



NOAA Technical Memorandum NMFS-AFSC-153

**Aerial, Ship, and Land-based Surveys  
of Steller Sea Lions (*Eumetopias jubatus*)  
in the Western Stock in Alaska,  
June and July 2003 and 2004**

by  
L. W. Fritz and C. Stinchcomb

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

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# **Aerial, Ship, and Land-based Surveys of Steller Sea Lions (*Eumetopias jubatus*) in the Western Stock in Alaska, June and July 2003 and 2004**

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## ABSTRACT

The National Marine Fisheries Service (NMFS) conducted aerial, land, and ship-based surveys of the western stock of Steller sea lions (*Eumetopias jubatus*) in Alaska during June and July 2003 and 2004. Survey effort in 2003 consisted of sea lion pup (newborn) counts from land or skiff/ship at 13 sites in the eastern Aleutian Islands and in the Gulf of Alaska. Efforts in 2004 included: (1) a medium-format (MF) photography, vertically-oriented aerial survey of adult and juvenile sea lions (non-pups) at 262 sites spanning the entire range of the western stock in Alaska, and (2) pup counts from land or skiff/ship at 20 sites in the central and eastern Aleutian Islands and in three sub-areas of the Gulf of Alaska.

Non-pup sea lion population trends in the western stock were analyzed using counts at groups of consistently surveyed sites: (1) '1970s trend sites' (n = 93) - surveyed since the mid-1970s; (2) '1990s trend sites' (n = 161), a group that includes all the 1970s sites and others surveyed since 1991; and (3) Kenai-Kiska trend sites – sites located between 150°W (Kenai Peninsula) and 177°E (Kiska Island). In all previous years, non-pups were counted from projected 35 mm slides. Comparison of non-pup counts from both 35 mm and MF images taken in June 2000 indicated that MF counts tended to be greater than 35 mm counts. To integrate the 2004 MF with the long-term 35 mm data for sea lion population trend analyses, sub-area totals of non-pup counts in 2004 were reduced by 3.64% to account for film format differences in resolution and orientation.

Non-pup counts at trend sites in the western stock increased 11-12% between 2000 and 2004. The trend observed between 2000 and 2002 continued from 2002 to 2004. Between 2000 and 2004, the estimated average annual rate of change at all the 1970s trend sites was +2.9% ( $P < 0.05$ ), while at all 1990s trend sites, the annual rate of change was not significantly different from zero. These short-term trend data suggest that the overall decline in the western Steller sea lion population may have abated. However, the western population has not significantly increased in size and in 2004 was 28-30% smaller than in 1991, and 69% smaller than in 1985 at the Kenai-Kiska trend sites.

Changes in sea lion non-pup counts between 2000 and 2004 have not been uniform across the range of the western stock and appear to follow the pattern in sub-area trends observed in the 1990s. Between 1991 and 2000, the sea lion population in the core of the western stock's range in Alaska (eastern and central Aleutian Islands and western Gulf of Alaska) was relatively stable, while the population at the eastern (eastern and central Gulf of Alaska) and western (western Aleutian Islands) edges declined considerably. Between 2000 and 2004, the decline in non-pup counts slowed at the edges, while increases were observed in the core.

While there are no recent (2003 or 2004) data for the western and much of the central Aleutian Islands, recent regional trends in pup counts were generally similar to those observed in non-pup counts. Pup counts in the eastern Aleutian Islands and eastern Gulf of Alaska have increased since 1998 but have been relatively stable since 1994 in the western Gulf of Alaska. Pup counts have been declining unabated in the central Gulf of Alaska since the 1980s and were the lowest on record in 2003-2004.

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## INTRODUCTION

The Steller sea lion (*Eumetopias jubatus*) is the largest otariid pinniped species in the world (Loughlin et al. 1987, Hoover 1988). It inhabits coastal and continental shelf regions of the North Pacific Ocean. Along the eastern and northern Pacific coasts, its breeding range extends from central California, north through British Columbia, Canada and southeast Alaska, and west through the Gulf of Alaska, Bering Sea, and Aleutian Islands in the United States. Along the western Pacific coast, Steller sea lions breed along the Kamchatka Peninsula, on various Kuril Islands, and on islands within the Sea of Okhotsk in Russia (Loughlin et al. 1987, Hoover 1988). The National Marine Fisheries Service (NMFS) listed Steller sea lions as “threatened” range-wide under the U.S. Endangered Species Act (ESA) in November 1990 (55 Federal Register 49204). Since then, two population stocks have been identified based on differences in genetics and population trends (Bickham et al. 1996, Loughlin 1997). The ESA listing for the western stock, which breeds on rookeries located from 144° W (just east of Prince William Sound, Alaska) westward to Russia, was changed to “endangered” in June 1997 (62 Federal Register 24345). The eastern stock, which breeds on rookeries in southeast Alaska southward to California, retained its “threatened” ESA-classification (62 Federal Register 24345). The western stock has been further sub-divided into central and Asian stocks, with the boundary occurring west of Russia’s Commander Islands (Bickham et al. 1998).

The NMFS conducted aerial surveys of Steller sea lion non-pups (adults and juveniles), and land and ship-based surveys of pups across the range of the western stock in Alaska during June and July 2003 and 2004. These efforts extend 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, Loughlin et al. 1992, Merrick et al. 1992, Sease et al. 1993, Strick et al. 1997, Sease et al. 1999, Sease and Loughlin 1999, Sease et al. 2001, Sease and Gudmundson 2002). This report focuses primarily on counts of pups (new-born), and adult and juvenile (non-pup; age 1+ years old) Steller sea lions at terrestrial rookery and haul-out sites from 1985 to 2004. Longer historical perspectives are included in Merrick et al. (1991: for 1956-90) and Sease et al. (1993: for 1976-92). Rookeries are those sites where adult male sea lions actively defend territories, pups are born, and mating takes place. Haul-out sites are those where sea lions rest on land (haul out), but where few or no pups are born (Calkins and Pitcher 1982, Loughlin et al. 1984). Trends in the size of the sea lion population are determined by analyzing time series of pup and non-pup counts at ‘trend’ sites that have been consistently surveyed over time.

## METHODS

### Aerial Survey of Non-Pups

The 2004 Steller sea lion non-pup counts were, for the first time, obtained from medium-format (MF) vertical photographs. In previous aerial surveys (e.g., Sease and Gudmundson 2002), adult and juvenile sea lions were counted from projected images of 35 mm photographic slides shot obliquely from the side windows of aircraft. Alternatively, if sea lions at a site were not numerous ( $\leq 10$ ), an airborne observer made only a visual count. In 2004, however, all counts were made from MF photographic images taken on 10-29 June 2004 at 262 Steller sea

lion terrestrial rookeries and haul-out sites from Cape St. Elias (59° 48'N, 144° 36'W) to Cape Wrangell, Attu Island (52° 55'N, 172° 28'E; Fig. 1).

The 2004 MF aerial photographic survey of non-pup Steller sea lions was conducted by the Marine Mammal Division of the NMFS Southwest Fisheries Science Center. The survey was conducted with an AeroCommander aircraft (i.e., high-wing, low speed, survey plane) and photographs of rookeries and haulouts were taken with a MF (5-inch) military reconnaissance camera (with image-motion compensation) mounted in the belly of the aircraft. Photographs were taken vertically at altitudes of at least 700 feet between 0900 and 1700 local time when sea lions are most likely to be on land (Sease and Gudmundson 2002). Counts of sea lions from MF images were made using a dissecting scope (magnification ranging from 2X to 20X) mounted over a high intensity light table.

Analyses of non-pup counts focused on 'trend' sites. Trend sites are those rookeries and haul-out sites surveyed consistently over a period of time, thus allowing analyses of population trends on decadal scales. Three groups of trend sites were used:

- '1970s trend sites' (n = 93): 30 rookeries and 63 haulouts consistently surveyed from the 1970s to the present. The '1970s trend sites' typically have 70%-80% of all animals observed during each survey.
- '1990s trend sites' (n = 161): sites consistently surveyed from 1991 to the present. This group includes all the '1970s trend sites', but also includes 68 other rookeries and haulouts surveyed routinely since 1991. The '1990s trend sites' typically have 91%-98% of all animals observed during each survey.

