Revised 12/30/98

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, 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 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 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. 1).

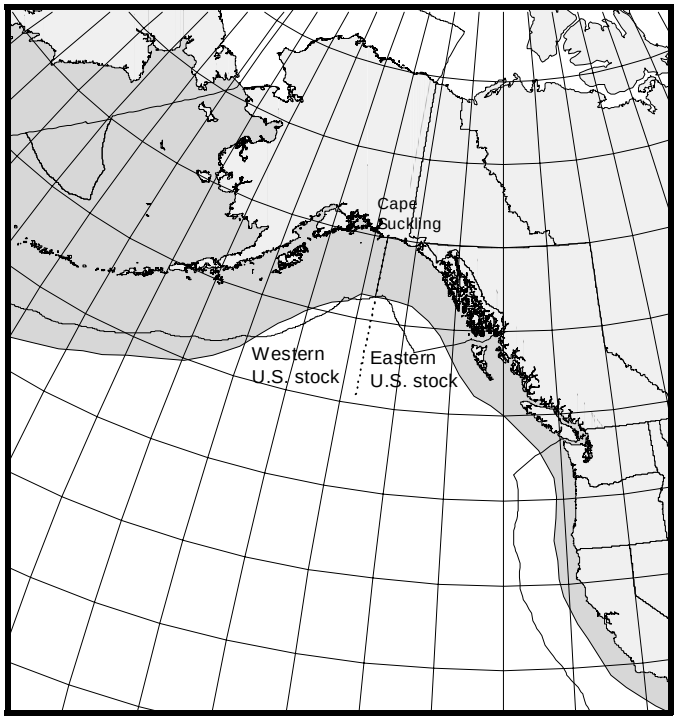

Figure 1. Approximate distribution of Steller sea lions in the eastern North Pacific (shaded area).

POPULATION SIZE

The most recent estimate of Steller sea lion abundance in Alaska is based on aerial surveys performed in June and July 1996 from Southeast Alaska to the western Aleutian Islands (Strick et al. in press). Data from these surveys represent actual counts of nonpups at 95 'trend sites', where sea lions have been monitored since the 1970s, and a few additional sites. Aerial and ship-based surveys of Steller sea lions conducted at these same trend sites during June and July 1992 resulted in coefficients of variation (CV) in counts from 0.025 to 0.12 for 7 distinct subareas of Alaska, with an overall CV of 0.0184 (Sease et al. 1993). As replicate counts were done only in 1992, a CV has not been recalculated since the 1992 survey. However, as survey methods have remained constant, we have assumed that the 1992 survey CV is an appropriate estimate for later surveys. Loughlin et al. (1992) derived correction factors for estimating total nonpup abundance (counted nonpups × 1.331) and for estimating total numbers of pups (counted nonpups ÷ 2.63). Using these correction factors and the 1996 counts for the Gulf of Alaska (9,782) and the Bering Sea/Aleutian Islands (13,320; this includes trend sites plus Attu Island, a major rookery in the western Aleutian Islands that has not been included in trend surveys for logistic reasons) resulted in an estimate of approximately 30,700 nonpups and 8,800 pups, for a total abundance estimate of 39,500 Steller sea lions in the Western U. S. stock.

A range wide survey for Steller sea lions is planned for the summer of 1998. Preliminary results from this survey will be available in the autumn of 1998.

Minimum Population Estimate

For the Western U. S. stock of Steller sea lions, the minimum population estimate (N_{MIN}) 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 39,500 and an associated CV(N) of 0.0184, N_{MIN} for the Western U. S. stock is 38,893. Even though CVs are not currently available for the correction factors, this estimate of N_{MIN} is such that the true number of animals in the population is very likely to be greater than N_{MIN} because Loughlin et al. (1992) have commented that the actual counts of pups and non-pups are likely to be underestimated by 5-10%. This approach is consistent with recommendations of the Alaska Scientific Review Group (DeMaster 1995, 1996, 1997).

