortality a minimum estimate.

Subsistence/Native Harvest Information

Information on the subsistence harvest of Steller sea lions comes via two sources: the Alaska Department of Fish and Game (ADFG) and the Ecosystem Conservation Office (ECO) of the Aleut Community of St. Paul. The ADFG conducted systematic interviews with hunters and users of marine mammals in approximately 2,100 households in about 60 coastal communities within the range of the Steller sea lion in Alaska (Wolfe et al. 2005). The interviews were conducted once per year in the winter (January to March), and covered hunter activities for the previous calendar year. As of 2009, data on community subsistence harvests are no longer being collected. Therefore, the most recent 5-years of data (2004-2008) will be retained and used for estimating an annual mortality estimate for all areas except St. Paul. Data from St. Paul are still being collected and will be updated with the most recent 5-year period available. The ECO collects data on the harvest in near real-time on St. Paul Island, and records hunter activities within 36 hours of the harvest (Zavadil et al. 2010). Information on subsistence harvest levels is provided in Table 3; data from ECO (e.g., Zavadil et al. 2010) are relied upon as the source of data for St. Paul Island and all other data are from the ADFG (e.g., Wolfe et al. 2005).

The mean annual subsistence take from this stock over the 5-year period from 2004 through 2008, combined with the mean take over the 2005-2009 period from St. Paul, was 198 Steller sea lions/year (Table 3).

Table 3. Summary of the subsistence harvest data for the western U. S. stock of Steller sea lions. As of 2009, data on community subsistence harvests are no longer being collected. Therefore, the most recent 5-years of data (2004-2008) will be retained and used for estimating an annual mortality estimate for all areas except St. Paul. Data from St. Paul are still being collected and will be updated with the most recent 5-year period available (2005-2009).

	All areas except St. Paul Island			St. Paul Island	
Year	**Number harvested**	**Number struck and lost**	**Total**	**Number harvested + struck and lost**	**Total take**
2004	136.8	49.1	185.9[1]		
2005	153.2	27.6	180.8[2]	22[6]	203
2006	114.3	33.1	147.4[3]	26[7]	173
2007	165.7	45.2	210.9[4]	34[8]	245
2008	114.7	21.6	136.3[5]	22[9]	158
2009	N/A	N/A	N/A	26[10]	N/A
Mean annual take	136.9	35.3	172.3	26	198

[1]Wolfe et al. 2005; [2]Wolfe et al. 2006; [3]Wolfe et al. 2008; [4]Wolfe et al. 2009a; [5]Wolfe et al. 2009b; [6]Lestenkof and Zavadil 2006; [7]Lestenkof et al. 2007; [8]Lestenkof et al. 2008, [9]Jones 2009, [10]Zavidil 2010.

Other Mortality

Illegal 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 U.S. Endangered Species Act (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 for subsistence take by Alaska Natives or where imminently necessary to protect human life). Records from NMFS enforcement indicate that there were two cases of illegal shootings of Steller sea lions in the Kodiak area in 1998, both of which were successfully prosecuted (NMFS, Alaska Enforcement Division). There have been no cases of successfully prosecuted illegal shootings between 1999 and 2003 (NMFS, Alaska Enforcement Division).

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 2006-2010, there was a total of 0 mortalities resulting from research on the western stock of Steller sea lions (Tammy Adams, Permits, Conservation, and Education Division, Office of Protected Resources, NMFS, 1315 East-West Highway, Silver Spring, MD 20910).

STATUS OF STOCK

The current annual level of incidental U. S. commercial fishery-related mortality (33.8) exceeds 10% of the PBR (28) and, therefore, cannot be considered insignificant and approaching a zero mortality and serious injury rate. Based on available data, the estimated annual level of total human-caused mortality and serious injury (33.8 + 198 = 231.8) is below the PBR level (275) for this stock. The western U. S. stock of Steller sea lion is currently listed as "endangered" under the ESA, and therefore designated as "depleted" under the MMPA. As a result, the stock is classified as a strategic stock. However, given that the population has declined for unknown reasons that are not explained by the level of direct human-caused mortality, there is no reason to believe that limiting those mortalities to the level of the PBR significantly improve the likelihood of recovery.

