



NOAA Technical Memorandum NMFS-AFSC-122

# **Aerial and Land-Based Surveys of Steller Sea Lions (*Eumetopias jubatus*) in Alaska, June and July 1999 and 2000**

by

J. L. Sease, W. P. Taylor, T. R. Loughlin, and K. W. Pitcher

**U.S. DEPARTMENT OF COMMERCE**  
National Oceanic and Atmospheric Administration  
National Marine Fisheries Service  
Alaska Fisheries Science Center

June 2001

### **Notice to Users of this Document**

In the process of converting the original printed document into an Adobe .PDF format, slight differences in formatting occur. The material presented in the original printed document and this .PDF, however, is the same.

## NOAA Technical Memorandum NMFS

The National Marine Fisheries Service's Alaska Fisheries Science Center uses the NOAA Technical Memorandum series to issue informal scientific and technical publications when complete formal review and editorial processing are not appropriate or feasible. Documents within this series reflect sound professional work and may be referenced in the formal scientific and technical literature.

The NMFS-AFSC Technical Memorandum series of the Alaska Fisheries Science Center continues the NMFS-F/NWC series established in 1970 by the Northwest Fisheries Center. The new NMFS-NWFSC series will be used by the Northwest Fisheries Science Center.

This document should be cited as follows:

Sease, J. L., W. P. Taylor, T. R. Loughlin, and K. W. Pitcher. 2001. Aerial and land-based surveys of Steller sea lions (*Eumetopias jubatus*) in Alaska, June and July 1999 and 2000. U. S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-122, 52 p.

Reference in this document to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.



NOAA Technical Memorandum NMFS-AFSC-122

# **Aerial and Land-Based Surveys of Steller Sea Lions (*Eumetopias jubatus*) in Alaska, June and July 1999 and 2000**

by  
J. L. Sease<sup>1</sup>, W. P. Taylor<sup>2</sup>, T. R. Loughlin<sup>1</sup>, and K. W. Pitcher<sup>2</sup>

<sup>1</sup>National Marine Mammal Laboratory  
Alaska Fisheries Science Center  
7600 Sand Point Way N.E.  
Seattle, WA 98115

<sup>2</sup>Alaska Department of Fish and Game  
Division of Wildlife Conservation  
333 Raspberry Road  
Anchorage, AK 99518-1599

## **U.S. DEPARTMENT OF COMMERCE**

Donald L. Evans, Secretary

**National Oceanic and Atmospheric Administration**

Scott B. Gudes, Acting Under Secretary and Administrator

**National Marine Fisheries Service**

William T. Hogarth, Acting Assistant Administrator for Fisheries

June 2001

**This document is available to the public through:**

National Technical Information Service  
U.S. Department of Commerce  
5285 Port Royal Road  
Springfield, VA 22161

*[www.ntis.gov](http://www.ntis.gov)*

## ABSTRACT

The National Marine Fisheries Service (NMFS) and the Alaska Department of Fish and Game (ADF&G) conducted aerial and land-based surveys of Steller sea lions (*Eumetopias jubatus*) in Alaska during July 1999 and June 2000. The 1999 aerial survey was restricted to the eastern Gulf of Alaska, where we counted 2,072 non-pup Steller sea lions on 23 rookery and haul-out sites. In June 2000, we counted a total of 37,801 non-pups on 289 rookery and haul-out sites from Southeast Alaska through the western Aleutian Islands. Of these non-pups Alaska-wide, 28,187 were on the 94 trend rookery and haul-out sites, which was a decline of 3.2% from 1998 and 26.1% from 1990. The 33 trend rookeries Alaska-wide included 20,298 non-pups, indicating declines of 3.8% from the 1998 count and 26.4% from 1990. Estimated average annual rates of decline from 1990 to 2000 were 3.2% ( $P < 0.001$ ; 95% C.I. 2.5% to 3.9%) for all trend sites and 3.3% ( $P < 0.001$ ; 95% C.I. 2.7% to 3.9%) for the 33 trend rookeries.

Most of the sites surveyed in 2000 (264 of 289; 91%) are part of the western stock, which includes animals from the eastern Gulf of Alaska (144° W long) through the western Aleutian Islands. The June 2000 count of 25,384 non-pups at all 264 sites in the western-stock indicated declines of 13.9% from 1998 and 31.7% from 1991, with an estimated annual decline of 4.0% ( $P < 0.001$ ; 95% C.I. 3.1% to 4.9%). At 82 rookery and haul-out trend sites in the western stock, the June 2000 count of 18,325 represented declines of 10.3% from 1998 and 40.0% from 1990. The 13,402 non-pups at the 30 western-stock trend rookeries indicated declines of 18.5% from 1998 and 39.9% from 1990. The estimated average annual decline from 1990 to 2000 was 5.1% for all western-stock trend sites ( $P < 0.001$ ; 95% C.I. 4.7% to 5.6%), as well as for western-stock trend rookeries ( $P < 0.001$ ; 95% C.I. 4.3% to 5.8%).

In the Kenai Peninsula to Kiska Island index area, a subarea within the Alaska portion of the western stock, we counted 21,381 non-pup sea lions at 227 surveyed sites, a decline of 12.3% from 1998 and 22.1% since 1991. Of these, 15,279 were at 69 trend sites (26 rookeries and 43 haulouts), and 11,738 were at 26 trend rookeries. These counts represented declines from 1998 to 2000 of 6.9% and 3.1%, respectively, for all trend sites and for trend rookeries, and declines of 32.9% and 37.2% since 1990. Overall declines in the Kenai to Kiska area have been more than 80% since 1976 and about 70% since 1985. Estimated annual rates of decline in the Kenai to Kiska index area were 2.5% ( $P = 0.003$ ; 95% C.I. 1.4% to 3.6%) for all 227 surveyed sites from 1991 to 2000, 3.9% ( $P < 0.001$ ; 95% C.I. 3.5% to 4.3%) for the 69 trend sites and 4.7% ( $P < 0.001$ ; 95% C.I. 3.9% to 5.5%) for the 26 trend rookeries from 1990 to 1998.

The eastern stock is represented in Alaska only by Southeast Alaska, where we counted 12,417 non-pups at all 25 sites in June 2000. The count of 9,862 non-pups at 12 trend sites represented increases of 13.4% from 1998 and 29.3% from 1990. At the three trend rookeries in Southeast Alaska, we counted 6,896 non-pups, which represented increases of 4.4% from 1998 and 25.6% from 1990. Estimated annual increases from 1990 to 2000 in Southeast Alaska were 1.9% ( $P = 0.058$ ; 95% C.I. 3.8% to 0.1%) for all trend sites and 1.6% for trend rookeries ( $P = 0.041$ ; 95% C.I. 3.0% to 0.1%).

National Marine Fisheries Service personnel counted 1,924 live pups at 9 rookeries and 75 live pups at three haul-out sites in Alaska during June and July 2000. Taken together, the number of pups at the 9 rookeries declined by 4.1% from 1998 to 2000, but this decline represented a difference of only 83 pups.

## CONTENTS

	<u>Page</u>
Abstract . . . . .	iii
Introduction . . . . .	1
Methods . . . . .	2
Aerial Surveys of Non-Pups . . . . .	3
Pup Surveys . . . . .	5
Data Analysis . . . . .	5
Changes in the Non-Pup Count Database . . . . .	6
Results . . . . .	8
Aerial Surveys of Non-Pups . . . . .	8
Western and Eastern Stocks . . . . .	9
Kenai to Kiska Index Area . . . . .	10
Counts within Geographical Subareas . . . . .	11
Counts and Proportions of Non-pups on Rookeries . . . . .	12
Pup Surveys . . . . .	12
Discussion . . . . .	13
Western Stock . . . . .	13
Eastern Stock . . . . .	14
Distribution at Rookery and Haul-out Sites . . . . .	15
Acknowledgments . . . . .	15
Citations . . . . .	17



## INTRODUCTION

In November 1990, the National Marine Fisheries Service (NMFS) listed Steller sea lions (*Eumetopias jubatus*) as threatened range-wide under the U.S. Endangered Species Act (55 Federal Register 49204). Several years later, two population stocks were identified, based on differences in genetics and population trends (Loughlin 1997). The western stock, which occurs from 144° W long (just east of Prince William Sound, Alaska) westward to Russia and Japan, was listed as endangered in June 1997 (62 Federal Register 24345). The eastern stock, which occurs from Southeast Alaska southward to California, remains classified as threatened.

The NMFS and the Alaska Department of Fish and Game (ADF&G) conducted aerial surveys of non-pup (adult and juvenile) Steller sea lions and land-based surveys of Steller sea lion pups from Southeast Alaska through the western Aleutian Islands during June and July 2000. Although 1999 was not a scheduled survey year, the ADF&G conducted a limited aerial survey in the eastern Gulf of Alaska to cover sites missed during the June survey in 1998. Combined, these efforts extended the series of surveys in Alaska that began in the mid-1970s (Braham et al. 1980, Calkins and Pitcher 1982, Loughlin et al. 1984, Merrick et al. 1987, Loughlin et al. 1990, Merrick et al. 1991, Merrick et al. 1992, Sease et al. 1993, Strick et al. 1997, Sease et al. 1999, Sease and Loughlin 1999).

We counted pups only at selected rookeries in June and July 2000. Range-wide survey efforts (e.g., 1994, 1998) included pup counts at virtually all rookeries in Alaska (Sease and Loughlin 1999); the next range-wide pup count is scheduled for 2002. During intervening years, we usually count pups only at a few selected rookeries on an alternating schedule to minimize potential cumulative effects of disturbance.

This report, like others in recent years, focuses primarily on counts of non-pup Steller sea lions at trend rookery and haul-out sites. Analyses in this report concentrate on counts from 1990 or 1991 to 2000. Longer historical perspectives are included in Merrick et al. (1991: for 1956-90) and Sease et al. (1993: for 1976-92).

## METHODS

The 1999 and 2000 surveys adhered to protocols of earlier aerial and land-based surveys (Braham et al. 1980, Calkins and Pitcher 1982, Merrick et al. 1991, Merrick et al. 1992, Loughlin et al. 1992, Sease et al. 1993, Strick et al. 1997, Sease et al. 1999, Sease and Loughlin 1999). Most of the analyses in this report focus on trend sites. Trend sites are those rookeries and haul-out sites surveyed consistently from the 1970s to the present, thus allowing analysis of population trends on a decadal scale. Trend sites include the majority of animals observed in each survey (71.7% in 1998, 74.6% in 2000). Most non-trend sites are haulouts with few animals. Trend rookeries are a sub-set of all trend sites. The only major rookeries that are not trend sites and trend rookeries are located on Outer and Attu Islands. Rookeries are those sites where adult males actively defend territories, pups are born, and mating takes place. Haul-out sites are those where sea lions predictably rest on land (haul out), but where few or no pups are born (Calkins and Pitcher 1982, Loughlin et al. 1984).

Geographical regions used for analyzing survey results were the same as those used in previous survey reports (Merrick et al. 1987, Loughlin et al. 1990, Merrick et al. 1991, Merrick et al. 1992, Sease et al. 1993, Strick et al. 1997, Sease et al. 1999, Sease and Loughlin 1999) and those adopted in the Final Recovery Plan for Steller sea lions (NMFS 1992): Southeast Alaska; eastern, central, and western Gulf of Alaska; eastern, central, and western Aleutian Islands; and the Bering Sea (Fig. 1).

The Bering Sea region contains few haul-out sites and only one rookery (Walrus Island in the Pribilof Islands). We did not survey the Bering Sea region in 1999 or 2000 because of logistical limitations.

Another geographical region used during the analyses of survey data is the Kenai Peninsula (Outer Island) to Kiska Island index area, which includes four of the smaller regions listed above: the central and western Gulf of Alaska, and the eastern and central Aleutian Islands. This index area was selected initially because it encompassed what historically was the center of the Steller sea lions range and it typically included about 60% of the Alaska sea lion population (Merrick et al 1987, NMFS 1992).

It should be noted that, with the exception of the distinction between the eastern and western stocks, the geographical divisions between regions are somewhat arbitrary and may not accurately reflect the underlying structure of stocks or other subunits of the population, if they exist. We present results for each region to identify and highlight varying population trends in the different regions. However, readers should not think that sea lion populations in one region are separate and independent of those in other regions.

### Aerial Surveys of Non-Pups

The ADF&G photographed and counted non-pup Steller sea lions on rookery and haul-out sites from Cape St. Elias, just east of Prince William Sound, to Rabbit Island, off the Kenai Peninsula, on 2 July 1999 (Table 1a) to fill data gaps for sites missed during the June 1998 survey (Sease and Loughlin 1999). The NMFS and ADF&G surveyed from Forrester Island in Southeast Alaska to Attu Island in the western Aleutian Islands, from 11 June to 29 June 2000 (Table 1b). Flight tracks included traditional sea lion rookeries and haul-out sites, but potential haul-out sites along the flight path also

were examined enroute. Under ideal conditions, we surveyed each site at 100-150 knots air speed, a minimum of 150-200 m (500-650 ft) altitude, and 500 m ( $\frac{1}{4}$  nautical mile) offshore, depending on the topography of the site. Strong winds occasionally required flying at higher altitudes or farther offshore, whereas fog or low clouds sometimes required flying at a lower altitude or closer inshore. The 1999 survey employed a single aircraft and survey team. The 2000 survey was divided into two regions, each with separate aircraft and personnel. NMFS surveyed the Gulf of Alaska and Aleutian Islands, from Cape St. Elias westward to Attu Island; ADF&G surveyed Southeast Alaska and five sites in the eastern and central Gulf of Alaska.

We photographed sea lions at most sites using 35-mm, manual-focus SLR cameras with motor drives and zoom lenses (70-210 mm or equivalent) and moderately fast (e.g., ISO 200 or faster) color transparency (slide) film. Where appropriate, sequential photographs overlapped slightly to guarantee complete coverage of a site. NMFS survey personnel also photographed each site using a high-resolution 8-mm (HI-8) video camera. Video recordings provided an overview of each site and served as a backup in case the slides were unusable. In the laboratory, we counted sea lions from projected images. The final count of non-pup sea lions for each rookery or haul-out site was the mean for two independent counters. If the individual results for a particular site differed by 10% or more, each person re-counted the images for that site. Because all final counts from photographs were means of two independent counts, each ended in  $-.0$  or  $-.5$ . To avoid a systematic upward bias, we rounded all means ending in  $-.5$  up or down to the next even integer (Knuth 1981). Both survey teams used direct visual counts instead of photographs for sites with few (e.g.,  $< 10$ ) sea lions. Five rookeries in the Gulf of Alaska (Seal Rocks and Fish, Outer, Sugarloaf, and Marmot Islands) were surveyed twice,

approximately 2 weeks apart. Individual survey results for these rookeries are presented in Table 1b, but a mean of each pair was used in the analyses.