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 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. More recently, counts of Steller sea lions at trend sites for the Western U. S. stock decreased 21% from 1990 to 1994 (Table 1). Counts at trend sites during 1996 indicate that the Western U. S. stock has continued to decline (7.9% since 1994, Table 1, Fig. 2).

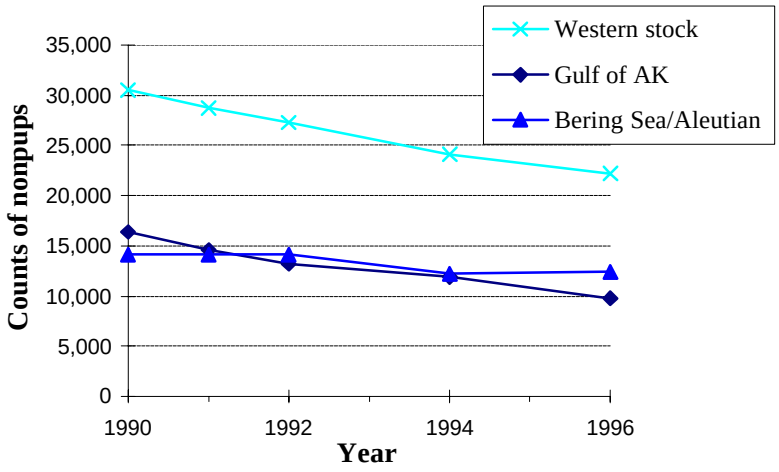

Figure 2. Counts of adult and juvenile Steller sea lions at rookery and haulout trend sites throughout the range of the Western U. S. stock, 1990- 96.

Table 1. Counts of adult and juvenile Steller sea lions observed at rookery and haulout trend sites by year and geographical area for the Western U. S. stock from the late 1970s through 1996 (NMFS 1995, Strick et al. 1997, Strick et al. in press). Counts from 1976-79 (NMFS 1995) were combined to produce complete regional counts which are comparable to the 1990-96 data.

Area	late 1970s	1990	1991	1992	1994	1996
Gulf of Alaska	65,296	16,409	14,603	13,179	11,871	9,782
Bering Sea/ Aleutians	44,584	14,116	14,141	14,107	12,248	12,434
Total	109,880	30,525	28,744	27,286	24,119	22,216

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). However, it should also be noted that from a theoretical, single-species perspective, a population that has declined from over 200,000 individuals to less than 50,000 individuals and one with an estimated annual removal rate due to human activities on the order of 1-2% of the current abundance level, should not be declining at present. For this stock, the potential biological removal (PBR) approach, given its single-species perspective, is difficult to apply.

POTENTIAL BIOLOGICAL REMOVAL

Under the 1994 re-authorized Marine Mammal Protection Act (MMPA), the 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 has been changed from 0.3 (Small and DeMaster 1995) to 0.15. This F_R value was selected by NMFS after considering recommendations from the Alaska Scientific Review Group (DeMaster 1997), the Alaska Fisheries Science Center, the Alaska Regional Office, and public comment. Based on simulations reported in Wade (1998), the use of an F_R of 0.15 versus allowing no human-related removals at all will result in a negligible difference in the population dynamics of a stock. Thus, for the Western U. S. stock of Steller sea lions, PBR = 350 animals ($38,893 \times 0.06 \times 0.15$).