Habitat Concerns

The decline in the western U. S. stock of Steller sea lion caused a change in the listing status of the stock in 1997 from "threatened" to "endangered" under the U. S. Endangered Species Act of 1973. Survey data collected since 2000 indicate that the decline continues in the central and western Aleutian Islands but that regional populations east of Samalga Pass have increased or are stable. Many factors have been suggested as causes of the steep decline observed in the 1980s, (e.g., competitive effects of fishing, environmental change, disease, killer whale predation, incidental take, illegal and legal shooting). Decreases in rates of survival, particularly for juveniles, were associated with the steep 1980s declines (Holmes et al. 2007). Factors causing direct mortality were likely the most important. The slowing of the decline in the 1990s, and the periods of increase and stability observed between 2000 and 2008 were associated with increases in survival of both adults and juveniles, but also with continuation of a chronic decline in reproductive rate that may have been initiated in the early 1980s (Pitcher et al. 1998, Holmes et al.

2007). Nutritional stress related to competition with commercial fisheries or environmental change, along with predation by killer whales, have been identified as potentially important threats to recovery (NMFS 2008). Additional potential threats to Steller sea lion recovery are shown in Table 4.

Table 4. Potential threats and impacts to Steller sea lion recovery and associated references. Threats and impact to recovery as described by the Draft Steller Sea Lion Recovery Plan (NMFS 2008). Reference examples identify research related to corresponding threats and may or may not support the underlying hypotheses.

Threat	Impact on Recovery	Reference Examples
Environmental variability	Potentially high	Fritz and Hinckley 2005, Trites and Donnelly 2003
Competition with fisheries	Potentially high	Dillingham et al. 2006, Fritz and Brown 2005, Hennen 2004, Fritz and Ferrero 1998
Predation by killer whales	Potentially high	DeMaster et al. 2006, Trites et al. 2007, Williams et al. 2004, Springer et al. 2003
Toxic substances	Medium	Albers and Loughlin 2003, Lee et al. 1996, Calkins et al. 1994
Incidental take by fisheries	Low	Perez 2006, Nikulin and Burkanov 2000, Wynne et al. 1992
Subsistence harvest	Low	Wolfe et al. 2005, Loughlin and York 2000, Haynes and Mishler 1991
Illegal shooting	Low	NMFS 2001, Loughlin and York 2000
Entanglement in marine debris	Low	Calkins 1985
Disease and parasitism	Low	Burek et al. 2005
Disturbance from vessel traffic and tourism	Low	Kucey and Trites 2006
Disturbance or mortality due to research activities	Low	Atkinson et al. 2008, Kucey and Trites 2006, Kucey 2005, Loughlin and York 2000, Calkins and Pitcher 1982

A number of management actions were implemented between 1990 and 1998 to promote the recovery of the western U. S. stock of Steller sea lions, including 3 nautical mile (nmi) no-entry zones around rookeries, prohibition of groundfish trawling within 10-20 nmi of certain rookeries, and spatial and temporal allocation of Gulf of Alaska pollock and Aleutian Island Atka mackerel total allowable catch. In 2000, NMFS issued a Biological Opinion (BO) on effects of the groundfish fisheries in the Bering Sea/Aleutian Islands and Gulf of Alaska regions on listed species. In this BO, NMFS determined that the continued prosecution of the groundfish fisheries as described in the Fishery Management Plan for Bering Sea/Aleutian Islands Groundfish and in the Fishery Management Plan for Gulf of Alaska Groundfish was likely to jeopardize the continued existence of the western population of Steller sea lion and to adversely modify critical habitat. NMFS also identified several other factors that could contribute to the decline of the population, including a shift in the large-scale weather regime and predation. To avoid jeopardy, NMFS identified a Reasonable and Prudent Alternative that included components such as 1) adoption of a more precautionary rule for setting "global" harvest limits, 2) extension of 3 nmi protective zones around rookeries and haulouts not currently protected, 3) closures of many areas around rookeries and haulouts to 20 nmi, 4) establishment of four seasonal and area catch limits, and 5) establishment of a procedure ("fishing in proportion to biomass") for setting seasonal catch limits on removal levels in critical habitat based on the biomass of the target species residing in critical habitat.