### Pup Surveys

NMFS personnel counted pups at nine rookeries (Pinnacle Rocks and Yunaska, Adugak, Bogosof, Akun, Atkins, Chirikof, Outer, and Fish Islands) between 21 June and 5 July 2000. A ship delivered the survey team to within 2-4 km of a site; the survey team then went ashore in skiffs. As one person cleared most sea lions older than pups from the beach, two or three others followed, counting all live pups on the beach and in the water. The final pup count for each rookery was the mean of the two or three individual counts. NMFS also counted pups at three haul-out sites (The Whaleback, Lighthouse Rock, and the Chiswell Islands) between 27 June and 6 July 2000. It is not unusual for pups to be born at haul-out sites, although the numbers are very small in comparison to births at rookeries (Calkins and Pitcher 1982, Loughlin et al. 1984).

### Data Analysis

Analyses for population trends included comparison of subtotals of non-pups for 1) rookery trend sites, 2) all trend sites (both rookeries and haul-out sites), and 3) all surveyed sites Alaska-wide, for a) the eastern and western stocks, b) the Kenai to Kiska index area, and c) within the seven smaller geographical regions. Overall changes in numbers of non-pups and pups, either regionally or for individual rookeries, are expressed as a percentage of the earlier count. We estimated annual rate of change for 1990 or 1991 to 2000 from the slope of a simple linear regression of the natural log of

counts on survey year, testing the null hypothesis of no trend using the significance of the slope for the natural-log regression.

For most regions, the number of sites included in the all surveyed sites sub-totals varied slightly between surveys. Most sites that account for these differences included very few (< 10) animals and many were unoccupied during recent surveys (1991 and later), thus the impact of these differences was negligible. Many non-trend haul-out sites in Southeast Alaska were not surveyed in June 2000. Similarly, some non-trend haul-out sites in Southeast Alaska and in the eastern Gulf of Alaska were not surveyed in 1998. These missing counts prevented calculation of subtotals for all surveyed sites for the individual geographic regions. All sites subtotals were calculated for the entire western stock and for all Alaska, wide geographic regions over which the effect of these missing data diminished. One trend site in Southeast Alaska (Turnabout Island) was not surveyed in both 1998 and 2000. This site accounted for only one non-pup in 1996, none in four surveys from 1990 through 1996 (Merrick et al. 1991, Merrick et al. 1992, Sease et al. 1993, Strick et al. 1997, Sease et al. 1999); the effect of these missing counts is negligible.

#### Changes in the Non-Pup Count Database

The database containing aerial survey counts for non-pup Steller sea lions in Alaska underwent considerable review, verification, and editing since publication of results from the 1998 aerial survey (Sease and Loughlin 1999). The most significant changes related to replicate counts of individual sites. Optimal survey dates for Steller sea lions are about 10 June through 7 July, the dates when numbers of animals on rookeries are likely to be greatest and most stable (Withrow 1982, Merrick 1987, Chumbley et al. 1997). Analyses of aerial survey counts during recent years have used a mean count

for a given site whenever more than one count was available within the correct time window. The means of these replicate counts for individual sites were then incorporated into regional subtotals for analysis. While verifying counts in the database, NMML and ADF&G personnel discovered replicate counts that had not been incorporated into the NMML database. Most were from Southeast Alaska in 1991, although there also were a few counts for rookeries in the eastern and central Gulf of Alaska from the mid-1990s. We also deleted several replicate counts that should not have been used. For example, one count was made shortly after a disturbance on the rookery, when numbers of non-pups were obviously quite low. In another case, a substantial subsection of the site was not photographed, and an undetermined number of animals were not counted.

Counts for the two Tanadak Islands were transposed in 1961 and 1989. Because the Tanadak near Amlia Island ( $52^{\circ} 4.2$  N,  $172^{\circ} 57.6$  W) is a trend haul-out site and the Tanadak near Kiska Island ( $51^{\circ} 56.8$  N,  $177^{\circ} 46.8$  E) is not a trend haul-out site, this transposition affected subtotals for trend sites in those years.

We also changed the rounding protocol for the count database. Non-pup counts are entered as integers, but because most are the mean of two independent counts, many end in  $-.5$ . By many rounding protocols, these counts round up to the next integer, which creates a systematic bias. To minimize this bias, we chose to round means ending in  $-.5$  up or down to the nearest even integer (after Knuth 1981). Rounding revision reduced the Alaska-wide total for the 1996, 1998, and 2000 surveys by less than 0.2%.

Finally, Sease and Loughlin (1999: Table 3) included an estimate of 1,000 non-pups for 22 haul-out sites (500 non-pups for the six trend sites) in the eastern Gulf of Alaska that were not surveyed in 1998. For this report, we substituted counts made in June 1999: 757 non-pups for all missed sites

and 521 non-pups for the six trend sites. These changes affect the 1998 subtotals for the eastern Gulf of Alaska, for the western stock, and for all Alaska.

## RESULTS

### Aerial Surveys of Non-pups

During 1999, we counted 2,072 non-pups at 23 rookery and haul-out sites in the eastern Gulf of Alaska, including 1,952 non-pups at 9 trend sites. The one trend site that is also a trend rookery was occupied by 624 non-pups (Table 1a). From the June 2000 survey, we counted a total of 37,801 non-pup Steller sea lions on 289 rookery and haul-out sites from Southeast Alaska through the western Aleutian Islands (Tables 1b, 2). This was a decline of 6.5% from 1998, 8.9% from 1996, and 19.8% from 1991, with an estimated annual decline of 2.5% ( $P < 0.001$ ; 95% C.I. 1.9% to 3.1%) from 1991 to 2000 (Table 2). About 30 non-trend haul-out sites in Southeast Alaska were not surveyed in June 1998 or 2000. Most of these sites have been unoccupied or occupied by very few animals during recent surveys, and together they accounted for fewer than 400 non-pups in 1992, 1994, or 1996. Assuming a similar number of non-pups on these sites during June 2000, the un-surveyed animals probably represented only 1% of the reported total, but the calculated declines would be 8.0% from 1996 to 2000, 19.8% 1991 to 2000, with an estimated annual decline of 2.4% from 1991 to 2000. Of the 289 sites surveyed in June 2000, 150 (52%) were occupied by 20 or more sea lions, 33 sites (11%) were occupied by 1 to 20 sea lions, and 106 sites (37%) were unoccupied.

The 94 trend rookery and haul-out sites Alaska-wide included 28,187 non-pups in June 2000. This was a decline of 3.2% from 1998, 7.4% from 1996, and 26.1% from 1990 (Table 2, Fig. 2). At the 33 trend rookeries, we counted 20,298 non-pups, indicating declines of 3.8% from the 1998 count,



10.0% from 1996, and 26.4% from 1990. Estimated average annual rates of decline from 1990 to 2000, based on natural log regression, were 3.2% ( $P < 0.001$ ; 95% C.I. 2.5% to 3.9%; Table 2) for all trend sites and 3.3% ( $P < 0.001$ ; 95% C.I. 2.7% to 3.9%) for the 33 trend rookeries.

### Western and Eastern Stocks

Most of the sites surveyed in 2000 (264 of 289:91%) are part of the western stock (west of 144° W long). Of these sites, 135 (51%) included 20 or more sea lions, 28 sites (11%) included 1 to 19 animals, and 101 (38%) were unoccupied. Of the western-stock sites occupied by 20 or more sea lions in 2000, 32% declined by more than 5% from 1998 to 2000, 14% increased by more than 5%, and 54% changed by less than 5% or by 10 animals or fewer. For the eastern-stock sites occupied by 20 or more sea lions in 2000, 35% declined by more than 5% from 1998 to 2000, 45% increased by more than 5%, and 20% changed by less than 5% or fewer than 10 non-pups.

The June 2000 count of 25,384 non-pups at all 264 sites in the western-stock indicated declines of 13.9% from 1998, 17.0% from 1996, and 31.7% from 1991 (Table 3, Fig. 3). The estimated average annual decline from 1991 to 2000 was 4.0% ( $P < 0.001$ ; 95% C.I. 3.1% to 4.9%). At 82 rookery and haul-out trend sites in the western stock, the June 2000 count of 18,325 represented declines of 10.3% from 1998, 17.5% from 1996, and 40.0% from 1990. The count of 13,402 non-pups at the 30 western-stock trend rookeries indicated declines of 18.5% from 1998, 18.9% from 1996, and 39.9% from 1990. The estimated average annual decline from 1990 to 2000 was 5.1% for all western-stock trend sites ( $P < 0.001$ ; 95% C.I. 4.7% to 5.6%), as well as for western-stock trend rookeries ( $P < 0.001$ ; 95% C.I. 4.3% to 5.8%).

The eastern stock is represented in Alaska only by Southeast Alaska, where we counted 12,417 non-pups at all 25 sites surveyed in June 2000. This represents an increase of 13.5% from 1998, of 13.8% from 1996, and an increase of 33.3% from 1990 (Table 3, Fig 3), or an average annual increase of 2.1% ( $P = 0.032$ ; 95% C.I. = 3.9% to 0.3%) from 1990 to 2000. As noted above, about 30 non-trend haul-out sites in Southeast Alaska were not surveyed in June 1998 or 2000. Had these sites been counted (approximately 350 sea lions in 1992, 1994, and 1996, respectively), the observed increase would have been greater.

The count of 9,862 non-pups at 12 trend sites (rookeries and haulouts) in June 2000 represented increases of 13.4% from 1998, 19.8% from 1996, and 29.3% from 1990 (Table 3). One trend site (Turnabout Island) was not surveyed in June 2000, but only two non-pups have been observed there during the 1990s (Merrick et al. 1991, Merrick et al. 1992, Sease et al. 1993, Strick et al. 1997, Sease et al. 1999). It is unlikely, therefore, that this missing count affected the trend site sub-total. Overall changes were smaller at the three trend rookeries in Southeast Alaska, with increases of 4.4% from 1998, 11.2% from 1996, and 25.6% from 1990 (Table 3). Estimated annual increases from 1990 to 2000 in Southeast Alaska were 1.9% ( $P = 0.058$ ; 95% C.I. = 3.8% to -0.1%) for all trend sites and 1.6% for trends rookeries ( $P = 0.041$ ; 95% C.I. = 3.0% to 0.1%).

### Kenai to Kiska Index Area

We counted 21,381 non-pup sea lions at 227 surveyed sites in the Kenai to Kiska index area in June 2000, which represented declines of 12.3% from 1998, 13.1% from 1996, and 22.1% since 1991 (Table 2, Fig. 2). The Kenai to Kiska index area includes 69 of the Alaskan trend sites (26 rookeries and 43 haulouts), where we counted 15,279 non-pups in 2000. This was a decline of 6.9%

from 1998, 14.6% from 1996, and 32.9% since 1990. There were 11,738 non-pups on the 26 trend rookeries in the Kenai to Kiska area; overall declines were 3.1% from 1998, 15.6% from 1996, and 37.2% from 1990. Estimated annual rates of decline in the Kenai to Kiska index area were 2.5% ( $P = 0.003$ ; 95% C.I. = 1.4% to 3.6%) for all 227 surveyed sites from 1991 to 2000, 3.9% ( $P < 0.001$ ; 95% C.I. = 3.5% to 4.3%) for the 69 trend sites and 4.7% ( $P < 0.001$ ; 95% C.I. = 3.9% to 5.5%) for the 26 trend rookeries from 1990 to 1998.

Overall declines in the Kenai to Kiska have been more than 80% since 1976, when there were almost 90,000 non-pups on trend sites and more than 70,000 non-pups on trend rookeries (Fig. 2). There has been about a 70% decline since 1985, when non-pup counts were about 55,000 at trend sites and almost 40,000 at trend rookeries.

#### Counts within Geographical Subareas

In general, counts in the four subregions making up the Kenai to Kiska index area experienced declines ranging from 4% to 22%, this was true for rookeries and haulouts and for trend sites and non-trend sites (Tables 4, 5, and 6; Figs. 4, 5, and 6). Declines in non-pup counts, ranging from 4% to 22%, were observed in each of the four subregions making up the Kenai to Kiska index area. This was true for trend sites and non-trend sites (Tables 4, 5, and 6; Figs. 4, 5, and 6). The exceptions were counts at rookery trend sites in the central Aleutian Islands, rookery trend sites in the eastern Aleutian Islands, and all trend sites in the eastern Aleutian Islands, each of which changed by 1% or less. The western Aleutian Islands, which is outside of the Kenai to Kiska index area, experienced the greatest declines: 44% at trend sites, 42% at all surveyed sites. Non-pup numbers on trend sites in the eastern Gulf of Alaska declined 6% from the pooled 1998/1999 counts to 2000, but showed an

increase of 3% at the one trend rookery and an increase of 6% at all surveyed sites. Analysis of counts for the eastern Gulf of Alaska is confounded by the substitution of 1999 counts for sites not surveyed in 1998, as described above.

### Counts and Proportions of Non-pups on Rookeries

Counts of non-pups at Alaskan rookeries from 1991 through 2000 are presented in Table 8. Alaska-wide, non-pup counts increased by more than 5% from 1998 to 2000 at 10 rookeries, declined by more than 5% at 18 rookeries, and changed by less than 5% at eight rookeries. Considering only the three rookeries in the eastern stock (Southeast Alaska), White Sisters increased by 63%, Hazy Islands declined by 7%, and Forrester declined by 3% (Table 8). The proportion of non-pups counted on rookeries increased slightly from 1998 to 2000 (Table 7, Fig. 7). This was preceded by a substantial drop in the proportion of non-pups on rookeries in most regions of Alaska from 1996 to 1998.

### Pup Surveys

The NMFS counted 1,999 live pups at 12 sites in Alaska during June and July 2000 (Tables 1b, 9). Most (1,924) were at 9 rookeries between Fish (Wooded) Island in the eastern Gulf of Alaska and Yunaska Island in the central Aleutian Islands. We did count 75 live pups on haul-out sites in the Gulf of Alaska (Table 1b): Chiswell Islands (58), Lighthouse Rock (5), and The Whaleback (12). Taken together, the number of pups at the 9 rookeries declined by 4.1% from 1998 to 2000, but this decline represented a total difference of only 83 pups. Pup numbers at three rookeries declined by

16% to 27% while those for two others increased by about 13% and four rookeries changed by less than 4% (Table 9).

## DISCUSSION

### Western Stock

Results of the June 2000 aerial survey indicate that the western stock of Steller sea lions in Alaska has continued its numerical decline at the same rate as in previous years (Fig. 3). The estimated annual rate of decline from 1990 to 2000 was 5.1% for trend rookeries and trend sites, compared to 5.4% and 5.3%, respectively, after the 1998 survey (Sease and Loughlin 1999). For all surveyed sites in the western stock, however, the annual rate of decline increased to 4.0% from 1991 to 2000, compared to 3.3% from 1991 to 1998. Results were similar for the Kenai to Kiska index area, the core region of the western stock in Alaska (Fig 2). Estimated annual rates of decline were slightly lower for trend rookeries (4.7%) and for trend sites (3.9%) over 1990 to 2000 compared to 1990 to 1998 (5.2% and 4.1%, respectively: Sease and Loughlin 1999). After showing very little change from 1996 to 1998 (1.2% decline: Sease and Loughlin 1999), the numbers of non-pups at all surveyed sites in the Kenai to Kiska area dropped 12.3% from 1998 to 2000 (Table 2, Fig 2). The estimated annual rate of decline jumped from 1.8% for 1991 to 1998 (Sease and Loughlin 1999) to 2.5% for 1991 to 2000 (Table 2). Pup counts were available for only nine western-stock rookeries in 2000, but the continued decline was apparent there, as well. The overall 4.1% decline for these rookeries from 1998 to 2000 was a difference of only 83 pups.