- “Trend rookeries” (n = 30) are a subset of all rookeries, and are the 30 rookeries included in the ‘1970s trend sites’. The only major rookeries not included with the ‘trend rookeries’ are located on Outer and Attu Islands.

The distinction between rookeries and haul-out sites has become blurred in recent years as some sites traditionally listed as rookeries have produced few or no pups (e.g., Semisopchnoi Island, Agligadak Island, and Amchitka Island-Column Rocks). Conversely, noteworthy numbers of pups have been counted at some haul-out sites (e.g., Chiswell Islands, Jude Island and Kanaga Island-Ship Rock).

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, Loughlin et al. 1992, Merrick et al. 1992, Sease et al. 1993, Strick et al. 1997, Sease et al. 1999, Sease and Loughlin 1999, Sease et al. 2001, Sease and Gudmundson 2002) and those adopted in the Final Recovery Plan for Steller sea lions (NMFS 1992). The NMFS aerial survey effort during 2004 covered six western-stock regions: the eastern, central, and western Gulf of Alaska and the eastern, central, and western Aleutian Islands (Fig. 1). Western stock terrestrial sites in the Bering Sea region, which contain few haul-out sites and only one rookery (Walrus Island in the Pribilof Islands), were not surveyed in 2004.

Another geographical region used during the analyses of survey data extends from the Kenai Peninsula (Outer Island) to Kiska Island. This index area includes all of the central and western Gulf of Alaska, and the eastern and central Aleutian Islands, and encompasses what historically was the heart of the Steller sea lions’ range (Merrick et al. 1987, NMFS 1992). The

Kenai-to-Kiska region typically has included between 74% and 88% of the western Alaska sea lion population. Except for the distinction between the eastern and western stocks, the geographical divisions used in this report are arbitrary and may not accurately reflect the underlying structure of the population. We present results for each region to identify and highlight varying population trends. However, readers should not think that sea lion populations in one region are separate and independent of those in other regions. York et al. (1996), using a cluster analysis based on location and similarities in population trends, derived groupings of rookeries (from Outer to Attu Islands only; central Gulf of Alaska through western Aleutian Islands) that were similar to those used here to present survey results. The only differences between the rookery clusters identified by York et al. (1996) and those used here are as follows:

- York et al. (1996) grouped Atkins Island with the central Gulf of Alaska instead of the western Gulf of Alaska, and
- York et al. (1996) grouped Buldir Island with the central Aleutian Islands instead of the western Aleutian Islands.

#### Comparison of Non-Pup Counts from Medium Format and 35 mm Film

From 24 to 29 June 2000, both MF and 35 mm film were used to photograph Steller sea lions on 20 rookery and haul-out sites in southeast Alaska, and the eastern and central Gulf of Alaska. Adult and juvenile Steller sea lions were counted from both types of film images at each site. Photographs were taken on the same day from different aircraft; the MF photograph was

always taken first, followed within minutes by the 35 mm photograph. Differences in counts at each site and in aggregate were determined and analyzed using a sign test (Sokal and Rohlf 1969).

## Pup Surveys

Pups were counted at 9 rookeries (Ugamak/North, Ugamak/Ugamak Bay, and Ugamak/Round were considered a single site) and 4 haul-out sites between 20 June and 5 July 2003 and at 17 rookeries and 3 haul-out sites from 20 June to 6 July 2004. Numbers of pups on all rookeries in the eastern, central and western Gulf of Alaska, and in the eastern Aleutian Islands were counted once in either 2003 or 2004. Pups on rookeries west of Adak Island were not counted in either 2003 or 2004. This area included all of the western Aleutian Islands (four rookeries) and most of the central Aleutian Islands (7 of 11 rookeries). Most pup counts were performed by personnel directly on the rookery beach (beach counts), but others were made from a skiff or ship just offshore, or from a viewpoint overlooking the rookery beach. Beach counts were conducted by two or three people after most sea lions older than pups were safely cleared from the beach; all live pups on the beach and in the water were counted. The final pup count for each rookery was the mean of the two or three individual counts. Beach counts of pups introduce disturbance to the rookeries and are logistically difficult to conduct. Consequently, complete Alaska-wide pup counts are attempted only every 4 years, with counts at selected rookeries during intervening years.

Pup counts made from overlooks or from a skiff are done at several sites without disturbing sea lions off the beach. This is done at sites where only few pups were present or where vantage points offered clear views of the entire rookery beach. Shore-based observers counted pups daily at Marmot and Ugamak Islands from overlooks in June and July 2003 and 2004. Pups were counted on two separate beach rookeries on both Marmot and Ugamak Islands. Counts at each beach by separate observers were averaged, and the maximum daily sum for each island and year is reported here (Ugamak: 2004 only). It is not unusual for pups to be born at haul-out sites, although the numbers typically are very small in comparison to births at rookeries (Calkins and Pitcher 1982, Loughlin et al. 1984).

#### Pup Count Method Comparison: 1998-2002 Counts from the Beach and Medium Format Film

Pup counts from MF photographs taken at 16 rookery and haul-out sites within the range of the western stock in Alaska in late June-early July in 1998, 2000, 2001, and 2002 were compared with beach pup counts at the same sites taken within 4 days of each other. There were 18 comparisons of photographic counts to ground counts since two rookeries were photographed twice in the same year and straddled the ground count. Differences in counts at each site and in aggregate were determined and analyzed using a sign test (Sokal and Rohlf 1969), with particular attention to the order of the surveys.

## Population Trend Analyses

To determine trends in the non-pup population, annual totals of non-pups at '1970s trend sites', '1990s trend sites', and trend rookeries were computed for each of the following regions:

- the western stock in Alaska (Cape St. Elias, 144°W to Attu Island, 172°E);
- the Kenai-to-Kiska index area (150°W to Kiska Island, 176°E); and
- within each of the six smaller geographical sub-areas.

Overall regional changes in numbers of non-pups for various time periods are expressed as a percentage of the earlier count. For instance, the percent change in numbers of non-pups at '1970s trend sites' in the Kenai-Kiska area between 1985 ( $n = 54,738$ ) and 2000 ( $n = 15,279$ ) is  $[(15,279-54,738)/54,738] = -72.1\%$ . Estimates of the annual rate of change ( $AR$ ) for various time periods are derived from regression coefficients ( $m$ ) of log-linear regressions of the natural logarithm of the non-pup counts on the survey years;  $AR = e^m - 1$ . Tests of the significance of the regression coefficient ( $H_0: m = 0$  vs.  $H_1: m \neq 0$ ) were done at the 95% level ( $P < 0.05$ ).

Trends in pup counts were analyzed only by calculating the percent change in numbers for similar time periods and regions used in the non-pup analyses. The lack of annual time series for any of the regions precludes further statistical analyses.



## RESULTS

### Aerial Survey of Non-Pups

The June 2004 MF aerial survey resulted in a total count of 29,037 non-pup Steller sea lions on all surveyed sites ( $n = 262$ ) in the western stock in Alaska (Table 1). Of these sites, 131 (50%) were occupied by more than 20 sea lions, 41 sites (16%) were occupied by 1 to 20 sea lions, and 90 sites (34%) were unoccupied. These rates of site occupancy by sea lions in 2004 were similar to those observed in 2002 (53% had more than 20 sea lions, 13% had 1-20, and 34% had none).