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fisheries Information

Six different commercial fisheries operating within the range of the Western U. S. stock of Steller sea lions were monitored for incidental take by fishery observers during 1990-96: Bering Sea (and Aleutian Islands) groundfish trawl, longline, and pot fisheries, and Gulf of Alaska groundfish trawl, longline, and pot fisheries. No sea lion mortality was observed by fishery observers in either pot fishery. For the fisheries with observed takes, the range of observer coverage over the 7-year period, as well as the annual observed and estimated mortalities, are presented in Table 2a. The mean annual (total) mortality was 9 (CV=0.37) for the Bering Sea groundfish trawl fishery, 1.2 (CV=0.61) for the Gulf of Alaska groundfish trawl fishery, 0.2 (CV=1.0) for the Bering Sea groundfish longline fishery, and 1.0 (CV=0.77) for the Gulf of Alaska groundfish longline fishery. In 1996 (66% observer coverage), only 2 of the 4 observed mortalities in the Bering Sea trawl fishery occurred during monitored hauls, leading to an underestimate (3) of the extrapolated mortality for that fishery. As a result, 4 mortalities were used as both the observed and estimated mortalities for that year (Table 2a). The observed mortality in the 1993 Bering Sea longline fishery (30% observer coverage) also occurred during an unmonitored haul and therefore could not be used to estimate mortality for the entire fishery. Therefore, 1 mortality was used as both the observed mortality and estimated mortality in 1993 for that fishery, and should be considered a minimum estimate.

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). Fisher self-reports from this fishery detail 12, 5, 1, and 23 Steller sea lion mortalities in 1990, 1991, 1992, and 1993, respectively. The extrapolated (estimated) observer mortality accounts for these self-reported mortalities, so they do not appear in Table 2a. 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. Combining the mortality estimates from the Bering Sea and Gulf of Alaska groundfish trawl and longline fisheries presented above (9+1.2+0.2+1.0=11.4) 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 25.9 (CV=0.58) sea lions per year from this stock.

Table 2a. Summary of incidental mortality of Steller sea lions (Western 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
Bering Sea/Aleutian Is. (BSAI) groundfish trawl	90-96	obs data	53-74%	13, 13, 15, 4, 9, 2, 4	13, 19, 21, 6, 11, 3, 4	9 (CV=0.37)
Gulf of Alaska (GOA) groundfish trawl	90-96	obs data	33-55%	2, 0, 0, 1, 1, 0, 0	4, 0, 0, 3, 3, 0, 0	1.2 (CV=0.61)
BSAI groundfish longline (incl. misc. finfish and sablefish fisheries)	90-96	obs data	27-80%	0, 0, 0, 1, 0, 0, 0	0, 0, 0, 1, 0, 0, 0	0.2 (CV=1.0)
GOA groundfish longline (incl. misc. finfish and sablefish fisheries)	90-96	obs data	8-21%	1, 0, 0, 0, 0, 1, 0	2, 0, 0, 0, 1, 4, 0	1.0 (CV=0.77)
Prince William Sound salmon drift gillnet	90-91	obs data	4-5%	0, 2	0, 29	14.5 (CV=1.0)
Alaska Peninsula/Aleutian Islands salmon drift gillnet	90	obs data	4%	0	0	0
Observer program total						25.9 (CV=0.58)
				Reported mortalities		
Alaska Peninsula/Aleutian Islands salmon set gillnet	90-96	self reports	n/a	0, 1, 1, 1 n/a, n/a, n/a	n/a	[≥0.75]
Cook Inlet salmon drift gillnet	90-96	self reports	n/a	0, 0, 0, 2 n/a, n/a, n/a	n/a	[≥0.5]
Bristol Bay salmon drift gillnet	90-96	self reports	n/a	0, 4, 2, 8 n/a, n/a, n/a	n/a	[≥3.5]
Prince William Sound set gillnet	90-96	self reports	n/a	0, 0, 2, 0 n/a, n/a, n/a	n/a	[≥0.5]
Alaska miscellaneous finfish set gillnet	90-96	self reports	n/a	0, 1, 0, 0 n/a, n/a, n/a	n/a	[≥0.25]
Alaska halibut longline (state and federal waters)	90-96	self reports	n/a	0, 0, 0, 0 1, n/a, n/a	n/a	[≥0.2]
Minimum total annual mortality						≥31.6 (CV=0.58)