The eastern Gulf of Alaska was the only western-stock region in which numbers of non-pups appeared to increase from 1998 to 2000: 3% for trend rookeries and 6% for all surveyed sites.

This may not be a completely accurate representation, however, as the trend rookery total in this region is for a single site and the 1998 subtotals for all trend sites and all surveyed sites included some 1999 counts for sites missed in 1998. Despite these problems, non-pups counts in the eastern Gulf of Alaska have remained relatively stable since 1996, a notable change for a region that exhibited some of the greatest relative declines from 1990 through 1996.

As was the case after the last aerial survey, the largest declines were observed in the western Aleutian Islands, where non-pup numbers declined by more than 40% from 1998 to 2000. The area of greatest decline appears to reach as far eastward as Amchitka Pass (180° long). For this entire western portion of the Aleutian Islands, from Amchitka Pass to Attu, non-pup numbers declined by about 35% from 1998 to 2000 and 42% to 47% from 1996 to 2000. The western Gulf of Alaska also showed substantial declines from 1998 to 2000, ranging from 11% at trend rookeries to 22% for all surveyed sites. The western Gulf of Alaska had been stable or declining slightly during most of the last decade. Pup counts were made at too few sites in 2000 to be meaningful for assessment of population trends. It bears repeating that, with the exception of the differentiation between the eastern and western stocks, these regional boundaries are not based on ecological or other biological parameters, and differences in regional trends should be interpreted with caution.

#### Eastern Stock

Numbers of non-pups in Southeast Alaska declined slightly from 1989 to 1990 and again from 1994 to 1996, but they have continued to increase since that time. The count at trend sites in Southeast Alaska increased 13.4% from 1998 to 2000. The overall trend from 1990 to 2000 has been about a 2% annual increase. The Forrester Island rookery, the largest site in Southeast Alaska, has been stable

from 1991 to 2000, fluctuating between about 3,500 to 4,000. The Steller sea lions in Southeast Alaska represent approximately one-half of the eastern stock; any analysis of population trends for this stock must include animals in British Columbia and the western United States. Trends in British Columbia and Oregon, at least for non-pup counts, have been approximately parallel to those of Southeast Alaska during recent years (P. Olesiuk, Canada Department of Fisheries and Oceans, unpubl. data; W. Perryman, NMFS Southwest Fisheries Science Center, unpubl. data), indicating continued growth of the eastern stock.

#### Distribution at Rookery and Haul-out Sites

After the 1998 survey, the overall changes in non-pup counts for the western stock generally were greatest for trend rookeries, intermediate for trend rookery and haul-out sites, and lowest for all surveyed sites. This was reversed from 1998 to 2000, however, with overall declines generally greatest for all surveyed sites and least for trend rookeries. Considering the proportions of non-pups on rookeries from 1991 to 2000 (Fig. 7), the relative number of non-pups on rookeries did drop in 1998, but only for that survey. Whether the relative drop in the population at rookeries in 1998 resulted in a drop in pup production in that year cannot be assessed, as complete pup counts are not available for most years.

#### ACKNOWLEDGMENTS

NMFS and ADF&G thank pilots T. Blaesing, D. Weintraub, and D. Stefanski of Aero Commander NW Ltd., Wenatchee, Washington, for aircraft transportation during aerial surveys. For

vessel support during pup counts, we thank K. Bell and the crew M/V *Tiglax*. We greatly appreciate the wide-ranging assistance from personnel of the Alaska Maritime National Wildlife Refuge in Homer, Alaska, and especially J. Mueller and C. Hill of the Refuge's Aleutian Islands Unit on Adak Island. The National Marine Fisheries Service Observer Program, the Dutch Harbor Airport Manager, and Delta Western Fuels, provided assistance in overcoming a fuel crisis in Dutch Harbor, Alaska. The Izembek National Wildlife Refuge provided housing and ground transportation in Cold Bay, Alaska.

K. Chumbley and S. Capron participated in the NMML survey. C. Kurlle (NMFS) and E. Schoen (ADF&G) counted sea lions from slides. Many individuals among the NMFS personnel participated in pup counts. J. Harper helped proofread tables; J. Cesarone, J. Thomason, and A. York provided comments on early drafts. G. Duker and J. Lee provided editorial support. We conducted these surveys under the authority of NOAA MMPA/ESA permit No. 782-1532-00 and Special Use Permit No. 51576 from the Alaska Maritime National Wildlife Refuge.



## CITATIONS

- Braham, H.W., R.D. Everitt, and D.J. Rugh. 1980. Northern sea lion population decline in the eastern Aleutian Islands. *J. Wildl. Manage.* 44:25-33.
- Calkins, D.G., and K.W. Pitcher. 1982. Population assessment, ecology and trophic relationships of Steller sea lions in the Gulf of Alaska. Alaska Department of Fish and Game, Final Report RU243. Alaska Department of Fish and Game, 333 Raspberry Road, Anchorage, AK 99502, 76 p.
- Chumbley, K., J. Sease, M. Strick, and R. Towell. 1997. Field studies of Steller sea lions (*Eumetopias jubatus*) at Marmot Island, Alaska, 1979 through 1994. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-77, 99 p.
- Knuth, D. E. 1981. The art of computer programming. Vol 2. Semi-numerical algorithms. Addison Wesley.
- Loughlin, T.R. 1997. Using the phylogeographic method to identify Steller sea lion stocks, p. 159-171. *In* A.E. Dizon, S.J. Chivers, and W.F. Perrin (editors), Molecular genetics of marine mammals. Soc. Mar. Mammal., Spec. Publ No. 3.
- Loughlin, T.R., A.S. Perlov, and V.A. Vladimirov. 1990. Survey of northern sea lions (*Eumetopias jubatus*) in the Gulf of Alaska and Aleutian Islands during June 1989. U.S. Dep. Commer., NOAA Tech. Memo. NMFS F/NWC-176, 26 p.
- Loughlin, T.R., A.S. Perlov, 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: 1956-80. *J. Wildl. Manage.* 48:729-740.
- Merrick, R. L. 1987. Behavioral and demographic characteristics of northern sea lion rookeries. M.S. Thesis, Oregon State University, Corvallis OR, 124 p.
- Merrick, R.L., D.G. Calkins, and D.C. McAllister. 1992. Aerial and ship-based surveys of Steller sea lions in Southeast, Alaska, the Gulf of Alaska, and Aleutian Islands during June and July 1991. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-1, 37 p.
- Merrick, R.L., L.M. Fern, R.D. Everitt, R.R. Ream, and L.A. Lessard. 1991. Aerial and ship-based surveys of northern sea lions, (*Eumetopias jubatus*) in the Gulf of Alaska and Aleutian Islands during June and July 1990. U.S. Dep. Commer., NOAA Tech. Memo. NMFS F/NWC-196, 34 p.

- Merrick, R.L., T.R. Loughlin, and D.G. Calkins. 1987. Decline in abundance of the northern sea lion, *Eumetopias jubatus*, in Alaska, 1956-86. Fish. Bull., U.S. 85:351-365.
- NMFS (National Marine Fisheries Service). 1992. Recovery plan for the Steller sea lion (*Eumetopias jubatus*). Prepared by the Steller Sea Lion Recovery Team for the National Marine Fisheries Service, Silver Spring Maryland, 92 p.
- Sease, J.L. and T.R. Loughlin. 1999. Aerial and land-based surveys of Steller sea lions (*Eumetopias jubatus*) in Alaska, June and July 1997 and 1998. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-100, 61 p.
- 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 F/NWC-17, 57 p.
- Sease, J.L., J.M. Strick, R.L. Merrick, and J.P. Lewis. 1999. Aerial and land-based surveys of Steller sea lions (*Eumetopias jubatus*) in Alaska, June and July 1996. U.S. Dep. Commer., NOAA Tech. Memo. NMFS F/NWC-99, 43 p.
- 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 F/NWC-71, 55 p.
- Withrow, D. E. 1982. Using aerial surveys, ground truth methodology, and haul out behavior to census Steller sea lions, *Eumetopias jubatus*. M.S. Thesis, University of Washington, Seattle, 102 p.

Table 1a.--Counts of adult and juvenile (non-pup) Steller sea lions at rookery (\*) and haul-out sites in Alaska on 2 July 1999. Trend sites ( ) are those sites used for analyses of trends in survey counts. Count types are photographic (P) or visual (V).

Location	Non-pup count			Pup count	
	Date	Type	Count	Date	Count
<b>Eastern Gulf of Alaska</b>					
Sitkagi Bluffs			n.s. <sup>1</sup>		
Cape St. Elias	2 July	P	380		
Hook Point	2 July	V	2		
Middleton	2 July	V	9		
Cape Hinchinbrook	2 July	P	15		
Seal Rocks *	2 July	P	624		
Fish (Wooded)	2 July	P	311		
Glacier	2 July	P	284		
Point Eleanor	2 July	V	0		
The Needle	2 July	P	127		
Perry	2 July	V	0		
Pleiades	2 July	V	0		
Point Elrington	2 July	P	135		
Cape Puget	2 July	V	7		
Cape Junken	2 July	V	0		
Cape Fairfield	2 July	V	0		
Cape Resurrection	2 July	V	0		
Rugged	2 July	V	11		
Aialik Cape	2 July	V	26		
Chiswell (including Nataoa I.)	2 July	P	79		
Seal Rock (Kenai)	2 July	V	1		
Granite Cape	2 July	V	0		
Steep Point	2 July	P	59		
Rabbit	2 July	V	2		
<b>Subtotals for the Eastern Gulf of Alaska</b>					
<b>All 23 sites</b>			<b>2,072</b>		
<b>9 trend rookery and haul-out sites</b>			<b>1,952</b>		
<b>1 trend rookery site</b>			<b>624</b>		

<sup>1</sup> n.s. indicates not surveyed.

Table 1b.--Counts of adult and juvenile (non-pup) Steller sea lions at rookery (\*) and haul-out sites in Alaska, June and July 2000. Trend sites ( ) are those sites used for analyses of trends in survey counts. Counts are from photographs (P) or visual (V).

Location	Non-pup count			Pup count	
	Date	Type	Count	Date	Count
<b>Southeast Alaska</b>					
West Rock	25 June	P	624		
Point Marsh	25 June	V	0		
Forrester *	28 June	P	3,674		
Wolf Rock	25 June	P	24		
Cape Bartolome	28 June	V	5		
Cape Addington	28 June	P	1,116		
Timbered	28 June	P	266		
Coronation	28 June	P	31		
Hazy Islands *	28 June	P	1,824		
Cape Ommaney	24 June	P	288		
Sea Lion Rock (Puffin Bay)	24 June	P	212		
Biali Rock	24 June	P	662		
Jacob Rock	24 June	P	232		
Kaiuchali (Biorka)	24 June	V	0		
Yasha	24 June	P	17		
Turnabout			n.s. <sup>1</sup>		
The Brothers	28 June	P	1,498		
Sail	28 June	V	1		
Sea Lion Island	24 June	V	7		
White Sisters *	24 June	P	1,398		
Cape Cross	24 June	V	0		
Graves Rock	24 June	P	492		
Venisa Point	24 June	V	0		
Inian	24 June	V	2		
Harbor Point	24 June	P	44		
Cape Fairweather	24 June	V	0		
<b>Subtotals for Southeast Alaska</b>					
At 25 sites			<b>12,417</b>		
At 12 of 13 trend sites			<b>9,862</b>		
3 trend rookery sites			<b>6,896</b>		
<b>Eastern Gulf of Alaska</b>					

Table 1b.--Non-pup and pup counts - 2000, continued.

Location	Non-pup count			Pup count	
	Date	Type	Count	Date	Count
Sitkagi Bluffs			n.s.		
Cape St. Elias	11 June	P	485		
Hook Point	11 June	P	60		
Cape Hinchinbrook	11 June	P	106		
Seal Rocks *	11 June	P	678		
" "	24 June	P	<u>820</u>		
" "			<b>749</b>		
Fish (Wooded)	11 June	P	384	5 July	149
" "	24 June	P	<u>408</u>		
" "			<b>396</b>		
Middleton	11 June		n.s.		
Glacier	11 June	V	0		
Point Eleanor	11 June	V	0		
The Needle	11 June	P	126		
Perry	11 June	V	0		
Pleiades	11 June	V	0		
Point LaTouche	11 June	V	0		
Danger	11 June	V	0		
Point Elrington	11 June	P	128		
Procession Rocks	11 June	P	146		
Cape Puget	11 June	V	0		
Cape Junken	11 June	V	0		
Cape Fairfield	11 June	P	21		
Cape Resurrection	11 June	V	0		
Rugged	11 June	V	3		
Aialik Cape	11 June	V	0		
Chiswell	11 June	P	54	6 July	58
Granite Cape	11 June	V	0		
Seal Rock (Kenai)	11 June	P	34		
Steep Point	11 June	P	45		
Rabbit	11 June	V	0		

Table 1b.--Non-pup and pup counts - 2000, continued.

Location	Non-pup count			Pup count	
	Date	Type	Count	Date	Count
<b>Subtotals for the Eastern Gulf of Alaska</b>					
<b>All 25 sites</b>			<b>2,353</b>		
<b>9 trend rookery and haul-out sites</b>			<b>1,975</b>		
<b>1 trend rookery sites</b>			<b>749</b>		
<b>Central Gulf of Alaska</b>					
Outer*	11 June	P	216	3 July	108
" "	29 June	P	<u>308</u>		
" "			<b>262</b>		
Nuka Point	11 June	V	0		
Gore Point	11 June	V	0		
East Chugach	11 June	V	0		
Perl	11 June	P	48		
Perl Rocks	11 June	V	0		
Nagahut Rocks	11 June	P	10		
Cape Elizabeth	11 June	P	78		
Flat	11 June	V	0		
West Amatuli	11 June	V	0		
Sugarloaf *	11 June	P	665		
" "	29 June	P	<u>746</u>		
" "			<b>706</b>		
Ushagat	11 June	P	99		
Rocks south of Ushagat	11 June	P	37		
Sud	11 June	V	0		
Latax Rocks	11 June	P	100		
Sea Otter	11 June	P	118		
Afognak/Tonki Cape	11 June	V	1		
Sea Lion Rocks (Marmot)	11 June	P	56		
Marmot *	11 June	P	644		
" "	29 June	P	<u>698</u>		
" "			<b>671</b>		
Long	13 June	P	36		
Kodiak/Cape Chiniak	13 June	P	165		
Ugak	13 June	V	0		
Kodiak/Gull Point	13 June	P	106		

Table 1b.--Non-pup and pup counts - 2000, continued.