The 2004 aerial survey of non-pup Steller sea lions was the first to use MF vertical photogrammetry to obtain counts at all sites (except one), with counts in all previous surveys being made visually or from projected 35 mm slide images. For trend analyses, it is necessary to construct a consistent time series of counts and to know if the counts from MF and 35 mm images are comparable. Counts of non-pup Steller sea lions from 35 mm and MF film taken in June 2000 at 20 terrestrial sites were compared (Table 2). As expected, counts from the two film formats were highly correlated (Fig. 2A;  $r^2 = 0.995$ ). However, of the 20 paired counts available, the MF count was greater at 17 sites while the 35 mm count was greater at only 3, resulting in a skewed distribution of differences (MF-35 mm; Figure 2B). This result was tested against the hypothesis that the positive and negative differences were present in equal proportions, where  $p =$  proportion of differences with  $MF > 35$  mm and  $q =$  proportion of differences with  $35$  mm  $>$  MF ( $H_0: p = q = 0.5$  vs.  $H_1: p > q$ ). Because of the better resolution and the vertical orientation of the

MF images, it was suspected that a MF count would be greater than one from a 35 mm image. Therefore, a one-tailed sign test (Sokal and Rohlf 1969) on the distribution of differences was performed. The cumulative probability of getting 17 or more positive and 3 or fewer negative differences in a sample of 20 is small (0.13%;  $P < 0.005$ ). Therefore, the null hypothesis is rejected and these results suggest that more sea lions were counted on MF than on 35 mm images of the same site.

While MF counts tended to be greater than 35 mm counts, the magnitude of this difference was not consistent. The MF count exceeded the 35 mm count by less than 5% at 9 of 20 sites (45%), by 5%-10% at 6 sites (30%), and by more than 10% at only 2 sites (10%; Table 2). The average percent difference across all sites (including those where 35 mm > MF) was 4.19%, which is slightly greater (because of the positively skewed distribution) than the percent difference between the 35 mm and MF totals across all sites (3.08%). The true correction factor for the 2004 MF counts to make them comparable with the existing time series of 35 mm counts may lie between 3.08% and 4.19%. Therefore, for the purposes of population trend analyses, 2004 MF counts by sub-area and for the entire western stock were reduced by 3.64% (average of 3.08% and 4.19%) to make them compatible with the existing 35 mm time series. Adjustments of 2004 MF counts were not done on a site-by-site basis because of the large range in site-by-site percent differences (-2.61% to +17.21%; Table 2).

The adjusted 2004 total counts of non-pup sea lions in each group of trend sites (1970s, 1990s, and rookeries) in the Kenai-Kiska area and the western stock were larger than their respective 2000 and 2002 counts (Table 3; Fig. 3). Percentage increases from 2000 to 2004 in the three groups of trend sites ranged from 10% to 18% in the Kenai-Kiska area, and from 11%

to 16% in the entire western stock in Alaska. Estimated annual rates of change from 2000 to 2004 were significantly different from zero for four of the six aggregate trend site groups, and ranged from +2.4% to +4.2% (Table 3).

Although recent overall trends have been positive, the 2004 non-pup population is considerably smaller than counted in 1985, 1991 or 1996 (Table 3; Fig. 3). All of the 2004 trend site group totals were smaller than those of 1996, and the percent changes between 1991 and 2004 in the Kenai-Kiska area and throughout the Alaskan western stock ranged from -18% to -21%, and -28% to -30%, respectively. Looking at the previous 20 years, overall changes between 1985 and 2004 in non-pup counts at trend rookeries and '1970s trend sites' in the Kenai-Kiska area were -65% and -69%, respectively.

Non-pup numbers at '1970s trend sites' (Table 4; Figs. 4 and 5), '1990s trend sites' (Table 5; Fig. 6), and trend rookeries (Table 6; Fig. 7) were greater in five of six sub-areas in 2004 than in 2002. The only sub-area where 2004 (adjusted) non-pup trend site counts were lower than in 2002 was the central Gulf of Alaska. However, while recent trend site counts have generally increased, only 2 of 18 estimated annual rates of change between 2000 and 2004 by sub-area were significantly different from zero (Tables 4-6), and both were positive and in the western Gulf of Alaska.

The numbers of non-pup sea lions at the edges of the western stock (eastern and central Gulf of Alaska and western Aleutian Islands) declined more sharply from 1991 to 2000 than in the central portion of its range (Tables 4-6; Fig. 5A). This pattern held for all three of the trend site groups and was responsible for the greater declines evident in the western stock as a whole than in the Kenai-Kiska index area. Since 2000, much of the central portion of the western

stock's range has shown an increase in non-pup numbers while trends at the edges have been more mixed (Tables 4-6; Fig. 5B).

Analysis of trends in non-pup numbers at individual rookeries (Table 7) for periods including 2004 is confounded by the issue of counts and film format. Absolute counts (disregarding film format differences) increased at 20 of 31 principal rookeries between 2002 and 2004, and each increased by a minimum of 6%. The 20 increasing rookeries were located in 5 of the 6 sub-areas, with none occurring in the central Gulf of Alaska. The 11 rookeries that had declining numbers of non-pups between 2002 and 2004 included all 4 principal rookeries in the central Gulf of Alaska and 7 other rookeries in the western Gulf of Alaska (n = 1), and the eastern (n = 1) and central (n = 5) Aleutian Islands. Each of these rookeries had smaller absolute non-pup counts in 2004 than in 2002 despite the difference in film format resolution (Table 2). The non-pup count at the Yunaska Island rookery in the central Aleutian Islands may have been artificially low from disturbance because the aerial survey photographs were taken on the same day that a beach count of pups occurred (Table 1).

## Pup Surveys

During June and July 2003 and 2004, live pups were counted at 27 different rookeries and haul-out sites in the eastern and central Aleutian Islands and eastern, central and western Gulf of Alaska (Tables 1 and 8). This includes all sites counted from the beach, a skiff or ship offshore, or from an overlook by either ship-based or field camp personnel. No rookeries west of Adak

Island in the central Aleutian Islands were visited in 2003 or 2004<sup>1</sup>. Trends in pup counts for the entire western stock in Alaska are available only through 2002 because of the lack of recent counts in much of the central and all of the western Aleutian Islands. Trends in pup counts by sub-area through 2004 are available only for the three Gulf of Alaska sub-areas and for the eastern Aleutians Islands (Table 9; Figs. 8 and 9). Since 1998, pup counts have increased in the eastern and western Gulf of Alaska and the eastern Aleutian Islands, but have continued to decrease in the central Gulf of Alaska and the central and western Aleutian Islands (through 2002).

Pup counts from MF images and from beach counts at the same location were compared if they were conducted no more than 4 days apart (Table 10 and Fig. 10). Paired counts were highly correlated ( $r^2 = 0.99$ ; Fig. 10A). In addition, there was little pattern associated with the differences between pairs of counts (Fig. 10B). A two-tailed sign test (Sokal and Rohlf 1969) was performed on these proportions, where  $p$  = proportion of differences with MF > beach and  $q$  = proportion of differences with beach > MF ( $H_0: p = q = 0.5$  vs.  $H_1: p \neq q$ ). The cumulative probability of getting the observed distribution is high (48%;  $P > 0.5$ ). Therefore, the null hypothesis cannot be rejected and these results suggest that one technique did not systematically yield higher sea lion pup counts than the other.

Pup counts were also analyzed to determine if the order in which the surveys were conducted affected the count. Since disturbance to the animals from beach counts exceeds that of aerial surveys, counts may be most similar in instances when the MF survey preceded the

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<sup>1</sup> An incomplete beach count was conducted on Lake Point, Adak Island on 21 June 2004, and the total ( $n = 295$ ) is considered an underestimate of the actual number of pups present and is not reported in Tables 1 or 8.

beach count (assuming that the disturbance associated with the beach count itself did not reduce the number of pups on the beach). There were 14 paired observations when the MF survey occurred 1-4 days *prior* to the beach count (Table 10; MF count < beach count for 9 pairs; MF count  $\geq$  beach count for 5 pairs). The cumulative probability of getting the observed distribution and the result of the two-tailed sign test (Sokal and Rohlf 1969) were similar to those when all the data were analyzed (42%;  $P > 0.5$ ). For the four pairs of counts when the MF survey occurred 1-4 days *after* the beach count, the MF count was less than the beach count in two, equal in one and greater in one. Even though there are limited data to address situations where the MF survey occurred after the beach count, these analyses suggest that the order in which the surveys occurred did not affect the sign of the difference between the counts.