In 2001, NMFS developed a programmatic SEIS to consider the impacts on Steller sea lions of different management regimes for the Alaska groundfish fisheries. A committee composed of 21 members from fishing groups, processor groups, Alaska communities, environmental advocacy groups, and NMFS representatives met to recommend conservation measures for Steller sea lions and to develop a "preferred alternative" for the SEIS. Although consensus was not reached, a "preferred alternative" was identified and included in the SEIS. The preferred alternative included complicated, area-specific management measures (e.g., area restrictions and closures) designed to reduce direct and indirect interactions between the Atka mackerel, pollock, and Pacific cod fisheries and Steller sea lions, particularly in waters within 10 nmi of haulouts and rookeries. The suite of conservation measures, which were implemented in 2002, were developed after working with the: 1) State of Alaska to explore whether there are potential adverse effects of state fisheries on Steller sea lions, and 2) the North Pacific Fishery Management Council (Council) to further minimize overcapitalization of fisheries and concentration of fisheries in

time and space. The 2002 suite of conservation measures also removed the broad prohibition of fishing with trawl gear within 10 (or 20) nmi of rookeries in the western stock in U.S. waters, and did not apply the "fishing in proportion to biomass" procedure for regulating seasonal catch for the three Steller sea lion prey species in the same manner as was initially applied in the 2000 BO. All Steller sea lion-fishery management measures were reviewed in a programmatic, status quo ESA Biological Opinion on the effects of groundfish fisheries on listed species released in December 2010 (NMFS 2010). NMFS concluded that the groundfish fisheries in the Bering Sea/Aleutian Islands area and in the Gulf of Alaska, as currently managed (as of 2010) were likely to jeopardize the continued existence (recovery) and adversely modify the critical habitat of the western stock of Steller sea lion. NMFS implemented interim final measures (reasonable and prudent alternatives to the status quo suite of fishery management regulations) that mitigate jeopardy and adverse modification: closure of the western Aleutian Islands region (170°-177°E) region to directed fishing for Atka mackerel and Pacific cod, and additional measures in the central Aleutian Islands (170°W-177°E) to reduce catches of Atka mackerel and Pacific cod in critical habitat and disperse the fisheries temporally and spatially.

NMFS reconstituted the Steller Sea Lion Recovery Team in 2002 to write a revised recovery plan for the eastern and western U.S. stocks. The Team's draft plan was reviewed by five independent reviewers in February 2006, prior to its delivery to NMFS, who then released the Plan for public review in May 2006. NMFS addressed the peer and public review comments and released the second draft Plan for another round of public and independent peer (one by the Council of Independent Experts and another commissioned by the Council) review in May 2007. NMFS released the final recovery plan in March 2008 (NMFS 2008). The de-listing criteria approved by NMFS for the western stock of Steller sea lion are:

1. The population for the U.S. region of this [stock] has increased (statistically significant) for 30 years (at an average annual growth rate of 3%), based on counts of non-pups (i.e., juveniles and adults). Based on an estimated population size of about 42,500 animals in 2000, this would represent approximately 103,000 animals in 2030.
2. The trends in non-pups in at least 5 of the 7 sub-regions are stable or increasing, consistent with the trend observed under criterion #1. The population trend in any two adjacent sub-regions can not be declining significantly. The population trend in any subregion cannot have declined by more than 50%. The 7 sub-regions are:
    a. Eastern Gulf of Alaska (US)
    b. Central Gulf of Alaska (US)
    c. Western Gulf of Alaska (US)
    d. Eastern Aleutian Islands (including the eastern Bering Sea) (US)
    e. Central Aleutian Islands (US)
    f. Western Aleutian Islands (US)
    g. Russia/Asia
3. The ESA listing factor criteria are met.

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