Location	Non-pup count			Pup count	
	Date	Type	Count	Date	Count
Kodiak/Cape Barnabas	13 June	V	0		
Twoheaded	13 June	P	254		
Cape Sitkinak	13 June	P	160		
Sundstrom	13 June	V	0		
Kodiak/Cape Alitak	13 June	V	0		
Cape Ikolik	12 June	P	41		
Tombstone Rock	12 June	V	0		
Kodiak/Sturgeon Head	12 June	V	0		
Kodiak/Cape Uyak	12 June	V	0		
Kodiak/Cape Kuliuk	12 June	V	0		
Kodiak/Cape Ugat	12 June	P	182		
Noisy	12 June	V	0		
Kodiak/Malina Point	12 June	V	0		
Kodiak/Steep Cape	12 June	V	0		
Kodiak/Cape Paramanof	12 June	V	0		
Shaw	12 June	P	119		
Cape Douglas	12 June	V	0		
Shakun Rocks	12 June	P	225		
Cape Nukshak	12 June	V	0		
Cape Ugyak	12 June	V	0		
Cape Gull	12 June	V	0		
Cape Kuliak	12 June	V	0		
Takli	12 June	P	33		
Puale Bay	12 June	P	84		
Kibkak Rocks	12 June	P	67		
Aiugnak Columns	12 June	P	32		
Ugaiushak	12 June	V	2		
Sutwik	12 June	P	114		
Aghiyuk	13 June	V	3		
Chowiet *	13 June	P	504		
Chirikof *	13 June	P	276	29 June	188
Nagai Rocks	13 June	P	228		
<b>Subtotals for the Central Gulf of Alaska</b>					
<b>All 55 sites</b>			<b>4,817</b>		

Table 1b.--Non-pup and pup counts - 2000, continued.

Location	Non-pup count			Pup count	
	Date	Type	Count	Date	Count
<b>15 trend rookery and haul-out sites</b>			<b>3,180</b>		
<b>4 trend rookery sites</b>			<b>2,157</b>		
<b>Western Gulf of Alaska</b>					
Lighthouse Rocks	13 June	P	64	28 June	5
Atkulik	12 June	V	0		
Kak	12 June	P	70		
Chankliut	13 June	V	3		
Seal Cape	13 June	V	0		
Mitrofanía	13 June	P	126		
Spitz	13 June	P	6		
Kupreanof Point	13 June	P	12		
Castle Rock	13 June	P	38		
Big Koniuji	13 June	V	0		
Atkins *	13 June	P	537	28 June	262
Chernabura *	13 June	P	496		
Twins	13 June	V	0		
The Haystacks	13 June	P	62		
The Whaleback	13 June	P	162	27 June	12
Nagai Island	13 June				
Mourtain Point	13 June	P	62		
Rocks west of Cape Wedge	13 June	V	0		
Egg (Sand Point)	13 June	V	0		
Sea Lion Rocks (Shumagins)	13 June	P	33		
Unga					
Cape Unga	13 June	V	0		
Acheredin Pt.	13 June	P	108		
Jude	13 June	P	391		
Omega	13 June	V	0		
Wosnesenski	13 June	V	0		
Olga Rocks	13 June	P	248		
Sushilnoi Rocks	13 June	P	64		
Pinnacle Rock *	13 June	P	868	26 June	638
Hunt	14 June	V	0		



Table 1b.--Non-pup and pup counts - 2000, continued.

Location	Non-pup count			Pup count	
	Date	Type	Count	Date	Count
Sozavarika	14 June	V	0		
Umga	14 June	V	0		
Clubbing Rocks *	14 June	P	712		
Cherni	14 June	V	0		
Hague	14 June	V	0		
Caton	14 June	P	257		
South Rock	14 June	P	161		
Bird	14 June	P	88		
Rock	14 June	V	0		
<b>Subtotals for the Western Gulf of Alaska</b>					
<b>All 37 sites</b>			<b>4,568</b>		
<b>9 trend rookery and haul-out sites</b>			<b>2,840</b>		
<b>4 trend rookery sites</b>			<b>2,613</b>		
<b>Eastern Aleutian Islands</b>					
Unimak					
Cape Lasaref	14 June	V	0		
Cape Lutke	14 June	V	0		
Scotch Cap	14 June	V	0		
Sennett Point	14 June	V	1		
Cape Sarichef	14 June	P	216		
Cave Point	14 June	V	0		
Oksenof Point	14 June	V	0		
Amak	14 June	P	946		
Sea Lion Rocks (Amak) *	14 June	P	258		
Ugamak and Round *	20 June	P	746		
Aktak	20 June	P	92		
Kaligigan	20 June	V	0		
Tigalda/NE Rocks	20 June	P	123		
Tigalda South side	20 June	P	42		
Avatanak/NE Point	20 June	V	1		
Basalt Rock	20 June	V	0		
Rootok	20 June	P	93		
Tanginak	20 June	P	8		

Table 1b.--Non-pup and pup counts - 2000, continued.

Location	Non-pup count			Pup count	
	Date	Type	Count	Date	Count
Akun					
Jackass Point	20 June	V	0		
Akun Bay	20 June	V	0		
Round Head	20 June	V	0		
Billings Head *	20 June	P	254	23 June	41
Akun Head	20 June	V	0		
Akutan					
North Head	20 June	V	0		
Reef Point/Lava Bight	20 June	P	43		
Cape Morgan *	20 June	P	739		
Battery Point	20 June	V	0		
Baby Islands	20 June	V	0		
Old Man Rocks	20 June	P	114		
Egg	20 June	V	0		
Outer Signal	20 June	V	2		
Inner Signal	20 June	V	0		
Unalaska					
Cape Sedanka	20 June	V	0		
Priest Rock	20 June	V	4		
Cape Wislow	19 June	V	0		
Bishop Point	19 June	P	106		
Cape Kovrzhka	19 June	V	0		
Makushin Bay	19 June	P	79		
Cape Starichkof	19 June	V	0		
Spray Cape	19 June	V	0		
Whalebone Cape	20 June	V	0		
Cape Izigan	20 June	P	116		
Bogoslof *	19 June	P	347	22 June	249
Umnak					
Cape Idak	19 June	V	0		
Reindeer Point	19 June	V	0		
Cape Chagak	19 June	V	0		
Aguliuk Point	19 June	V	0		
Cape Asik	19 June	P	74		

Table 1b.--Non-pup and pup counts - 2000, continued.

Location	Non-pup count			Pup count	
	Date	Type	Count	Date	Count
Emerald	20 June	V	0		
Polivnoi Rock	20 June	P	108		
Pillars	20 June	P	51		
Ogchul *	20 June	P	117		
Vsevidof	20 June	P	46		
Samalga	19 June		<b>n.s.</b>		
Adugak *	19 June	P	270	22 June	153
<b>Subtotals for the Eastern Aleutian Islands</b>					
<b>All 54 sites</b>			<b>4,996</b>		
<b>11 trend rookery and haul-out sites</b>			<b>3,840</b>		
<b>7 trend rookery sites</b>			<b>2,731</b>		
<b>Central Aleutian Islands</b>					
Uliaga	19 June	P	90		
Kagamil	19 June	P	24		
Chuginadak	19 June	P	23		
Carlisle	19 June	P	12		
Herbert	19 June	P	6		
Yunaska *	19 June	P	241	21 June	136
Chagulak	19 June	P	40		
Amukta	19 June	P	38		
Seguam					
Saddleridge *	18 June	P	570		
Other	18 June	P/V	178		
Agligadak *	18 June	P	48		
Amlia					
East Cape	18 June	P	86		
Sviechnikof*	18 June	P	120		
Cape Misty	18 June		72		
Tanadak (Amlia)	18 June	P	74		
Sagigik	18 June	P	22		
Amatagis	18 June	V	0		
Sagchudak	18 June	V	0		
Atka					

Table 1b.--Non-pup and pup counts - 2000, continued.

Location	Non-pup count			Pup count	
	Date	Type	Count	Date	Count
North Cape	18 June	P	76		
Cape Korovin	18 June	P	12		
Salt	18 June	V	0		
Koniuji	18 June	V	0		
Kasatochi *	18 June	P	390		
Oglodak	18 June	P	66		
Ikginak	18 June	V	0		
Fenimore	18 June	P	67		
Tagalak	18 June	P	72		
Chagul	18 June	P	31		
Anagaksik	18 June	P	46		
Igitkin	18 June	V	0		
Great Sitkin	18 June	P	29		
Little Tanaga (including Silak I.)	18 June	P	234		
Kagalaska	18 June	P	45		
Adak					
Argonne Point/Cape Moffet	15 June	P/V	8		
Cape Yakak/Lake Point *	15 June	P	874		
Crone	18 June	P	16		
Kanaga					
North Cape/Cape Miga	15 June	P	26		
Ship Rock	15 June	P	156		
Cape Chunu	15 June	V	0		
Bobrof	15 June	V	0		
Tanaga					
Bumpy Point	15 June	P	18		
Cape Sasmik	15 June	P	154		
Ilak	15 June	P	42		
Gramp Rock *	15 June	P	580		
Ugidak	15 June	P	6		
Tag *	15 June	P	301		
Ogliuga	15 June	V	0		
Skagul	15 June	V	0		
Garebi	15 June	V	0		

Table 1b.--Non-pup and pup counts - 2000, continued.

Location	Non-pup count			Pup count	
	Date	Type	Count	Date	Count
Kavalga	15 June	P	50		
Unalga and Dinkum Rocks	15 June	P	50		
Ulak/Hasgox Point *	15 June	P	663		
Amatignak					
Knob Point	15 June	V	0		
Nitrof Point	15 June	P	96		
Semisopochnoi					
Pochnoi Point*	15 June	P	65		
Petrel Point	15 June	P	65		
Tuman Point	15 June	V	0		
Southwestern Point	15 June	P	14		
Amchitka					
Ivakin Point	15 June	V	0		
East Cape	15 June	P	101		
Omega Point	15 June	V	0		
Cape St. Makarias	15 June	V	0		
Column Rocks*	15 June	P	92		
Bird	15 June	P	20		
Chitka Point	15 June	V	0		
Ayugadak *	15 June	P	146		
Rat	15 June	V	2		
Little Sitkin	15 June	P	18		
Segula	15 June	V	0		
Sea Lion Rocks (Kiska)	15 June	V	0		
Tanadak (Kiska)	17 June	P	71		
Kiska					
Twin Rocks	17 June	P	39		
South Head	17 June	V	0		
Gertrude-Bukhti Point	17 June	V	0		
Sobaka-Vega Point	17 June	P	152		
Cape St. Stephen *	17 June	P	152		
Lief Cove *	17 June	P	272		
Witchcraft Point	17 June	P	28		
Wolf Point	17 June		9		

Table 1b.--Non-pup and pup counts - 2000, continued.

Location	Non-pup count			Pup count	
	Date	Type	Count	Date	Count
Sirius Point	17 June	V	2		
Pillar Rock	17 June	V	0		
<b>Subtotals for the Central Aleutian Islands</b>					
<b>All 81 sites</b>			<b>7,000</b>		
<b>34 trend rookery and haul-out sites</b>			<b>5,419</b>		
<b>11 trend rookery sites</b>			<b>4,237</b>		
<b>Western Aleutian Islands</b>					
Buldir *	17 June	P	129		
Ingenstrem Rocks	17 June	P	3		
Shemya	17 June	P	54		
Nizki	17 June	V	0		
Alaid	17 June	P	156		
Agattu					
Cape Sabak *	17 June	P	480		
Gillon Point *	17 June	P	306		
Attu					
Massacre Bay & offshore rocks	17 June	V/P	14		
Chirikof Point	17 June	P	145		
Chichagof Point	17 June	P	52		
Kresta Point	17 June	V	1		
Cape Wrangell*	17 June	P	310		
<b>Subtotals for the Western Aleutian Islands</b>					
<b>All 12 sites</b>			<b>1,650</b>		
<b>4 trend rookery and haul-out sites</b>			<b>1,071</b>		
<b>3 trend rookery sites</b>			<b>915</b>		
<b>Totals for Kenai to Kiska</b>					
<b>All 227 sites (pups at 8 rookeries and 2 haulouts)</b>			<b>21,381</b>		<b>1,792</b>
<b>69 trend rookery and haul-out sites</b>			<b>15,279</b>		
<b>26 trend rookery sites</b>			<b>11,738</b>		
<b>Totals for the western stock (west of 144° W long.)</b>					
<b>All 264 sites (pups at 9 rookeries and 3 haulouts)</b>			<b>25,384</b>		<b>1,999</b>

Table 1b.--Non-pup and pup counts - 2000, continued.

Location	Non-pup count			Pup count	
	Date	Type	Count	Date	Count
<b>82 trend rookery and haul-out sites</b>			<b>18,325</b>		
<b>30 trend rookery sites</b>			<b>13,402</b>		
<b>Subtotals for all surveyed sites</b>					
<b>All 289 sites <sup>2</sup> (pups at 9 rookeries and 3 haulouts)</b>			<b>37,801 <sup>2</sup></b>		<b>1,999</b>
<b>94 trend rookery and haul-out sites</b>			<b>28,187</b>		
<b>33 trend rookery sites</b>			<b>20,298</b>		

<sup>1</sup> n.s. indicates sites not surveyed in 2000.

<sup>2</sup> Incomplete coverage of sites in Southeast Alaska.

Table 2.--Counts of adult and juvenile (non-pup) Steller sea lions (and the percent change from each year to 2000) at trend rookeries, at all trend sites, and at all surveyed sites in the Kenai to Kiska index area and Alaska-wide for June-July aerial surveys from 1900 to 2000, including the number of sites in each region (n), estimated annual rates of change, upper and lower 95% confidence intervals, and significance (P) from linear regression.

Year	Kenai to Kiska index area			All Alaska		
	Trend rookeries (n=26)	All trend sites (n=69)	All surv. sites (n=227)	Trend rookeries (n=33)	All trend sites (n=94)	All surv. sites (n=289)
1990	18,694 ( 37.2%)	22,754 ( 32.9%)	inc. <sup>1</sup>	27,563 ( 26.4%)	38,154 ( 26.1%)	inc.
1991	17,181 ( 31.7%)	21,726 ( 29.7%)	27,454 ( 22.1%)	27,527 ( 26.3%)	38,026 ( 25.9%)	47,641 ( 20.7%)
1992	16,593 ( 29.3%)	20,692 ( 26.2%)	26,970 ( 20.7%)	25,852 ( 21.5%)	34,854 ( 19.1%)	45,898 ( 17.6%)
1994	14,534 ( 19.2%)	18,736 ( 18.5%)	25,997 ( 17.8%)	23,476 ( 13.5%)	33,137 ( 14.9%)	45,232 ( 16.4%)
1996	13,902 ( 15.6%)	17,891 ( 14.6%)	24,603 ( 13.1%)	22,557 ( 10.0%)	30,441 ( 7.4%)	41,502 ( 8.9%)
1998	12,116 ( 3.1%)	16,417 ( 6.9%)	24,380 ( 12.3%)	21,097 ( 3.8%)	29,131 ( 3.2%)	40,414 <sup>2</sup> ( 6.5%)
2000	11,738	15,279	21,381	20,298	28,187	37,801 <sup>2</sup>
Estimated annual rate of change						
1990-2000	4.7%	3.9%	--	3.3%	3.2%	--
1991-2000	--	--	2.5%	--	--	2.5%
Upper 95%	3.9%	3.5%	1.4%	2.7%	2.5%	1.9%
Lower 95 %	5.5%	4.3%	3.6%	3.9%	3.9%	3.1%
P	<0.001	<0.001	0.003	<0.001	<0.001	<0.001

<sup>1</sup> inc. indicates incomplete survey data.