## DISCUSSION

From 1989 to 2000, the western population of Steller sea lions in Alaska, as indexed by counts of adults and juveniles at trend sites, declined at an average rate of about 5% per year (Sease et al. 2001), and at rates as high as 15% per year in the late 1980s (Merrick et al. 1991). Since 2000, index counts of sea lions have increased. Sease and Gudmundson (2002) reported a 5.5% increase in western stock non-pup numbers at trend sites between 2000 and 2002, and data reported here suggest that this trend continued between 2002 and 2004. Annual rates of increase between 2000 and 2004 at trend sites, while not all significantly different from zero, were in the range of +2.4% to +4.2%. Thus, evidence from two consecutive surveys suggests that the decline in the western stock of Steller sea lions as a whole has abated.

While increases in non-pups between 2000 and 2002 occurred throughout the range of the western stock (Sease and Gudmundson 2002), 2004 counts in the central Gulf of Alaska were the lowest on record and those in the western Aleutian Islands and eastern Gulf of Alaska were largely unchanged from 2002. Therefore, the 2000-2004 increases in aggregate Kenai-Kiska or Alaskan western stock indices were driven by changes in the western Gulf of Alaska and eastern and central Aleutian Islands populations. Throughout the 1990s, non-pup counts in this central part of the range were generally stable or only slightly decreasing, while at the ends, they declined at much faster rates. While declines at the edges of the Alaskan western stock appear to have slowed, they do not appear to have stopped, particularly in the central Gulf of Alaska. Therefore, there is considerable geographic variation in the recent trends in non-pup Steller sea lion numbers in the Alaskan western stock, and it is not possible to make conclusions regarding broad-based stability or recovery of the population.

Regional trends in pup numbers, where available, largely support the observed non-pup trends. Pup counts in the eastern Aleutians and at rookeries visited in the central Aleutians (east of Adak Island) have shown recent increases. However, pup counts in the western Gulf of Alaska have been largely constant since 1994, while they have continued to decline in the central Gulf of Alaska.

Integration of non-pup counts from MF images into the existing time series of counts from 35 mm slides requires further study. The non-pup count comparisons reported here suggest that counts from MF images are higher, but the magnitude of the correction factor, particularly on a site-by-site basis is uncertain. Differences in terrain and substrate between sites may yield a different relationship between 35 mm and MF counts, and therefore, different correction factors.

The non-pup correction factor for MF aggregate counts used in this report (-3.64%) is considered provisional and will be investigated further in a comparative study planned for 2005.

In comparison to the non-pup time series, there are fewer data available for comparison of MF counts and beach counts of pups. However, based on these limited analyses, as well as those of Snyder et al. (2001), the two techniques yield similar results and neither tended to produce greater or smaller counts than the other. This suggests that MF photogrammetry could yield an index of pup counts throughout the range of the western stock in Alaska that is consistent with the existing beach count time series if the survey time frames are similar. Additional comparisons of MF and beach counts of pups are planned for 2005.

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Table 1.--Counts of Steller sea lions at rookery (R) and haul-out sites in Alaska, June and July 2003 and 2004. All adult and juvenile (non-pup) counts are from medium-format photographs taken vertically over each site in June 2004. Pup counts are from on-site beach counts (B), from a skiff or ship just offshore (S), or from a land-based overlook (O; Type) in June and July 2003 and 2004. Trend (T) and 1990s trend (90T) sites are those sites used for analyses of trends in survey counts. M = Month (June = 6, July = 7); D = Day.

Site Name	Non-Pups			Pups				
	M	D	Count	M	D	Year	Count	Type
<b>Eastern Gulf of Alaska</b>								
CAPE ST. ELIAS (T, 90T)	6	29	318					
HOOK POINT	6	10	96					
CAPE HINCHINBROOK (90T)	6	10	496					
SEAL ROCKS (R, T, 90T)	6	29	841	7	4	2003	543	B
WOODED (FISH) (R, T, 90T)	6	29	523	7	3	2003	173	B
MIDDLETON	6	10	4					
GLACIER (T, 90T)	6	10	620					
THE NEEDLE (T, 90T)	6	10	123	7	5	2003	7	S
POINT LaTOUCHE	6	10	0					
DANGER	6	10	12					
POINT ELRINGTON (T, 90T)	6	10	132	7	5	2003	2	S
PROCESSION ROCKS	6	10	36					
CAPE PUGET (90T)	6	10	0					
CAPE JUNKEN	6	10	0					
CAPE FAIRFIELD (90T)	6	10	0					
CAPE RESURRECTION	6	10	3					
RUGGED (T, 90T)	6	10	0					
AIALIK CAPE (90T)	6	10	1					
CHISWELL ISLANDS (T, 90T)	6	10	72					
GRANITE CAPE	6	10	1					
SEAL ROCKS (KENAI) (T, 90T)	6	10	3					
STEEP POINT	6	10	1					
RABBIT	6	10	0					
<b>Eastern Gulf of Alaska Total</b>			<b>3,282</b>					
<b>Central Gulf of Alaska</b>								
OUTER (PYE) (R, 90T)	6	10	222	7	5	2004	59	S,O
NUKA POINT	6	10	0					
GORE POINT (90T)	6	11	0					
EAST CHUGACH (90T)	6	11	0					
PERL (90T)	6	10	49					
PERL ROCKS	6	11	0					
NAGAHUT ROCKS (90T)	6	11	1					
ELIZABETH/CAPE ELIZABETH (90T)	6	26	28					

Table 1.--(Continued).

Site Name	Non-Pups			Pups				
	M	D	Count	M	D	Year	Count	Type
<b>Central Gulf of Alaska (continued)</b>								
FLAT	6	10	4					
WEST AMATULI	6	11	0					
SUGARLOAF (R, T, 90T)	6	25	667	7	6	2004	488	B,S,O
USHAGAT/NW (T, 90T)	6	25	3					
USHAGAT/SW (T, 90T)	6	25	101					
USHAGAT/ROCKS SOUTH (T, 90T)	6	25	8					
SUD	6	11	0					
LATAK ROCKS (T, 90T)	6	11	56					
SEA OTTER (90T)	6	24	127					
RK NEAR SEA OTTER (90T)	6	24	10					
AFOGNAK/TONKI CAPE (90T)	6	24	0					
SEA LION ROCKS (MARMOT) (T, 90T)	6	25	2					
MARMOT (R, T, 90T)				7	6	2003	505	O
MARMOT (R, T, 90T)	6	26	703	6	26	2004	474	O
LONG ISLAND (T, 90T)	6	24	32					
KODIAK/CAPE CHINIAK (T, 90T)	6	25	87					
UGAK (90T)	6	26	0					
KODIAK/GULL POINT (90T)	6	26	109					
KODIAK/CAPE BARNABAS (T, 90T)	6	26	0					
TWOHEADED (T, 90T)	6	26	266	6	29	2003	20	S
SITKINAK/CAPE SITKINAK (T, 90T)	6	26	80					
KODIAK/SUNDSTROM	6	11	0					
KODIAK/CAPE ALITAK	6	11	0					
KODIAK/CAPE IKOLIK	6	11	108					
KODIAK/TOMBSTONE ROCKS	6	11	0					
KODIAK/CAPE KULIUK	6	11	0					
KODIAK/CAPE UGAT (90T)	6	24	2					
NOISY	6	24	0					
KODIAK/MALINA POINT	6	24	0					
KODIAK/STEEP CAPE (90T)	6	24	0					
KODIAK/CAPE PARAMANOF	6	24	0					
SHAW	6	11	81					
CAPE DOUGLAS	6	11	0					
SHAKUN ROCKS (90T)	6	11	104					
CAPE NUKSHAK	6	11	0					
CAPE UGYAK	6	11	0					
CAPE GULL	6	11	0					
TAKLI (90T)	6	11	85					
PUALE BAY (90T)	6	11	58					
KILOKAK ROCKS	6	26	85					
AIUGNAK COLUMNS	6	26	1					



Table 1. --(Continued).