An additional source of information on the number of Steller sea lions killed or injured incidental to commercial fishing operations is the self-reported fisheries information required of vessel operators by the MMPA. Some incidental takes of sea lions reported in the Gulf of Alaska fisheries were listed as "unknown species", indicating the animals could have been either Steller or California sea lions. Based on all logbook reports for both species within the Gulf of Alaska, California sea lions represented only 2.2% of all interactions. Thus, the reports of injured and killed "unknown" sea lions were considered to be Steller sea lions. During the period between 1990 and 1996, fisher self-reports from 6 unobserved fisheries (see Table 2a) resulted in an annual mean of 5.7 mortalities from interactions

with commercial fishing gear. 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. These totals are based on all available self-reports for Alaska fisheries, except the groundfish trawl and longline fisheries in the Bering Sea, Aleutian Islands, and Gulf of Alaska, and the Prince William Sound salmon drift gillnet fishery for which observer data were presented above. The Bristol Bay salmon drift gillnet and set gillnet fisheries accounted for the majority of the reported incidental take in unobserved fisheries. Self-reported fisheries data are incomplete for 1994, not available for 1995, and considered unreliable for 1996 (see Appendix 4).

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 commercial fisheries is 32 sea lions per year, based on observer data (25.9) and self-reported fisheries information (5.7) where observer data were not available. No observers have been assigned to several fisheries that are known to interact with this stock (self-reported data from these fisheries are provided in Table 2a), making the estimated mortality a minimum estimate.

Subsistence/Native Harvest Information

The 1992-95 subsistence harvest of Steller sea lions in Alaska was estimated by the Alaska Department of Fish and Game, under contract with the NMFS (Table 2b: Wolfe and Mishler 1993, 1994, 1995, 1996). 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 1992-95, approximately 43 of the interviewed communities lie within the range of the Western U. S. stock. The majority (79%) of sea lions were taken by Aleut hunters in the Aleutian and Pribilof Islands. Details concerning the subsistence harvest of Steller sea lions from the Western U. S. stock are provided in Table 2b. The great majority (approximately 99%) of the statewide subsistence take was from the Western U. S. stock. The mean annual subsistence take from this stock over the 3-year period from 1993 to 1995 was 412 sea lions. The reported average age-specific kill of the harvest across all years was 31% adults, 62% juveniles, 3% pups, and 4% unknown age. The reported average sex-specific kill of the harvest was approximately 64% males, 19% females, and 17% of unknown sex. The 1993-95 subsistence harvest data were used in the mortality rate calculation because 1996 data for Steller sea lion takes in the Pribilof Islands are in dispute.

Table 2b. Summary of the subsistence harvest data for the Western U. S. stock of Steller sea lions, 1992-95.

Year	Estimated total number taken	95% confidence interval	Number harvested	Number struck and lost
1992	549	452-712	370	179
1993	487	390-629	348	139
1994	416	330-554	336	80
1995	339	258-465	307	32
Mean annual take (1993-95)	412			

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 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 where imminently necessary to protect human life).

STATUS OF STOCK

At present, estimated annual fishery mortality of less than 35 animals per year (i.e., 10% of PBR) can be considered insignificant and approaching a zero mortality and serious injury rate. However, because logbook records (fisher self-reports required during 1990-94) are most likely negatively biased (Credle et al. 1994), the current annual level of incidental mortality (32) 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 (32+412=444) is known to exceed the PBR (350) 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.

A number of management actions have recently been implemented to safeguard the Western U. S. stock of Steller sea lion including 3 nautical mile no-entry zones around rookeries, prohibition of groundfish trawling within 10-20 nautical miles of certain rookeries, and spatial and temporal allocation of Gulf of Alaska pollock total allowable catch.