<sup>2</sup> Some haul-out sites missed in Southeast Alaska in 1998 and 2000.



Table 3.--Counts of adult and juvenile (non-pup) Steller sea lions (and the percent change from each year to 2000) at trend rookeries, at all trend sites, and at all surveyed sites from the eastern and western stocks in Alaska during June-July aerial surveys from 1990 to 2000, including the number of sites in each region (n), estimated annual rates of change, upper and lower 95% confidence interval, and significance (P) from linear regression.

Year	Eastern stock (Southeast Alaska)			Western stock in Alaska		
	Trend rookeries (n=3)	All trend sites (n=13)	All surv. sites (n=58)	Trend rookeries (n=30)	All trend sites (n=82)	All surv. sites (n=264)
1990	5,491 (+25.6%)	7,629 (+29.3%)	9,315 (+33.3%)	22,072 (-39.3%)	30,525 (-40.0%)	inc. <sup>1</sup>
1991	6,441 (+7.1%)	8,621 (+14.4%)	10,455 (+18.8%)	21,086 (-36.4%)	29,405 (-37.7%)	37,186 (-31.7%)
1992	5,944 (+16.0%)	7,555 (+30.5%)	10,011 (+24.0%)	19,908 (-32.7%)	27,299 (-32.9%)	35,887 (-29.3%)
1994	6,493 (+6.2%)	9,001 (+9.6%)	11,879 (+4.5%)	16,983 (-21.1%)	24,136 (-24.1%)	33,353 (-23.9%)
1996	6,204 (+11.2%)	8,231 (+19.8%)	10,907 (+13.8%)	16,353 (-18.0%)	22,210 (-17.5%)	30,595 (-17.0%)
1998	6,608 (+4.4%)	8,693 <sup>2</sup> (+13.4%)	10,939 <sup>2</sup> (+13.5%)	14,489 (-7.5%)	20,438 <sup>3</sup> (-10.3%)	29,475 <sup>3</sup> (-13.9%)
2000	6,896	9,862 <sup>2</sup>	12,417 <sup>2</sup>	13,402	18,325	25,384
Estimated annual rate of change						
1990-2000	1.6%	1.9%	2.1%	5.1%	5.1% <sup>3</sup>	--
1991-2000	--	--	--	--	--	4.0% <sup>3</sup>
Upper 95%	3.0%	3.8%	3.9%	4.3%	4.7%	3.1%
Lower 95 %	0.1%	0.1%	0.3%	5.8%	5.6%	4.9%
P	0.041	0.058	0.032	<0.001	<0.001	<0.001

<sup>1</sup> inc. indicates incomplete survey data.

<sup>2</sup> One trend site and several non-trend haul-out sites not surveyed in 1998 and 2000 (see text).

<sup>3</sup> Includes 1999 counts substituted for incomplete 1998 counts for the eastern Gulf of Alaska.

Table 4.--Counts of adult and juvenile (non-pup) Steller sea lions observed at rookery trend sites in seven subareas of Alaska during June-July aerial surveys from 1990 to 2000, including overall percent change between the count for each year and the count for 2000.

Year	Eastern Stock	Western Stock						Kenai to Kiska subtotal (n=26)	Western stock subtotal (n=30)
	Southeast Alaska (n=3)	Gulf of Alaska			Aleutian Islands				
		Eastern (n=1)	Central (n=4)	Western (n=4)	Eastern (n=7)	Central (n=11)	Western (n=3)		
1990	5,491 (+26%)	1,471 (-49%)	5,043 (-57%)	3,496 (-25%)	3,417 (-20%)	6,738 (-37%)	1,907 <sup>1</sup> (-52%)	18,694 (-37.2%)	22,072 <sup>1</sup> (-39.3%)
1991	6,441 (+7%)	1,220 (-39%)	4,336 (-50%)	3,234 (-19%)	3,516 (-22%)	6,095 (-30%)	2,685 (-66%)	17,181 (-31.7%)	21,086 (-36.4%)
1992	5,944 (+16%)	784 (-4%)	4,308 (-50%)	3,313 (-21%)	3,712 (-26%)	5,260 (-19%)	2,531 (-64%)	16,593 (-29.3%)	19,908 (-32.7%)
1994	6,493 (+6%)	636 (+18%)	3,098 (-30%)	3,155 (-17%)	3,514 (-22%)	4,767 (-11%)	1,813 (-50%)	14,534 (-19.2%)	16,983 (-21.1%)
1996	6,204 (+11%)	544 (+38%)	2,795 (-23%)	3,029 (-14%)	3,538 (-23%)	4,540 (-7%)	1,907 (-52%)	13,902 (-15.6%)	16,353 (-18.0%)
1998	6,608 (+4%)	730 <sup>2</sup> (+3%)	2,255 (-4%)	2,948 (-11%)	2,719 (-1%)	4,194 (+1%)	1,643 (-44%)	12,116 (-3.1%)	14,489 <sup>2</sup> (-7.5%)
2000	6,896	749	2,157	2,613	2,731	4,237	915	11,738	13,402

<sup>1</sup> Gillon Point rookery, Agattu Island. not surveyed in 1990.

<sup>2</sup> 1999 counts substituted for sites in the eastern Gulf of Alaska not surveyed in 1998.

Table 5.--Counts of adult and juvenile (non-pup) Steller sea lions observed at rookery and haul-out trend sites in seven subareas of Alaska during June and July aerial surveys from 1990 to 2000, including overall percent change between the count for each year and the count for 2000.

Year	Eastern Stock	Western Stock							Kenai to Kiska subtotal (n=69)	Western Stock subtotal (n=82)
	Southeast Alaska (n=12)	Gulf of Alaska			Aleutian Islands					
		Eastern (n=9)	Central (n=15)	Western (n=9)	Eastern (n=11)	Central (n=34)	Western (n=4)			
1990	7,629 (+29%)	5,444 ( 64%)	7,050 ( 55%)	3,915 ( 27%)	3,801 (+ 1%)	7,988 ( 32%)	2,327 <sup>1</sup> ( 54%)	22,754 ( 32.9%)	30,525 <sup>1</sup> ( 40.0%)	
1991	8,621 (+14%)	4,596 ( 57%)	6,270 ( 49%)	3,732 ( 24%)	4,228 ( 9%)	7,496 ( 28%)	3,083 ( 65%)	21,726 ( 29.7%)	29,405 ( 37.7%)	
1992	7,555 (+31%)	3,738 ( 47%)	5,739 ( 45%)	3,716 ( 24%)	4,839 ( 21%)	6,398 ( 15%)	2,869 ( 63%)	20,692 ( 26.2%)	27,299 ( 32.9%)	
1994	9,001 (+10%)	3,365 ( 41%)	4,516 ( 30%)	3,981 ( 29%)	4,419 ( 13%)	5,820 ( 7%)	2,035 ( 47%)	18,736 ( 18.5%)	24,136 ( 24.1%)	
1996	8,231 (+20%)	2,132 ( 7%)	3,913 ( 19%)	3,739 ( 24%)	4,715 ( 19%)	5,524 ( 2%)	2,187 ( 51%)	17,891 ( 14.6%)	22,210 ( 17.5%)	
1998	8,693 (+13%)	2,110 <sup>2</sup> ( 6%)	3,467 ( 8%)	3,360 ( 15%)	3,841 ( <1%)	5,749 ( 6%)	1,911 ( 44%)	16,417 ( 6.9%)	20,438 <sup>2</sup> ( 10.3%)	
2000	9,862	1,975	3,180	2,840	3,840	5,419	1,071	15,279	18,325	

<sup>1</sup> Gillon Point rookery, Agattu Island. not surveyed in 1990.

<sup>2</sup> 1999 counts substituted for sites in the eastern Gulf of Alaska not surveyed in 1998.

Table 6.--Counts of adult and juvenile (non-pup) Steller sea lions observed at all surveyed rookery and haul-out sites in seven subareas of Alaska during June and July aerial surveys from 1991 to 2000, including overall percent change between the count for each year and the count for 2000. Results from the ADF&G survey in Southeast Alaska were not available when this report was prepared.

Year	Eastern Stock		Western Stock						
	Southeast Alaska (n=25)	Gulf of Alaska			Aleutian Islands			Kenai to Kiska (n=227)	Western Stock (n=264)
		Eastern (n=25)	Central (n=55)	Western (n=37)	Eastern (n=54)	Central (n=81)	Western (n=12)		
1991	10,455 (+19%)	4,812 ( 51%)	7,872 ( 39%)	5,338 ( 14%)	5,285 ( 5%)	8,959 ( 22%)	4,920 ( 66%)	27,454 ( 22.1%)	37,186 ( 31.7%)
1992	10,011 (+24%)	4,386 ( 46%)	7,462 ( 35%)	5,495 ( 17%)	5,711 ( 13%)	8,302 ( 16%)	4,531 ( 64%)	26,970 ( 20.7%)	35,887 ( 29.3%)
1994	11,879 (+ 5%)	3,989 ( 41%)	6,788 ( 29%)	5,717 ( 20%)	5,875 ( 15%)	7,617 ( 8%)	3,367 ( 51%)	25,997 ( 17.8%)	33,353 ( 23.9%)
1996	10,907 (+14%)	2,585 ( 9%)	5,744 ( 16%)	5,722 ( 20%)	5,967 ( 16%)	7,170 ( 2%)	3,407 ( 52%)	24,603 ( 13.1%)	30,595 ( 17.0%)
1998	10,939 <sup>1</sup> (+14%)	2,230 <sup>2</sup> (+ 6%)	5,022 ( 4%)	5,850 ( 22%)	5,837 ( 14%)	7,671 ( 9%)	2,865 ( 42%)	24,380 ( 12.3%)	29,475 <sup>2</sup> ( 13.9%)
2000	12,417 <sup>1</sup>	2,353	4,817	4,568	4,996	7,000	1,650	21,381	25,384

<sup>1</sup> Some haul-out sites missed in Southeast Alaska in 1998 and 2000.

<sup>2</sup> 1999 counts substituted for sites in the eastern Gulf of Alaska not surveyed in 1998.

Table. 7-- Proportion of adult and juvenile (non-pup) Steller sea lions on rookeries, compared to all surveyed sites, in seven subareas of Alaska during June and July aerial surveys, 1991 to 2000. Subtotals include counts for five non-trend rookeries, as indicated in the footnotes, as well as all haul-out sites listed in Tables 1a and 1b and in reports for previous surveys <sup>1</sup>.

Year	Southeast Alaska	Gulf of Alaska			Aleutian Islands			Western stock	Alaska-wide
		Eastern <sup>2</sup>	Central <sup>3</sup>	Western	Eastern	Central <sup>4</sup>	Western <sup>5</sup>		
1991	0.6160	0.5341	0.6129	0.6058	0.6653	0.7287	0.6953	0.6479	0.6409
1992	0.5938	0.4079	0.6280	0.6029	0.6500	0.6694	0.7250	0.6226	0.6163
1994	0.5466	0.3219	0.5162	0.5519	0.5981	0.6657	0.7876	0.5751	0.5676
1996	0.5688	0.4046	0.5420	0.5294	0.5929	0.6643	0.7714	0.5922	0.5860
1997			0.4869	0.5333					
1998	0.6041 <sup>6</sup>	0.4753 <sup>6</sup>	0.5044	0.5039	0.4658	0.5766	0.7773	0.5398 <sup>6</sup>	0.5572 <sup>6</sup>
1999		0.4513							
2000	0.5554 <sup>6</sup>	0.4866	0.5022	0.5720	0.5466	0.6356	0.7424	0.5745	0.5682 <sup>6</sup>

<sup>1</sup> Merrick et al. (1992), Sease et al. (1993), Strick et al. (1997), Sease et al. (1999), Sease and Loughlin (1999).

<sup>2</sup> Includes non-trend rookery at Fish (Wooded) Island.

<sup>3</sup> Includes non-trend rookery at Outer Island.

<sup>4</sup> Includes non-trend rookeries at Amlia Island (Sviechnikof Harbor) and Amchitka Island (Column Rocks).

<sup>5</sup> Includes rookery at Attu Island (Cape Wrangel).

<sup>6</sup> These proportions of sea lions on rookeries will be slightly inflated because several haul-out sites were not surveyed in the eastern Gulf of Alaska (1998) and Southeast Alaska (1998 and 2000).

Table 8.-- Counts of adult and juvenile (non-pup) Steller sea lions at principal rookeries in Alaska during June and July surveys from 1991 through 2000, including overall percent change ( 2000) between the count for each year and the count for 2000.

Rookery	1991 ( 2000)	1992 ( 2000)	1994 ( 2000)	1996 ( 2000)	1997 ( 2000)	1998 ( 2000)	1999 ( 2000)	2000
<b>Southeast Alaska</b>								
Forrester	3,970 ( 7%)	3,508 (+5%)	4,010 ( 8%)	3,551 (+3%)		3,788 ( 3%)		3,674
Hazy	1,496 (+22%)	1,576 (+16%)	1,615 (+13%)	1,759 (+4%)		1,962 ( 7%)		1,824
White Sisters	975 (+43%)	860 (+63%)	868 (+61%)	894 (+56%)		858 (+63%)		1,398
<b>Eastern Gulf of Alaska</b>								
Seal Rocks	1,220 ( 39%)	784 ( 4%)	636 (+18%)	544 (+38%)		730 (+3%)	624 (+20%)	749
Fish ( Wooded)	1,350 ( 71%)	1,005 ( 61%)	648 ( 39%)	502 ( 21%)		330 (+20%)	311 (+27%)	396
<b>Central Gulf of Alaska</b>								
Outer	489 ( 46%)	378 ( 31%)	406 ( 35%)	318 ( 18%)	224 (+17%)	278 ( 6%)		262
Sugarloaf	1,216 ( 42%)	1,186 ( 40%)	976 ( 28%)	741 ( 5%)	624 (+13%)	748 ( 6%)		706
Marmot	1,458 ( 54%)	1,581 ( 58%)	1,091 ( 38%)	1,102 ( 39%)	780 ( 14%)	726 ( 8%)		671

Table 8.--Non-pup courts at selected rookeries, 1991-2000, continued.