Site Name	Non-Pups			Pups				Type
	M	D	Count	M	D	Year	Count	
<b>Central Gulf of Alaska (continued)</b>								
UGAIUSHAK (T, 90T)	6	26	0					
SUTWIK (T, 90T)	6	26	206					
AGHIYUK	6	12	27					
CHOWIET (R, T, 90T)	6	12	541	6	28	2003	368	O
CHIRIKOF (R, T, 90T)	6	26	303	7	1	2004	189	B
NAGAI ROCKS (90T)	6	26	330	7	1	2004	22	S
<b>Central Gulf of Alaska Total</b>			<b>4,486</b>					
<b>Western Gulf of Alaska</b>								
LIGHTHOUSE ROCKS (90T)	6	12	111					
ATKULIK	6	12	0					
KAK (90T)	6	12	17					
CHANKLIUT	6	12	0					
SEAL CAPE	6	12	0					
MITROFANIA (90T)	6	12	182					
SPITZ (T, 90T)	6	12	1					
KUPREANOF POINT (90T)	6	12	53					
CASTLE ROCK (T, 90T)	6	12	70					
BIG KONIUJI	6	12	0					
ATKINS (R, T, 90T)	6	12	651	6	30	2004	266	B,O
CHERNABURA (R, T, 90T)	6	12	828	6	27	2003	82	B
TWINS	6	12	0					
THE HAYSTACKS (90T)	6	12	38					
THE WHALEBACK (90T)	6	12	102					
NAGAI/MOUNTAIN POINT (T, 90T)	6	12	80					
NAGAI/RK W OF CAPE WEDGE	6	12	0					
EGG (SAND POINT)	6	12	0					
SEA LION ROCKS (SHUMAGINS) (T, 90T)	6	12	36					
UNGA/CAPE UNGA	6	12	0					
UNGA/ACHEREDIN POINT (90T)	6	12	264					
JUDE (90T)	6	12	474	6	29	2004	187	B,O
OMEGA	6	12	0					
WOSNESENSKI	6	12	166					
OLGA ROCKS NE	6	12	11					
OLGA ROCKS SW	6	12	117					
SUSHILNOI ROCKS	6	12	290					
PINNACLE ROCK (R, T, 90T)	6	12	1,011	6	29	2004	663	B
HUNT	6	12	0					
SOZAVARIKA	6	12	0					
UMGA	6	12	0					

Table 1. --(Continued).

Site Name	Non-Pups			Pups				
	M	D	Count	M	D	Year	Count	Type
<b>Western Gulf of Alaska (continued)</b>								
CLUBBING ROCKS (R, T, 90T)	6	12	911	6	26	2003	566	B
CHERNI (90T)	6	12	0					
HAGUE ROCK	6	12	0					
CATON	6	12	109					
SOUTH ROCKS (90T)	6	12	528					
SANAK	6	12	0					
BIRD (T, 90T)	6	12	57					
ROCK (90T)	6	12	17					
<b>Western Gulf of Alaska Total</b>			<b>6,124</b>					
<b>Eastern Aleutian Islands</b>								
UNIMAK/CAPE LAZAREF	6	12	0					
UNIMAK/CAPE LUTKE	6	12	0					
UNIMAK/SCOTCH CAP	6	12	0					
UNIMAK/SENNETT POINT	6	12	0					
UNIMAK/CAPE SARICHEF (90T)	6	14	250					
AMAK+ROCKS (T, 90T)	6	24	733					
SEA LION ROCK (AMAK) (R, T, 90T)	6	24	456	6	27	2004	185	B
UGAMAK/NORTH (R, T, 90T)				6	25	2003	352	B
UGAMAK/NORTH (R, T, 90T)	6	14	644	7	3	2004	272	O
UGAMAK/UGAMAK BAY (R, T, 90T)				6	24	2003	295	O
UGAMAK/UGAMAK BAY (R, T, 90T)	6	14	575	7	3	2004	242	O
UGAMAK/ROUND (R, T, 90T)				6	25	2003	39	S
UGAMAK/ROUND (R, T, 90T)	6	14	85	6	28	2004	27	O
AIKTAK (90T)	6	14	101	6	28	2004	7	S
KALIGAGAN	6	14	1					
TIGALDA/ROCKS NE (90T)	6	14	141					
TIGALDA/SOUTH SIDE (90T)	6	14	46					
BASALT ROCK	6	14	1					
ROOTOK/EAST (90T)	6	14	31					
ROOTOK/NORTH (90T)	6	14	65					
TANGINAK (90T)	6	14	4					
AKUN/JACKASS POINT	6	14	0					
AKUN/AKUN BAY	6	14	0					
AKUN/BILLINGS HEAD (R, T, 90T)	6	14	307 <sup>1</sup>	6	26	2004	85	B
AKUN/AKUN HEAD	6	14	0					
AKUTAN/REEF-LAVA (T, 90T)	6	14	119					
AKUTAN/CAPE MORGAN (R, T, 90T)	6	14	1,021	6	22	2003	497	B

<sup>1</sup> In 2004, the count from Akun/Billingshead Rookery was made from projected 35 mm image shot obliquely from the side window of the aircraft

Table 1. --(Continued).

Site Name	Non-Pups			Pups				
	M	D	Count	M	D	Year	Count	Type
<b>Eastern Aleutian Islands (continued)</b>								
AKUTAN/BATTERY POINT	6	14	0					
BABY	6	14	0					
OLD MAN ROCKS (90T)	6	14	71					
EGG (90T)	6	14	5					
OUTER SIGNAL (90T)	6	14	0					
INNER SIGNAL	6	14	38					
UNALASKA/CAPE SEDANKA (90T)	6	14	0					
UNALASKA/PRIEST ROCK	6	23	0					
UNALASKA/CAPE WISLOW	6	23	0					
UNALASKA/BISHOP POINT (90T)	6	23	265	6	20	2003	2	S
UNALASKA/KOVRIZHKA	6	23	0					
UNALASKA/MAKUSHIN BAY (90T)	6	23	20					
UNALASKA/CAPE STARICHKOF	6	23	0					
UNALASKA/SPRAY CAPE (90T)	6	23	0					
UNALASKA/WHALEBONE CAPE	6	14	0					
UNALASKA/CAPE IZIGAN (90T)	6	14	238					
BOGOSLOF/FIRE ISLAND (R, T, 90T)	6	23	380	6	25	2004	278	B
UMNAK/CAPE ASLIK (T, 90T)	6	14	119					
EMERALD	6	14	0					
POLIVNOI ROCK (90T)	6	14	91					
THE PILLARS (90T)	6	14	4					
OGCHUL (R, T, 90T)	6	14	139	6	21	2003	69	B
VSEVIDOF (T, 90T)	6	14	48					
SAMALGA	6	14	1					
ADUGAK (R, T, 90T)	6	14	259	6	24	2004	185	B
<b>Eastern Aleutian Islands Total</b>			<b>6,258</b>					
<b>Central Aleutian Islands</b>								
ULIAGA (T, 90T)			Not surveyed					
KAGAMIL (T, 90T)	6	23	1					
CHUGINADAK (T, 90T)	6	23	129					
CARLISLE (T, 90T)	6	23	0					
HERBERT (T, 90T)	6	23	38					
YUNASKA (R, T, 90T)	6	23	260 <sup>2</sup>	6	23	2004	145	B
CHAGULAK (T, 90T)	6	23	0					
AMUKTA+ROCKS (T, 90T)	6	23	2					
SEGUAM/FINCH POINT (T, 90T)	6	23	2					
SEGUAM/SW RIP (T, 90T)	6	23	40					
SEGUAM/SADDLERIDGE (R, T, 90T)	6	23	923	6	22	2004	517	B
SEGUAM/TURF POINT (T, 90T)	6	23	58					

<sup>2</sup> Possibly a low non-pup count because of the on-land disturbance related to the pup count on the same day.