Habitat Concerns

The unprecedented decline in the Western U. S. stock of Steller sea lion has caused a recent change in the listing status of the stock from "threatened" to" endangered." There is currently no sign that the decline in the population has slowed or stopped. Although many theories have been suggested (overfishing, environmental change, disease, etc.) it is not clear what factor or factors are causing the decline. The predicted El Niño of 1997 is also showing signs of affecting the environment in Alaska waters (e.g., die offs of large numbers of seabirds which appear to be unable to successfully find forage fish) that may not be favorable to Steller sea lions. However, it is unclear what affect, if any, this will have on the Western U. S. Steller sea lion stock.

REFERENCES

Bickham, J. W., J. C. Patton, and T. R. Loughlin. 1996. High variability for control-region sequences in a marine mammal: Implications for conservation and biogeography of Steller sea lions (*Eumetopias jubatus*). J. Mammal. 77(1):95-108.

Braham, H. W., R. D. Everitt, and D. J. Rugh. 1980. Northern sea lion decline in the eastern Aleutian Islands. J. Wildl. Manage. 44:25-33.

Byrd, G. V. 1989. Observations of northern sea lions at Ugamak, Buldir, and Agattu Islands, Alaska in 1989. Unpubl. rep., U.S. Fish and Wildlife Service. Alaska Maritime National Wildlife Refuge, P.O. Box 5251, NSA Adak, FPO Seattle, WA 98791.

Credle, V. R., D. P. DeMaster, M. M. Merklein, M. B. Hanson, W. A. Karp, and S. M. Fitzgerald (eds.). 1994. NMFS observer programs: minutes and recommendations from a workshop held in Galveston, Texas, November 10-11, 1993. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-OPR-94-1, 96 pp.

DeMaster, D. P. 1995. Minutes from the 4-5 and 11 January 1995 meeting of the Alaska Scientific Review Group, Anchorage, Alaska. 27 pp. + appendices. (available upon request - D. P. DeMaster, National Marine Mammal Laboratory, 7600 Sand Point Way, NE, Seattle, WA 98115).

DeMaster, D. P. 1996. Minutes from the 11-13 September 1996 meeting of the Alaska Scientific Review Group, Anchorage, Alaska. 20 pp. + appendices. (available upon request - D. P. DeMaster, National Marine Mammal Laboratory, 7600 Sand Point Way, NE, Seattle, WA 98115).

DeMaster, D. P. 1997. Minutes from fifth meeting of the Alaska Scientific Review Group, 7-9 May 1997, Seattle, Washington. 21 pp. + appendices. (available upon request - D. P. DeMaster, National Marine Mammal Laboratory, 7600 Sand Point Way, NE, Seattle, WA 98115).

Dizon, A. E., C. Lockyer, W. F. Perrin, D. P. DeMaster, and J. Sisson. 1992. Rethinking the stock concept: a phylogeographic approach. Conserv. Biol. 6:24-36.

Loughlin, T. R. 1997. Using the phylogeographic method to identify Steller sea lion stocks. Pp. 329-341, *in* A. Dizon, S. J. Chivers, and W. Perrin (eds.), Molecular genetics of marine mammals, incorporating the proceedings of a workshop on the analysis of genetic data to address problems of stock identity as related to management of marine mammals. Spec. Pub. No. 3 of the Society of Marine Mammalogy.

Loughlin, T. R., Perlov, A. S., and V. A. Vladimirov. 1992. Range-wide survey and estimation of total number of Steller sea lions in 1989. Mar. Mammal Sci. 8:220-239.

Loughlin, T. R., D. J. Rugh, and C. H. Fiscus. 1984. Northern sea lion distribution and abundance: 1956-1980. J. Wildl. Manage. 48:729-740.

Merrick, R. L., T. R. Loughlin, and D. G. Calkins. 1987. Decline in abundance of the northern sea lion, *Eumetopias jubatus*, in 1956-86. Fish. Bull., U.S. 85:351-365.

National Marine Fisheries Service. 1995. Status review of the United States Steller sea lion (*Eumetopias jubatus*) population. Prepared by the National Marine Mammal Laboratory, AFSC, NMFS, NOAA, 7600 Sand Point Way NE, Seattle, WA 98115. 61 pp.