Rookery	1991 ( 2000)	1992 ( 2000)	1994 ( 2000)	1996 ( 2000)	1997 ( 2000)	1998 ( 2000)	1999 ( 2000)	2000
Chowiet	716 ( 30%)	771 ( 35%)	599 ( 16%)	592 ( 15%)	538 ( 6%)	515 ( 2%)		504
Chirikof	946 ( 71%)	770 ( 64%)	432 ( 36%)	360 ( 23%)	294 ( 6%)	266 (+4%)		276
<b>Western Gulf of Alaska</b>								
Atkins	616 ( 13%)	792 ( 32%)	571 ( 6%)	624 ( 14%)	544 ( 1%)	602 ( 11%)		537
Chernabura	650 ( 24%)	459 (+8%)	676 ( 27%)	422 (+18%)	729 ( 32%)	624 ( 21%)		496
Pinnacle Rock	1,048 ( 17%)	1,092 ( 21%)	977 ( 11%)	1,026 ( 15%)	1007 ( 14%)	864 ( <1%)		868
Clubbing Rocks	920 ( 23%)	970 ( 27%)	931 ( 24%)	957 ( 26%)	934 ( 24%)	858 ( 17%)		712
<b>Eastern Aleutian Islands</b>								
Sea Lion Rock	300 ( 14%)	329 ( 22%)	480 ( 46%)	590 ( 56%)	452 ( 43%)	444 ( 42%)		258
Ugamak (and Round)	1,062 ( 30%)	954 ( 22%)	971 ( 23%)	854 ( 13%)	840 ( 11%)	742 ( <1%)		746
Akun (Billings Head)	156 (+63%)	271 ( 6%)	220 (+15%)	346 ( 27%)	247 (+3%)	212 (+20%)		254

Table 8.--Non-pup courts at selected rookeries, 1991-2000, continued.

Rookery	1991 ( 2000)	1992 ( 2000)	1994 ( 2000)	1996 ( 2000)	1997 ( 2000)	1998 ( 2000)	1999 ( 2000)	2000
Akutan (Cape Morgan)	818 ( 10%)	1,061 ( 30%)	908 ( 19%)	934 ( 21%)	760 ( 3%)	681 (+9%)		739
Bogoslof	558 ( 38%)	540 ( 36%)	413 ( 16%)	382 ( 9%)		274 (+27%)		347
Ogchul	228 ( 49%)	235 ( 50%)	208 ( 44%)	155 ( 25%)	166 ( 30%)	136 ( 14%)		117
Adugak	394 ( 31%)	322 ( 16%)	314 ( 14%)	277 ( 3%)		230 (+17%)		270



Table 8.--Non-pup counts at selected rookeries, 1991-2000, continued.

Rookery	1991 ( 2000)	1992 ( 2000)	1994 ( 2000)	1996 ( 2000)	1997 ( 2000)	1998 ( 2000)	1999 ( 2000)	2000
<b>Central Aleutian Islands</b>								
Yunaska	398 ( 39%)	394 ( 39%)	462 ( 48%)	340 ( 29%)		210 (+15%)		241
Seguam (Saddleridge)	684 ( 17%)	696 ( 18%)	658 ( 13%)	553 (+3%)		586 ( 3%)		570
Kasatochi	466 ( 16%)	376 (+4%)	288 (+35%)	330 (+18%)		350 (+11%)		390
Adak (Lake Point- and Cape Yakak)	847 (+3%)	615 (+42%)	765 (+14%)	618 (+41%)		683 (+28%)		874
Gramp Rock	773 ( 25%)	691 ( 16%)	537 (+8%)	582 (<1%)		570 (+2%)		580
Tag	440 ( 32%)	370 ( 19%)	309 ( 3%)	320 ( 6%)		370 ( 19%)		301
Ulak (Hasgox Point)	1,046 ( 37%)	1,059 ( 37%)	866 ( 23%)	844 ( 21%)		698 ( 5%)		663
Amchika (Column Rocks)	233 ( 61%)	194 ( 53%)	188 ( 51%)	137 ( 33%)		112 ( 18%)		92
Ayugadak	324 ( 55%)	313 ( 53%)	284 ( 49%)	281 ( 48%)		179 ( 18%)		146
Kiska (Lief Cove)	506 ( 46%)	357 ( 24%)	358 ( 24%)	341 ( 20%)		284 ( 4%)		272

Table 8.--Non-pup courts at selected rookeries, 1991-2000, continued.

Rookery	1991 ( 2000)	1992 ( 2000)	1994 ( 2000)	1996 ( 2000)	1997 ( 2000)	1998 ( 2000)	1999 ( 2000)	2000
Kiska (Cape St. Stephen)	380 ( 60%)	248 ( 39%)	232 ( 34%)	258 ( 41%)		224 ( 32%)		152
<b>Western Aleutian Islands</b>								
Buldir	587 ( 78%)	454 ( 72%)	344 ( 63%)	312 ( 59%)		336 ( 62%)		129
Agattu (Cape Sabak)	1,428 ( 66%)	1,304 ( 63%)	961 ( 50%)	1,001 ( 52%)		826 ( 42%)		480
Agattu (Gillon Point)	670 ( 54%)	773 ( 60%)	508 ( 40%)	594 ( 48%)		481 ( 36%)		306
Attu (Cape Wrangell)	736 ( 58%)	754 ( 59%)	839 ( 63%)	721 ( 57%)		584 ( 47%)		310
<b>Eastern Stock</b> (Southeast Alaska 3 rookeries)	6,441 (+7.1%)	5,944 (+16.0%)	6,493 (+6.2%)	6,204 (+11.2%)		6,608 (+4.4%)		6,896
<b>Western Stock</b> (33 rookeries)	23,663 ( 39.1%)	22,098 ( 34.8%)	19,056 ( 24.4%)	17,958 ( 19.7%)		15,753 ( 8.5%)		14,414
<b>Kenai to Kiska</b> (27 rookeries)	17,672 ( 31.9%)	17,024 ( 29.3%)	15,120 ( 20.3%)	14,284 ( 15.7%)		12,466 ( 3.4%)		12,044
<b>All 36 Rookeries</b>	30,104 ( 29.2%)	28,042 ( 24.0%)	25,549 ( 16.6%)	24,162 ( 11.8%)		22,361 ( 4.7%)		21,310

Table 9.--Counts of Steller sea lion pups at rookeries in Alaska during June and July surveys from 1990 through 2000, including the percent change ( 2000) from the earlier counts to the 2000 count.

Rookery	1990 ( 2000)	1994 ( 2000)	1996 ( 2000)	1997 ( 2000)	1998 ( 2000)	2000
<b>Eastern Gulf of Alaska</b>						
Fish (Wooded)		305 ( 51%)	232 ( 36%)	123 <sup>1</sup> (+21%)	147 <sup>2</sup> (+1%)	149
<b>Central Gulf of Alaska</b>						
Outer	363 ( 70%)	119 ( 9%)	114 ( 5%)	106 <sup>1</sup> (+2%)	113 ( 4%)	108
Chirikof	607 ( 69%)	325 ( 42%)			184 (+2%)	188
<b>Western Gulf of Alaska</b>						
Atkins	433 ( 39%)	324 ( 19%)	366 ( 28%)		352 ( 26%)	262
Pinnacle Rock	794 <sup>3</sup> ( 20%)	652 ( 2%)			639 (<1%)	638
<b>Eastern Aleutian Islands</b>						
Akun (Billingshead)	63 ( 35%)	69 ( 41%)			56 ( 27%)	41
Bogoslof	461 ( 46%)	322 <sup>4</sup> ( 23%)	282 <sup>5</sup> ( 12%)	281 ( 11%)	220 (+13%)	249
Adugak	262 ( 42%)	180 ( 15%)			135 (+13%)	153

Table 9.-- Pup counts at selected rookeries, 1990-1998, continued

Rookery	1990 ( 2000)	1994 ( 2000)	1996 ( 2000)	1997 ( 2000)	1998 ( 2000)	2000
<b>Central Aleutian Islands</b>						
Yunaska	230 ( 41%)	217 ( 37%)		192 ( 29%)	161 ( 16%)	136
Total for 9 listed rookeries		2,513 ( 23.4%)			2,007 ( 4.1%)	1,924

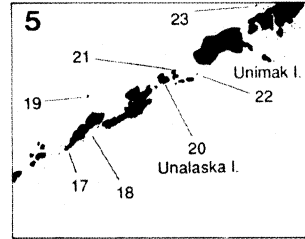
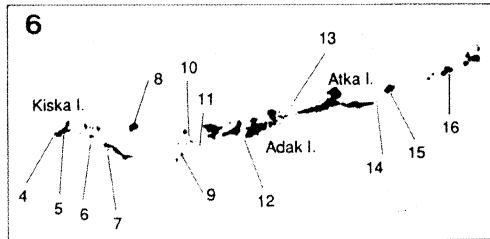
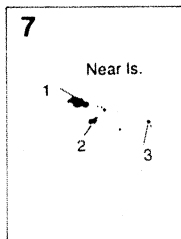
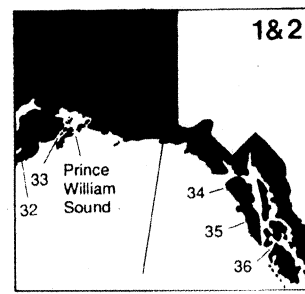
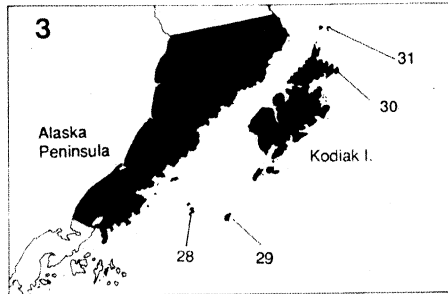
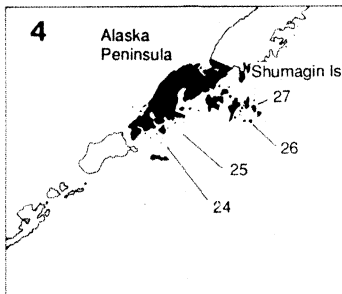
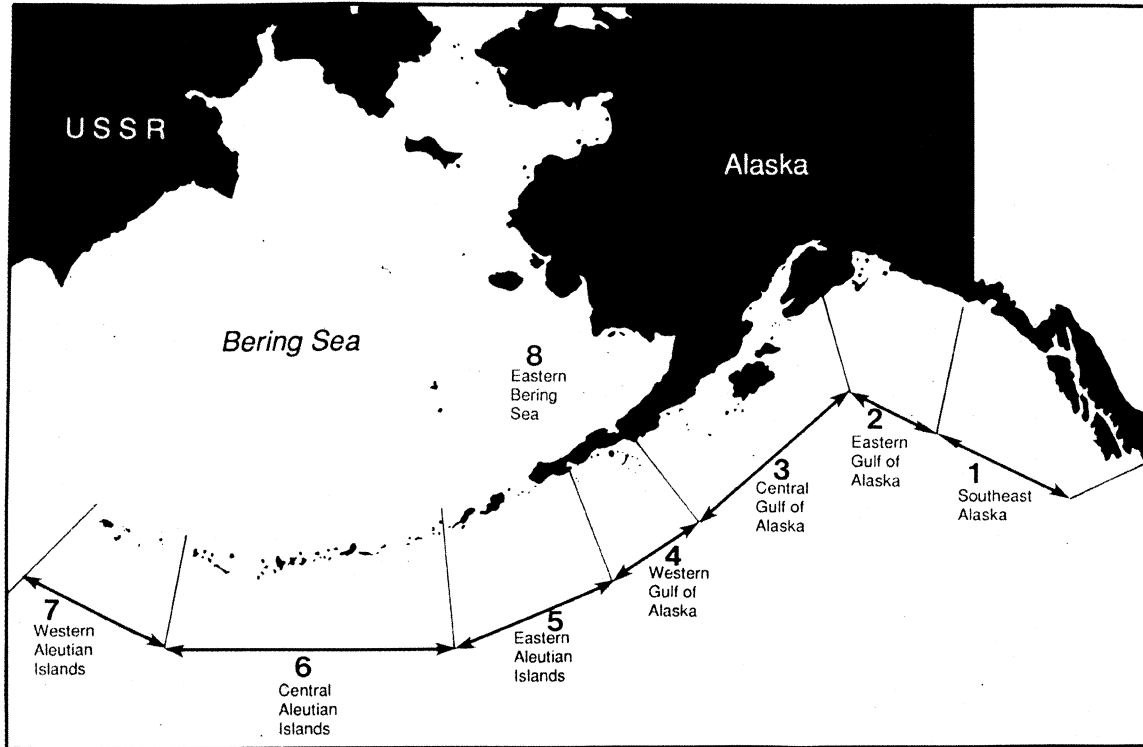
<sup>1</sup> Count from medium-format photographs (Westlake et al. 1997, ADF&G, unpublished data).

<sup>2</sup> Count from observation point at periphery of rookery at Fish Island 1998.

<sup>3</sup> 1991 count at Pinnacle Rocks.

<sup>4</sup> 1993 count at Bogosof Island.

<sup>5</sup> 1995 count at Bogosof Island.



- |          |                |               |             |                   |              |                  |
|----------|----------------|---------------|-------------|-------------------|--------------|------------------|
| 1 Attu   | 4,5 Kiska      | 11 Gramp Rock | 17 Adugak   | 22 Ugamak         | 27 Atkins    | 33 Seal Rocks    |
| 2 Agattu | 6 Ayugadak     | 12 Adak       | 18 Ogchul   | 23 Sea Lion Rock  | 28 Chowiet   | 34 White Sisters |
| 3 Buldir | 7 Amchitka     | 13 Kasatochi  | 19 Bogoslof | 24 Clubbing Rocks | 29 Chirikof  | 35 Hazy          |
|          | 8 Semisopchnoi | 14 Agligadak  | 20 Akutan   | 25 Pinnacle Rock  | 30 Marmot    | 36 Forrester     |
|          | 9 Ulak         | 15 Seguam     | 21 Akun     | 26 Chernabura     | 31 Sugarloaf |                  |
|          | 10 Tag         | 16 Yunaska    |             |                   | 32 Outer     |                  |

Figure 1. – Map of Alaska, showing seven geographical regions used for analyses of aerial survey results and major rookeries, as modified from Merrick et al. (1987).