Table 1. --(Continued)

Site Name	Non-Pups			Pups				Type
	M	D	Count	M	D	Year	Count	
<b>Central Aleutian Islands (continued)</b>								
SEGUAM/LAVA COVE (T, 90T)	6	23	0					
SEGUAM/LAVA POINT (T, 90T)	6	23	5					
SEGUAM/WHARF POINT (T, 90T)	6	23	90					
AGLIGADAK (R, T, 90T)	6	15	61	6	22	2004	2	S
AMLIA/EAST CAPE (T, 90T)	6	15	34					
AMLIA/CAPE MISTY	6	15	21					
AMLIA/SVIECH. HARBOR (R, 90T)	6	15	144	6	22	2004	28	O
TANADAK (AMLIA) (T, 90T)	6	15	1					
SAGIGIK (T, 90T)	6	15	30					
ATKA/NORTH CAPE (T, 90T)	6	15	383					
ATKA/CAPE KOROVIN (T, 90T)	6	15	4					
SALT (T, 90T)	6	15	0					
KONIUJI/NORTH POINT	6	15	0					
KASATOCHI/NORTH POINT (R, T, 90T)	6	15	667	6	20	2004	354	B
OGLODAK (90T)	6	15	86					
IKIGINAK (T, 90T)	6	15	0					
FENIMORE (90T)	6	15	30					
TAGALAK	6	15	91					
CHUGUL	6	15	39					
ANAGAKSIK (T, 90T)	6	15	2					
IGITKIN/SW POINT	6	15	0					
GREAT SITKIN (90T)	6	15	0					
LITTLE TANAGA STRAIT (T, 90T)	6	15	49					
SILAK	6	15	38					
KAGALASKA (90T)	6	15	48					
ADAK/CAPE MOFFET (T)	6	15	0					
ADAK/ARGONNE POINT (T)	6	15	35					
ADAK/LAKE POINT (R, T, 90T)	6	15	799					
ADAK/CAPE YAKAK (R, T, 90T)	6	15	209	6	21	2004	4	S
ADAK/CRONE ISLAND	6	14	0					
KANAGA/N CAPE (90T)	6	15	7					
KANAGA/CAPE MIGA (90T)	6	15	0					
KANAGA/SHIP ROCK (90T)	6	15	229					
KANAGA/CAPE CHUNU	6	23	9					
BOBROF	6	23	49					
TANAGA/BUMPY POINT (90T)	6	23	33					
TANAGA/CAPE SASMIK (90T)	6	23	122					
ILAK	6	23	45					
GRAMP ROCK (R, T, 90T)	6	23	679					
UGIDAK (T, 90T)	6	23	25					
TAG (R, T, 90T)	6	23	242					
OGLIUGA	6	23	49					

Table 1. --(Continued)

Site Name	Non-Pups			Pups		
	M	D	Count	M	D	Year Count Type
<b>Central Aleutian Islands (continued)</b>						
SKAGUL/S. POINT	6	23	1			
KAVALGA (T, 90T)	6	23	56			
UNALGA+DINKUM ROCKS (T, 90T)	6	23	19			
ULAK/HASGOX POINT (R, T, 90T)	6	23	531			
AMATIGNAK/KNOB POINT (90T)	6	23	1			
AMATIGNAK/NITROF POINT (T, 90T)	6	23	76			
SEMISOPOCHNOI/POCHNOI (R, 90T)	6	20	55			
SEMISOPOCHNOI/PETREL (R)	6	20	0			
SEMISOPOCHNOI/TUMAN POINT	6	20	0			
SEMISOPOCHNOI/SW KNOB	6	20	17			
AMCHITKA/CAPE IVAKIN (T, 90T)	6	20	0			
AMCHITKA/EAST CAPE (T, 90T)	6	23	178			
AMCHITKA/OMEGA POINT	6	23	0			
AMCHITKA/ST. MAKARIUS (90T)	6	23	0			
AMCHITKA/COLUMN ROCK (R, 90T)	6	20	85			
AMCHITKA/BIRD	6	20	0			
AMCHITKA/CHITKA POINT	6	20	0			
AYUGADAK (R, T, 90T)	6	20	152			
RAT (90T)	6	20	45			
SEA LION ROCK (KISKA) (90T)	6	20	0			
TANADAK (KISKA) (90T)	6	20	34			
TWIN ROCKS (KISKA)	6	20	13			
KISKA/SOUTH HEAD	6	24	0			
KISKA/GERTRUDE-BUKHTI	6	20	0			
KISKA/SOBAKA-VEGA (90T)	6	20	101			
KISKA/CAPE ST STEPHEN (R, T, 90T)	6	20	210			
KISKA/LIEF COVE (R, T, 90T)	6	20	170			
KISKA/WITCHCRAFT POINT	6	20	0			
KISKA/PILLAR ROCK (90T)	6	20	0			
<b>Central Aleutian Islands Total</b>			<b>7,552</b>			
<b>Western Aleutian Islands</b>						
BULDIR/EAST CAPE (90T)	6	21	0			
BULDIR/ROOKERY (R, T, 90T)	6	21	72			
BULDIR/NW ROCKS (R, T, 90T)	6	21	36			
INGENSTREM ROCKS	6	21	0			
SHEMYA (90T)	6	16	17			
NIZKI	6	16	0			
ALOID (T, 90T)	6	16	125			
AGATTU/CAPE SABAK (R, T, 90T)	6	21	325			
AGATTU/GILLON POINT (R, T, 90T)	6	21	374			

Table 1. --(Continued).

Site Name	Non-Pups			Pups				
	M	D	Count	M	D	Year	Count	Type
<b>Western Aleutian Islands (continued)</b>								
DAN'S ROCKS	6	17	0					
ATTU/MASSACRE BAY (90T)	6	17	0					
ATTU/CHIRIKOF POINT (90T)	6	17	75					
ATTU/CHICHAGOF POINT (90T)	6	17	54					
ATTU/KRESTA POINT (90T)	6	17	0					
ATTU/CAPE WRANGELL (R, 90T)	6	21	257					
<b>Western Aleutian Islands Total</b>			<b>1,335</b>					
<b>Western Stock in Alaska Total</b>			<b>29,037</b>					

Table 2.--Counts of non-pup Steller sea lions from 35 mm (shot obliquely from side window of aircraft) and medium-format (MF; shot vertically) photographs taken at various sites in southeast Alaska, and eastern and central Gulf of Alaska in June 2000. Photographs were taken on the same day, minutes apart at each site. The medium-format photograph was always taken first. The percent difference  $((\text{Medium}-35\text{mm})/35\text{ mm}=\% \text{ Diff})$  for each site is calculated along with the aggregate totals and percent difference for all sites. Time is Alaska Daylight Time, HH:MM.

Location	Date	Time	Film Format		% Diff
			35 mm	MF	
Fish I.	6/24/2000	10:10	408	421	3.31
Seal Rocks (PWS)	6/24/2000	10:30	820	846	3.23
Graves Rock	6/24/2000	14:25	492	558	13.53
White Sisters	6/24/2000	15:10	1,398	1,361	-2.61
Jacob Rock	6/24/2000	15:52	233	228	-1.94
Biali Rock	6/24/2000	16:10	662	669	1.13
Sea Lion Rock (Puffin)	6/24/2000	16:38	212	213	0.71
Cape Ommaney	6/24/2000	16:54	289	305	5.72
West Rock	6/25/2000	11:24	625	732	17.21
Sea Lion Rock	6/28/2000	15:25	507	557	9.86
North Rock	6/28/2000	15:35	1,202	1,221	1.58
East Rock	6/28/2000	15:43	193	203	5.45
Lowrie I.	6/28/2000	15:50	1,213	1,228	1.24
Cape Addington	6/28/2000	16:26	1,116	1,180	5.73
Timbered I.	6/28/2000	16:50	267	287	7.69
Hazy I.	6/28/2000	17:18	1,824	1,885	3.34
SW Brother	6/28/2000	18:12	1,499	1,461	-2.50
Outer I.	6/29/2000	11:37	308	328	6.67
Sugarloaf I.	6/29/2000	12:55	746	756	1.34
Marmot I.	6/29/2000	13:50	699	720	3.08
Total			14,706	15,159	3.08
Average of site by site % differences					4.19

Table 3.--Counts of adult and juvenile (non-pup) Steller sea lions observed at trend rookeries, 1970s and 1990s trend sites, and at all surveyed (surv.) sites in the Kenai-to-Kiska area and throughout the western stock in Alaska during June and July aerial surveys from 1985 to 2004. Also shown are overall percent changes between various pairs of years, and estimated annual rates of change between 1991 and 2000 and between 2000 and 2004. Annual rates of change that are significantly different from zero ( $P < 0.05$ ) are shown in bold. Totals at trend sites in 2004 (\*) have been adjusted to account for film format-count differences (see text).