Sease, J. L., J. P. Lewis, D. C. McAllister, R. L. Merrick, and S. M. Mello. 1993. Aerial and ship-based surveys of Steller sea lions (*Eumetopias jubatus*) in Southeast Alaska, the Gulf of Alaska, and Aleutian Islands during June and July 1992. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-17, 57 pp.

Small, R. J., and D. P. DeMaster. 1995. Alaska marine mammal stock assessments 1995. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-57, 93 pp.

Strick, J. M., L. W. Fritz, and J. P. Lewis. 1997. Aerial and ship-based surveys of Steller sea lions (*Eumetopias jubatus*) in Southeast Alaska, the Gulf of Alaska, and Aleutian Islands during June and July 1994. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-71, 55 pp.

Strick, J. M., R. L. Merrick, D. C. McAllister, L. W. Fritz, and K. M. Wynne. In press. Aerial and ship-based surveys of Steller sea lions (*Eumetopias jubatus*) in Southeast Alaska, the Gulf of Alaska, and Aleutian Islands during June and July 1996. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-xx (draft available upon request - J. M. Strick, National Marine Mammal Laboratory, 7600 Sand Point Way, NE, Seattle, WA 98115).

Wade, P. R. 1998. Calculating limits to the allowable human-caused mortality of cetaceans and pinnipeds. Mar. Mammal Sci. 14(1):1-37.

Wade, P. R., and R. Angliss. 1997. Guidelines for assessing marine mammal stocks: report of the GAMMS workshop April 3-5, 1996, Seattle, Washington. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-OPR-12, 93 pp.

Wolfe, R. J., and C. Mishler. 1993. The subsistence harvest of harbor seal and sea lion by Alaska natives in 1992. Final report for year one, subsistence study and monitor system (no. 50ABNF20055). Prepared for the NMFS by Alaska Dept. Fish and Game, Juneau, Alaska, 94 pp. + appendices.

Wolfe, R. J., and C. Mishler. 1994. The subsistence harvest of harbor seal and sea lion by Alaska natives in 1993. Final report for year two, subsistence study and monitor system (no. 50ABNF20055). Prepared for NMFS by Alaska Dept. Fish and Game, Juneau, Alaska, 60 pp. + appendices.

Wolfe, R. J., and C. Mishler. 1995. The subsistence harvest of harbor seal and sea lion by Alaska natives in 1994. Final report for year three, subsistence study and monitor system (no. 50ABNF20055). Prepared for NMFS by Alaska Dept. Fish and Game, Juneau, Alaska, 69 pp. + appendices.

Wolfe, R. J., and C. Mishler. 1996. The subsistence harvest of harbor seal and sea lion by Alaska natives in 1995. Final report for year four, subsistence study and monitor system (no. 50ABNF400080). Prepared for NMFS by Alaska Dept. Fish and Game, Juneau, Alaska, 69 pp. + appendices.

Wynne, K. M., D. Hicks, and N. Munro. 1991. 1990 salmon gillnet fisheries observer programs in Prince William Sound and South Unimak Alaska. Annual Rept. NMFS/NOAA Contract 50ABNF000036. 65 pp. NMFS, Alaska Region, Office of Marine Mammals, P.O. Box 21668, Juneau, AK 99802.

Wynne, K. M., D. Hicks, and N. Munro. 1992. 1991 Marine mammal observer program for the salmon driftnet fishery of Prince William Sound Alaska. Annual Rept. NMFS/NOAA Contract 50ABNF000036. 53 pp. NMFS, Alaska Region, Office of Marine Mammals, P.O. Box 21668, Juneau, AK 99802.

York, A. E., R. L. Merrick, and T. R. Loughlin. 1996. An analysis of the Steller sea lion metapopulation in Alaska. Chapter 12, pp. 259-292, *in* D. R. McCullough (ed.), Metapopulations and wildlife conservation. Island Press, Covelo, California.