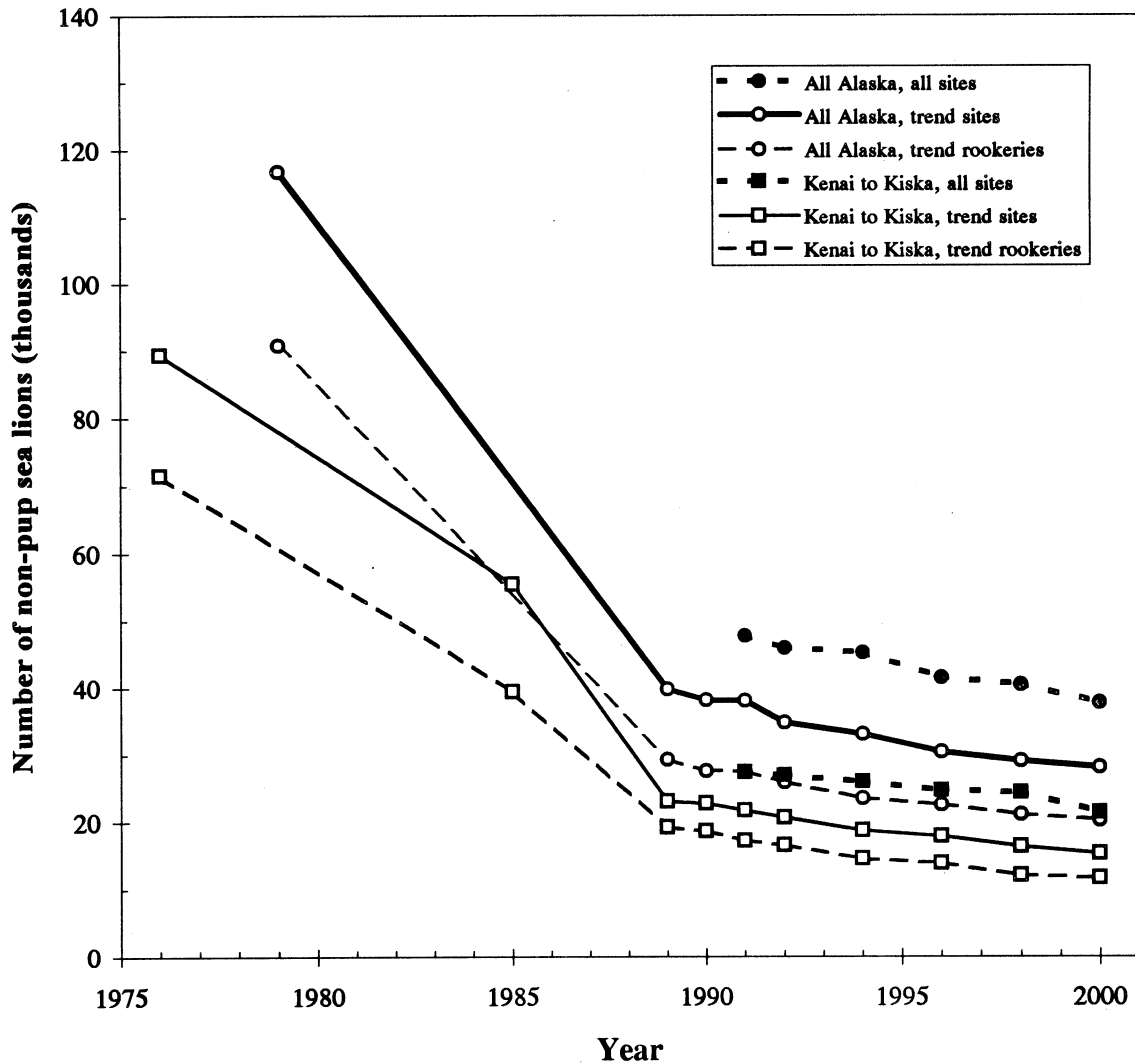


Figure 2.--Counts of non-pup (adult and juvenile) Steller sea lions at all surveyed sites, all trend sites (rookeries and major haulouts), and trend rookeries for Alaska state-wide and for the Kenai Peninsula to Kiska Island index area, 1970s to 2000. All counts are from aerial surveys.

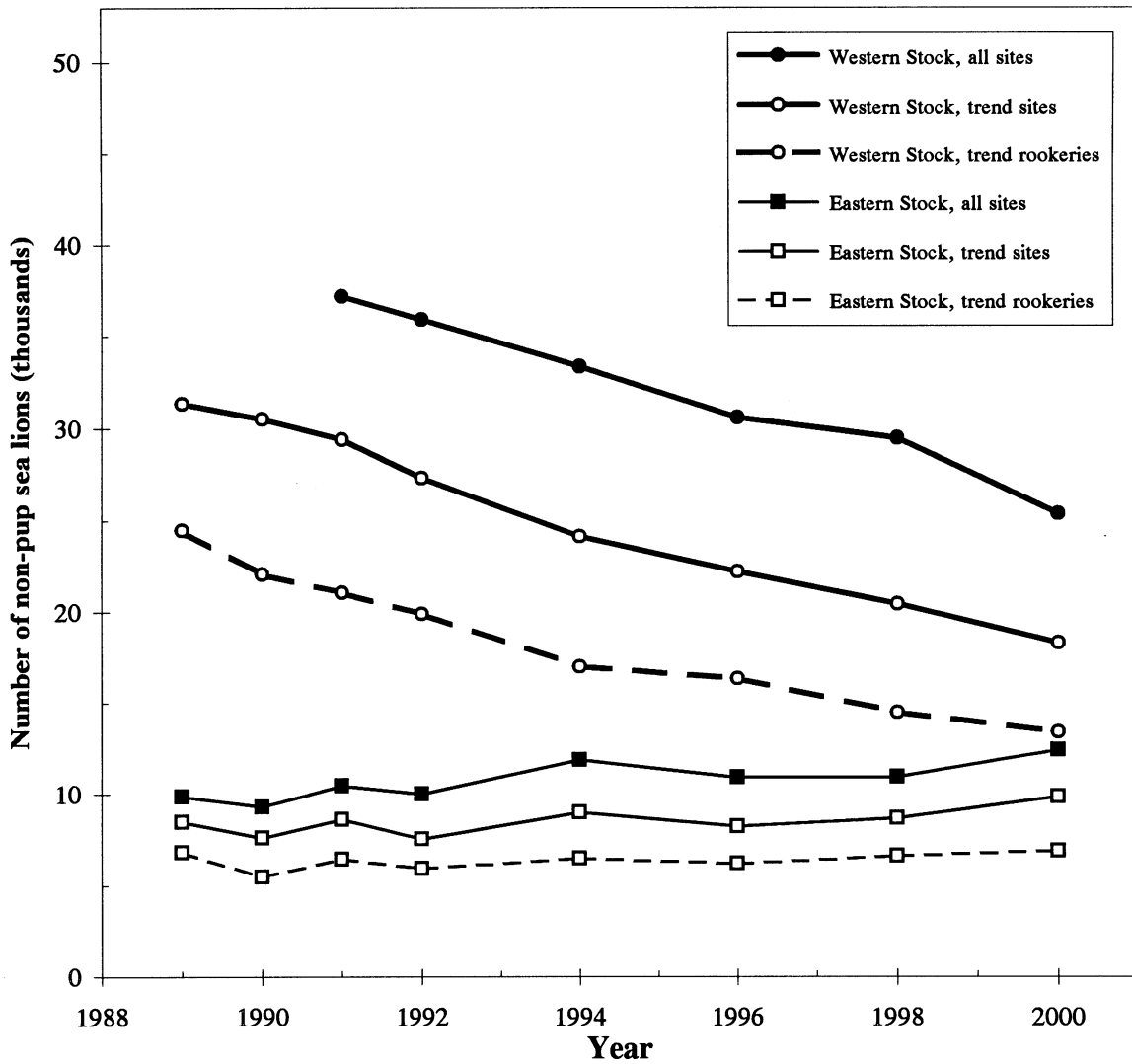


Figure 3.---Counts of non-pup (adult and juvenile) Steller sea lions at all surveyed sites, all trend sites (rookeries and major haulouts), and trend rookeries for the western and eastern stocks in Alaska, 1989 to 2000. All counts are from aerial surveys.

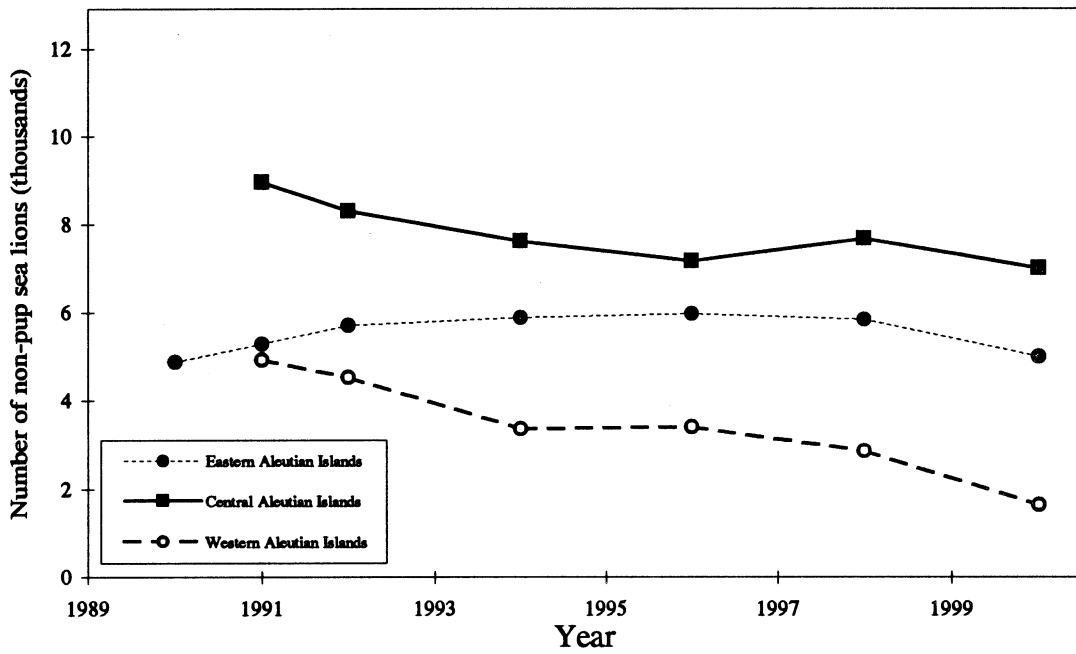
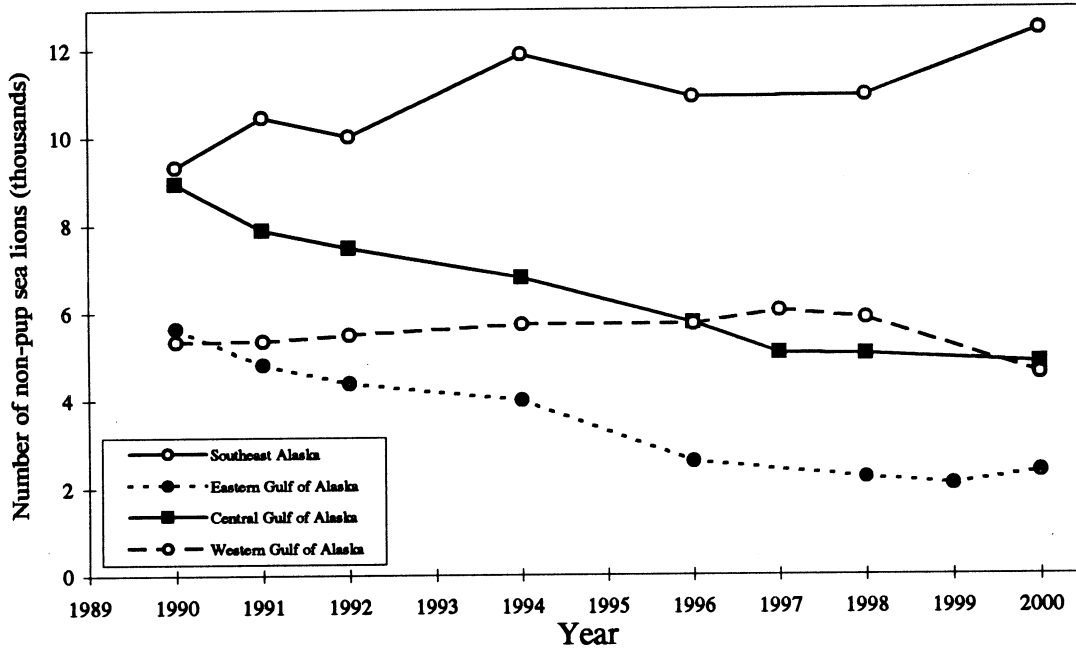


Figure 4.--Numbers of non-pup (adult and juvenile) Steller sea lions counted on all surveyed rookery and haulout sites (A) in Southeast Alaska and the Gulf of Alaska and (B) in the Aleutian Islands, 1990 to 2000.



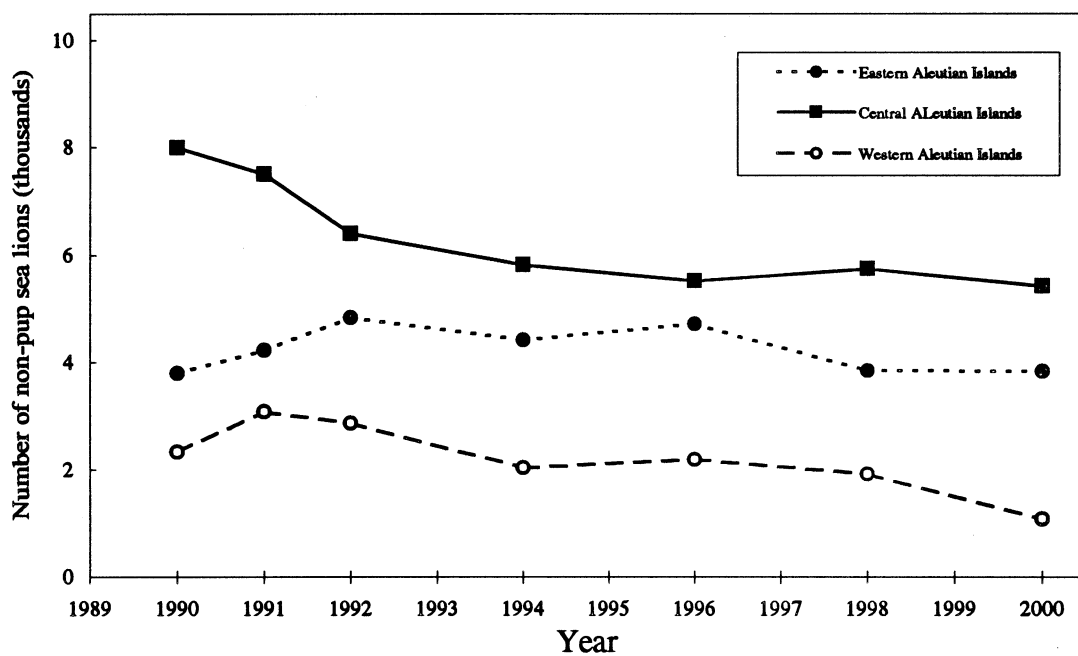
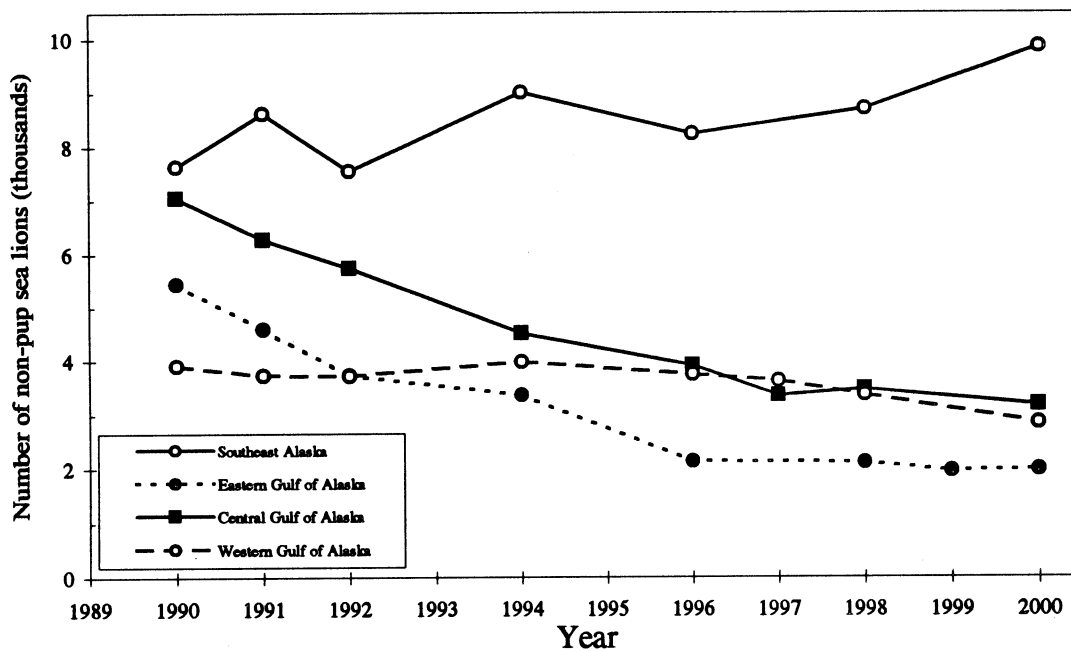


Figure 5.--Numbers of non-pup (adult and juvenile) Steller sea lions counted on all rookery and haul-out trend sites in (A) in Southeast Alaska and the Gulf of Alaska and (B) in the Aleutian Islands, 1990 to 2000.