Year	Kenai-to-Kiska Index Area				Western Stock in Alaska			
	Trend Rookeries	1970s Trend Sites	1990s Trend Sites	All Surv. Sites	Trend Rookeries	1970s Trend Sites	1990s Trend Sites	All Surv. Sites
1985	39,390	54,738		67,336				
1990	18,791	22,754		26,219				
1991	17,181	21,726	27,149	27,454	22,436	29,405	36,562	37,186
1992	16,577	20,692	25,811	26,970	20,897	27,299	33,991	35,887
1994	14,536	18,736	24,796	25,997	17,633	24,136	31,522	33,353
1996	13,902	17,891	23,091	24,603	16,855	22,210	28,875	30,595
1998**	12,116	16,417	22,964	24,380	14,819	20,438	27,908	29,475
2000	11,738	15,279	20,101	21,381	13,798	18,325	23,836	25,384
2002	12,893	16,023	21,018	22,221	14,716	19,340	24,829	26,602
2004*	13,860	17,099	22,137	24,420	15,952	20,533	26,438	29,037
<b>Percent change</b>								
1985-2000	-70.2%	-72.1%						
1985-2004	-64.8%	-68.8%						
1991-2000	-31.7%	-29.7%	-26.0%		-38.5%	-37.7%	-34.8%	
1991-2004	-19.3%	-21.3%	-18.5%		-28.9%	-30.2%	-27.7%	
2000-2004	18.1%	11.9%	10.1%		15.6%	12.1%	10.9%	
<b>Estimated annual rates of change: 1991 to 2000</b>								
Annual Change	<b>-4.3%</b>	<b>-3.8%</b>	<b>-2.9%</b>		<b>-5.2%</b>	<b>-4.9%</b>	<b>-4.2%</b>	
+95%CI	-3.4%	-3.3%	-1.9%		-4.1%	-4.3%	-3.2%	
-95% CI	-5.3%	-4.2%	-3.9%		-6.3%	-5.5%	-5.2%	
P	< 0.001	< 0.001	< 0.01		< 0.001	< 0.001	< 0.001	



Table 3. --(Continued)

Year	Kenai-to-Kiska Index Area				Western Stock in Alaska			
	Trend Rookeries	1970s Trend Sites	1990s Trend Sites	All Surv. Sites	Trend Rookeries	1970s Trend Sites	1990s Trend Sites	All Surv. Sites
<b>Estimated annual rates of change: 2000 to 2004</b>								
Annual Change	<b>4.2%</b>	2.9%	<b>2.4%</b>		<b>3.7%</b>	<b>2.9%</b>	2.6%	
+95%CI	8.4%	6.2%	3.8%		6.8%	4.0%	6.8%	
-95% CI	0.2%	-0.4%	1.1%		0.7%	1.8%	-1.4%	
P	< 0.05	> 0.05	< 0.05		< 0.05	< 0.05	> 0.05	

\*\* For eastern Gulf of Alaska in 1998, counts made in 1999 were substituted for those sites not surveyed in 1998.

Table 4.--Counts of adult and juvenile (non-pup) Steller sea lions observed at 1970s trend sites in seven sub-areas of Alaska during June and July aerial surveys from 1985 to 2004. Also shown are overall percent changes between various pairs of years and estimated annual rates of change between 1991 and 2000 and between 2000 and 2004. Annual rates of change that are significantly different from zero ( $P < 0.05$ ) are shown in bold. ND = no data. Data shown for 2004(\*) have been adjusted to account for film format-count differences (see text).

Year	Gulf of Alaska			Aleutian Islands			Kenai to	Western
	Eastern	Central	Western	Eastern	Central	Western	Kiska	Stock in AK
1985***	ND	19,002	6,275	7,505	21,956	4,526	54,738	
1990	5,444	7,050	3,915	3,801	7,988	ND	22,754	
1991	4,596	6,270	3,732	4,228	7,496	3,083	21,726	29,405
1992	3,738	5,739	3,716	4,839	6,398	2,869	20,692	27,299
1994	3,365	4,516	3,981	4,419	5,820	2,035	18,736	24,136
1996	2,132	3,913	3,739	4,715	5,524	2,187	17,891	22,210
1998**	2,110	3,467	3,360	3,841	5,749	1,911	16,417	20,438
2000	1,975	3,180	2,840	3,840	5,419	1,071	15,279	18,325
2002	2,500	3,366	3,221	3,956	5,480	817	16,023	19,340
2004*	2,536	2,944	3,512	4,707	5,936	898	17,099	20,533
<b>Percent change</b>								
1985-2000		-83.3%	-54.7%	-48.8%	-75.3%	-76.3%	-72.1%	
1985-2004		-84.5%	-44.0%	-37.3%	-73.0%	-80.2%	-68.8%	
1991-2000	-57.0%	-49.3%	-23.9%	-9.2%	-27.7%	-65.3%	-29.7%	-37.7%
1991-2004	-44.8%	-53.0%	-5.9%	11.3%	-20.8%	-70.9%	-21.3%	-30.2%
2000-2004	28.4%	-7.4%	23.7%	22.6%	9.5%	-16.1%	11.9%	12.1%
<b>Estimated annual rates of change: 1991 to 2000</b>								
Rate	<b>-9.3%</b>	<b>-7.4%</b>	-2.7%	-1.8%	<b>-2.9%</b>	<b>-9.5%</b>	<b>-3.8%</b>	<b>-4.9%</b>
+95% CI	-5.1%	-5.7%	0.2%	1.1%	-0.3%	-4.0%	-3.3%	-4.3%
-95% CI	-13.3%	-9.1%	-5.5%	-4.7%	-5.4%	-14.6%	-4.2%	-5.5%
P	< 0.01	< 0.001	> 0.05	> 0.10	< 0.05	< 0.01	< 0.001	< 0.001
<b>Estimated annual rates of change: 2000 to 2004</b>								
Rate	6.3%	-1.9%	5.3%	5.1%	2.3%	-4.4%	2.8%	<b>2.8%</b>
+95% CI	59.8%	39.2%	13.3%	37.0%	16.0%	87.0%	6.2%	4.0%
-95% CI	-29.1%	-30.9%	-1.9%	-19.2%	-9.8%	-51.0%	-0.4%	1.8%
P	> 0.30	> 0.60	> 0.05	> 0.20	> 0.20	> 0.50	> 0.05	< 0.05

\*\* For eastern Gulf of Alaska in 1998, counts made in 1999 were substituted for those sites not surveyed in 1998.

\*\*\* For western Aleutian Islands in 1985, counts made in 1988 were substituted for Buldir.

Table 5.--Counts of adult and juvenile (non-pup) Steller sea lions observed at 1990s trend sites in seven subareas of Alaska during June-July aerial surveys from 1991 to 2004. Also shown are overall percent changes between various pairs of years and estimated annual rates of change between 1991 and 2000 and between 2000 and 2004. Annual rates of change that are significantly different from zero ( $P < 0.05$ ) are shown in bold. Data shown for 2004(\*) have been adjusted to account for film format-count differences (see text).