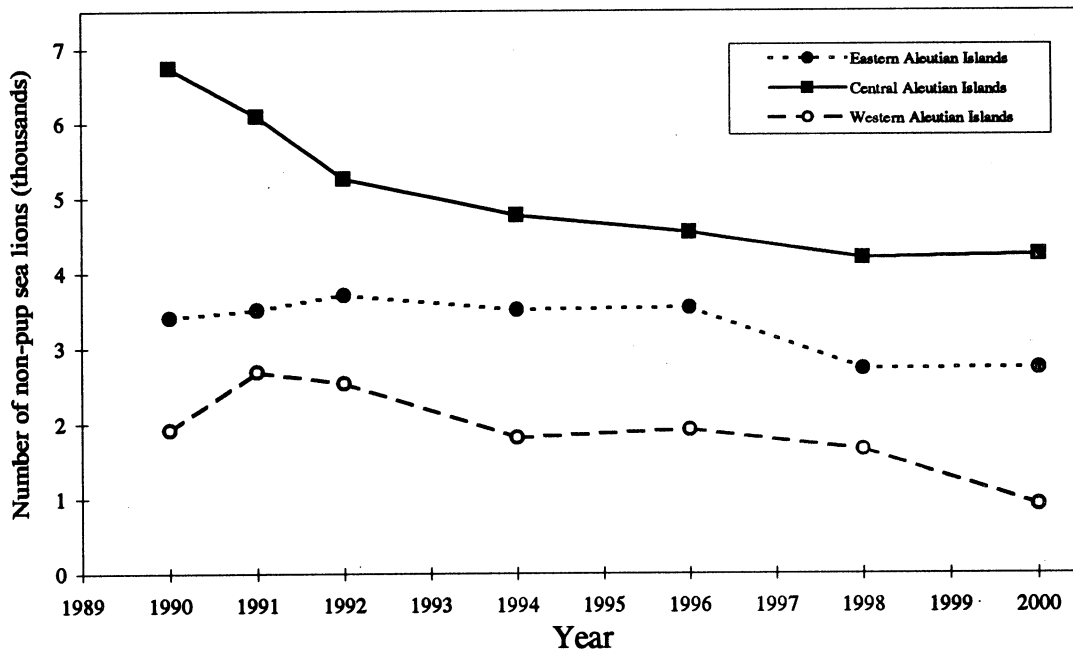
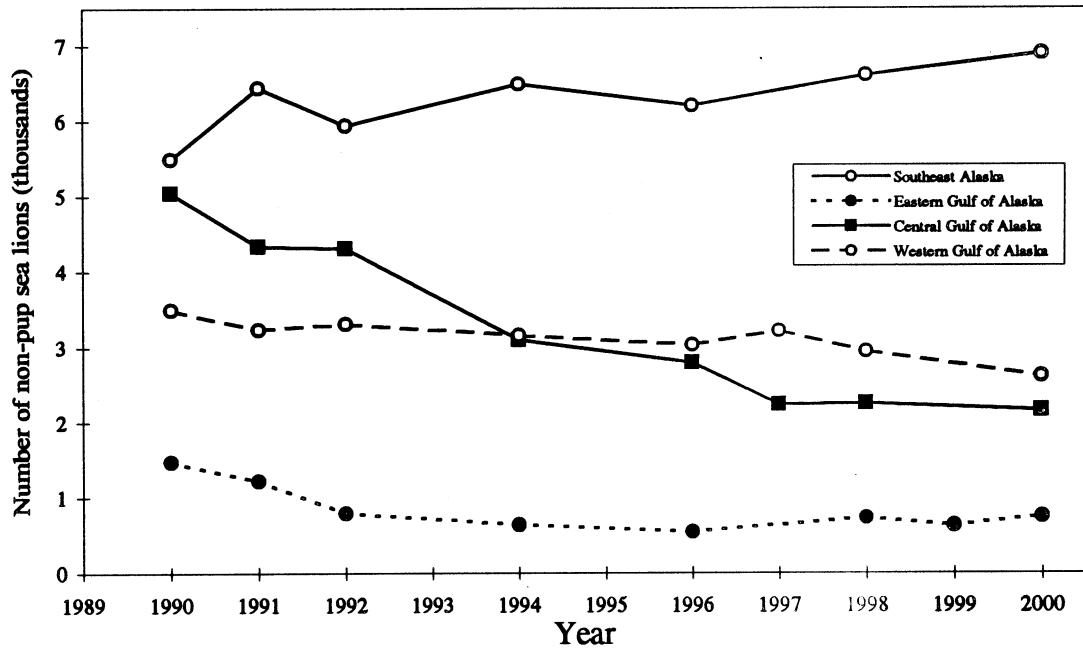


Figure 6.---Numbers of non-pup (adult and juvenile) Steller sea lions counted on trend rookery sites (A) in Southeast Alaska and the Gulf of Alaska and (B) in the Aleutian Islands, 1990 to 2000.

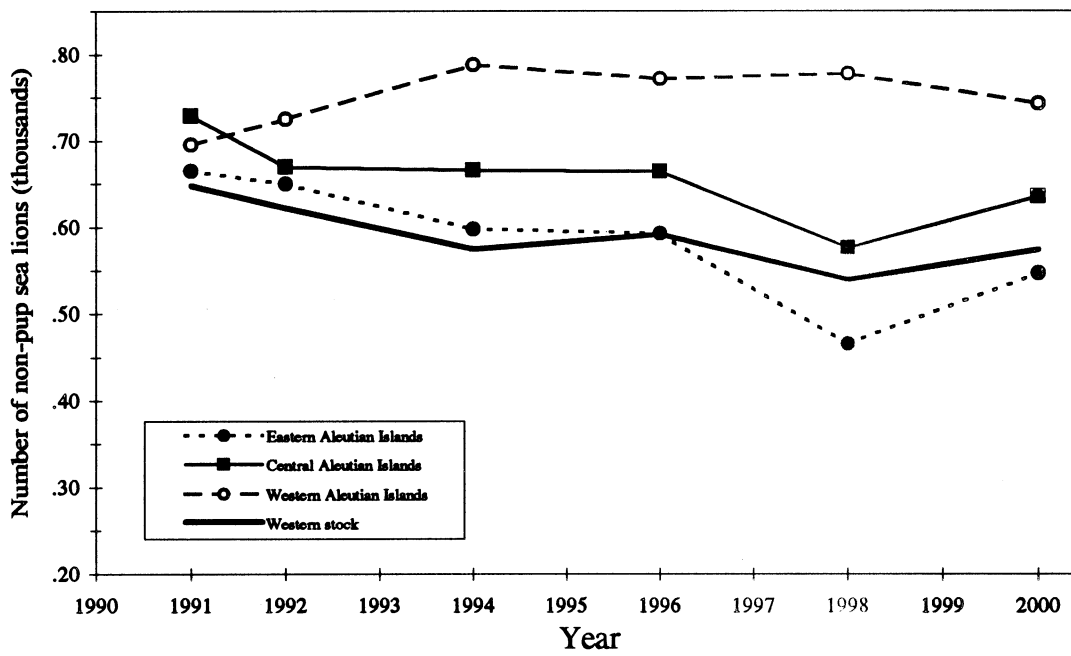
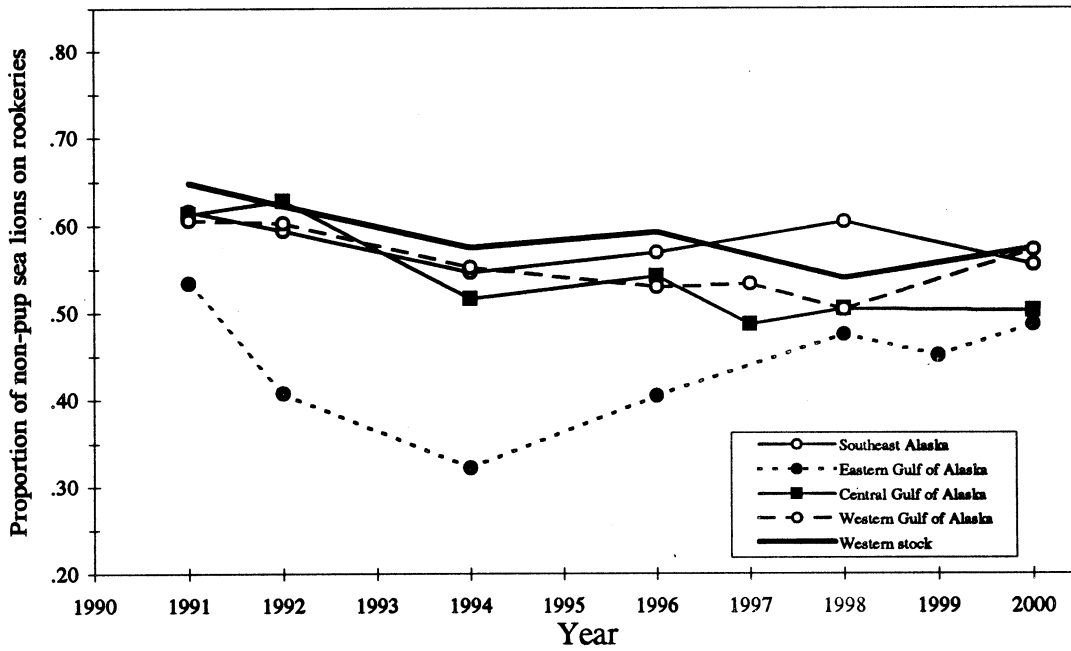


Figure 7.--Proportions of non-pup (adult and juvenile) Steller sea lions located on rookeries, compared to numbers of non-pups on all surveyed sites, by region, 1991 to 1998. Counts include five rookeries and about 180 haulouts that are not trend sites, as listed in Tables 1, 2, and 7.

## RECENT TECHNICAL MEMORANDUMS

Copies of this and other NOAA Technical Memorandums are available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22167 (web site: [www.ntis.gov](http://www.ntis.gov)). Paper and microfiche copies vary in price.

### AFSC-

- 121 BRITT, L. L., and M. H. MARTIN. 2001. Data report: 1999 Gulf of Alaska bottom trawl survey, 249 p. NTIS No. PB2001-105324
- 120 LAUTH, R. R. 2001. The 2000 Pacific west coast upper continental slope trawl survey of groundfish resources off Washington, Oregon, and California: Estimates of distribution, abundance, and length composition, 284 p. NTIS No. PB2001-105327.
- 119 FERRERO, R. C., HILL, D. P. DEMASTER, P. S. HILL, M. M. MUTO, and A. L. LOPEZ. 2000. Alaska marine mammal stock assessments, 2000, 191p. NTIS No. PB2001-102015.
- 118 WILSON, C. D., M. A. GUTTORMSEN, K. COOKE, M. W. SAUNDERS, and R. KIESER. 2000. Echo integration-trawl survey of Pacific hake, Merluccius productus, off the Pacific coast of the United States and Canada during July-August, 1998, 103 p. NTIS No. PB2000-108482.
- 117 ORR, J. W., M. A. BROWN, and D. C. BAKER. 2000. Guide to rockfishes (Scorpaenidae) of the genera Sebastes, Sebastolobus, and Adelosebastes of the northeast Pacific Ocean, second edition, 47 p. NTIS No. PB2001-100757.
- 116 WION, D. A., and R. A. MCCONNAUGHEY (editors). 2000. Mobile fishing gear effects on benthic habitats: A bibliography, 163 p. NTIS No. PB2000-108106.
- 115 LAUTH, R. R. 2000. The 1999 Pacific west coast upper continental slope trawl survey of groundfish resources off Washington, Oregon, and California: Estimates of distribution, abundance, and length composition, 287 p. NTIS No. PB2000-106004.
- 114 SHAW, F. R., M. E. WILKINS, K. L. WEINBERG, M. ZIMMERMANN, and R. R. LAUTH. 2000. The 1998 Pacific west coast bottom trawl survey of groundfish resources: Estimates of distribution, abundance, and length and age composition, 138 p. + Appendices. NTIS No. PB2000-105410.
- 113 ROBSON, B. W. (editor). 2000. Fur seal investigations, 1998, 101 p. NTIS No. PB2000-104258.
- 112 YANG, M-S., and M. W. NELSON. 2000. Food habits of the commercially important groundfishes in the Gulf of Alaska in 1990, 1993, and 1996, 174 p. NTIS No. PB2000-103403.
- 111 BUSBY, M. S., A. C. MATARESE, and K. L. MEIR. 2000. Annual, seasonal, and diel composition of larval and juvenile fishes collected by dip-net in Clam Bay, Puget Sound, Washington, from 1985 to 1995, 36 p. NTIS No. PB2000-103424.
- 110 HILL, P. S., and D. P. DEMASTER. 1999. Alaska marine mammal stock assessments, 1999, 166 p. NTIS PB2000-102844.
- 109 FOWLER, C. W., and M. A. PEREZ. 1999. Constructing species frequency distributions - a step toward systemic management, 59 p. NTIS No. PB2000-102552.