Year	Gulf of Alaska			Aleutian Islands			Kenai to Kiska	Western Stock in Alaska
	Eastern	Central	Western	Eastern	Central	Western		
1991	4,812	7,872	5,338	5,283	8,656	4,601	27,149	36,562
1992	3,981	7,358	5,112	5,707	7,633	4,199	25,811	33,991
1994	3,612	6,505	5,718	5,664	6,909	3,114	24,796	31,522
1996	2,450	5,400	5,356	5,967	6,368	3,334	23,091	28,875
1998**	2,158	4,806	5,367	5,774	7,017	2,786	22,964	27,908
2000	2,102	4,555	3,996	4,990	6,560	1,633	20,101	23,836
2002	2,615	4,594	4,617	5,261	6,547	1,196	21,018	24,829
2004*	3,015	4,028	5,233	5,991	6,885	1,286	22,137	26,438
<b>Percent change</b>								
1991-2000	-56.3%	-42.1%	-25.1%	-5.5%	-24.2%	-64.5%	-26.0%	-34.8%
1991-2004	-37.3%	-48.8%	-2.0%	13.4%	-20.5%	-72.0%	-18.5%	-27.7%
2000-2004	43.4%	-11.6%	31.0%	20.1%	5.0%	-21.2%	10.1%	10.9%
<b>Estimated annual rates of change: 1991 to 2000</b>								
Annual Rate	<b>-9.2%</b>	<b>-6.2%</b>	-2.2%	-0.4%	-2.5%	<b>-9.3%</b>	<b>-2.9%</b>	<b>-4.2%</b>
+95% CI	-5.9%	-5.0%	1.9%	2.2%	0.3%	-4.3%	-1.9%	-3.2%
-95% CI	-12.4%	-7.4%	-6.0%	-2.9%	-5.2%	-14.1%	-3.9%	-5.2%
P	< 0.05	< 0.001	> 0.20	> 0.60	> 0.05	< 0.01	< 0.01	< 0.001
<b>Estimated annual rates of change: 2000 to 2004</b>								
Annual Rate	9.4%	-3.0%	<b>7.0%</b>	4.7%	1.2%	-5.8%	<b>2.4%</b>	2.6%
+95% CI	25.8%	25.4%	10.8%	20.6%	11.4%	90.6%	3.8%	6.8%
-95% CI	-4.8%	-25.0%	3.3%	-9.1%	-8.0%	-53.4%	1.1%	-1.4%
P	> 0.05	> 0.30	< 0.05	> 0.10	> 0.30	> 0.40	< 0.05	> 0.05

\*\* For eastern Gulf of Alaska in 1998, counts made in 1999 were substituted for those sites not surveyed in 1998.

Table 6.--Counts of adult and juvenile (non-pup) Steller sea lions observed at trend rookeries in seven subareas of Alaska during June-July aerial surveys from 1985 to 2004. Also shown are overall percent changes between various pairs of years and estimated annual rates of change between 1991 and 2000 and between 2000 and 2004. Annual rates of change that are significantly different from zero ( $P < 0.05$ ) are shown in bold. ND = no data. Data shown for 2004(\*) have been adjusted to account for film format-count differences (see text). Number of rookeries in each subarea (n) used in the analysis is shown.

Year	Gulf of Alaska			Aleutian Islands			Kenai to Kiska	Western Stock in Alaska
	Eastern n = 2	Central n = 4	Western n = 4	Eastern n = 7	Central n = 11	Western n = 3		
1985**	ND	12,379	4,888	6,406	15,717	4,526	39,390	
1990	2,703	5,140	3,496	3,417	6,738	ND	18,791	
1991	2,570	4,336	3,234	3,516	6,095	2,685	17,181	22,436
1992	1,789	4,308	3,313	3,712	5,244	2,531	16,577	20,897
1994	1,284	3,098	3,155	3,514	4,769	1,813	14,536	17,633
1996	1,046	2,795	3,029	3,538	4,540	1,907	13,902	16,855
1998	1,060	2,255	2,948	2,719	4,194	1,643	12,116	14,819
2000	1,145	2,157	2,613	2,731	4,237	915	11,738	13,798
2002	1,164	2,486	2,920	3,271	4,216	659	12,893	14,716
2004*	1,314	2,133	3,277	3,725	4,725	778	13,860	15,952
<b>Percent change</b>								
1985-2000		-82.6%	-46.5%	-57.4%	-73.0%	-79.8%	-70.2%	
1985-2004		-82.8%	-33.0%	-41.8%	-69.9%	-82.8%	-64.8%	
1991-2000	-55.4%	-50.3%	-19.2%	-22.3%	-30.5%	-65.9%	-31.7%	-38.5%
1991-2004	-48.9%	-50.8%	1.3%	6.0%	-22.5%	-71.0%	-19.3%	-28.9%
2000-2004	14.8%	-1.1%	25.4%	36.4%	11.5%	-15.0%	18.1%	15.6%
<b>Estimated annual rates of change: 1991 to 2000</b>								
Annual Rate	<b>-8.2%</b>	<b>-8.2%</b>	<b>-2.3%</b>	<b>-3.4%</b>	<b>-3.7%</b>	<b>-9.7%</b>	<b>-4.3%</b>	<b>-5.2%</b>
+95% CI	-0.7%	-5.8%	-1.1%	-0.6%	-1.6%	-4.3%	-3.4%	-4.1%
-95% CI	-15.1%	-10.5%	-3.4%	-6.1%	-5.8%	-14.8%	-5.3%	-6.3%
P	< 0.05	< 0.001	< 0.01	< 0.05	< 0.01	< 0.01	< 0.001	< 0.001
<b>Estimated annual rates of change: 2000 to 2004</b>								
Annual Rate	3.5%	-0.3%	<b>5.8%</b>	8.1%	2.8%	-4.0%	<b>4.2%</b>	<b>3.7%</b>
+95% CI	25.4%	71.3%	6.7%	18.5%	27.8%	137.5%	8.4%	6.8%
-95% CI	-14.6%	-41.9%	5.0%	-1.5%	-17.4%	-61.2%	0.2%	0.7%
P	> 0.20	> 0.90	< 0.01	> 0.05	> 0.30	> 0.60	< 0.05	< 0.05

\*\* For western Aleutian Islands in 1985, counts made in 1988 were substituted for Buldir Island.

Table 7.--Counts of Steller sea lion non-pups (adults and juveniles) at principal western stock rookeries in Alaska during June and July surveys, 1985-2004. Counts from 1985 to 2002 were made from 35 mm slides. All counts in 2004 (except Akun-Billings Head: 35 mm) were made from medium-format photographs. Counts in 2004 should not be used for trend analyses at individual sites because of differences in resolution between film formats (see text). Data for haul-out sites where significant number of pups were counted are also shown (\*). Italicized rookery names are trend rookeries whose counts are summed in Table 5.

Sub-Area and Rookery	1985	1989	1990	1991	1992	1994	1996	1997	1998	1999	2000	2002	2004
<b>Eastern Gulf of Alaska</b>													
<i>Seal Rocks</i>		2,159	1,471	1,220	784	636	544		730	624	749	768	841
<i>Fish (Wooded)</i>		1,333	1,232	1,350	1,005	648	502		330	311	396	396	523
Chiswell Islands*		456	408	383	240	180	115			79	54	97	72
<b>Central Gulf of Alaska</b>													
Outer (Pye)		1,127	589	489	378	406	318	224	278		262	226	222
<i>Sugarloaf</i>	2,991	2,164	1,416	1,216	1,186	976	741	624	748		706	736	667
Ushagat (NW, SW, & Rocks S) *	1,813	273	496	284	519	228	137	117	98		235	122	112
<i>Marmot</i>	4,983	2,331	1,766	1,458	1,581	1,091	1,102	780	726		671	848	703
Two-headed*	1,240	479	268	382	330	364	216	308	378		254	227	266
<i>Chowiet</i>	2,059	737	897	716	771	599	592	538	515		504	582	541
<i>Chirikof</i>	2,346	1,278	1,061	946	770	432	360	294	266		276	320	303
Nagai Rocks*	798	233	196	245	362	331	180	204	312		228	230	330
<b>Western Gulf of Alaska</b>													
Lighthouse Rocks													
<i>Atkins</i>	1,562	755	728	616	792	571	624	544	602		537	560	651
<i>Chernabura</i>	487	544	442	650	459	676	422	729	624		496	496	828
The Haystacks		0	0	0	0	0			60		62	50	38
The Whaleback		355	419	411	395	324	288		316		162	116	102
Jude*	315		200	363	352	410	355	434	450		391	374	474
<i>Pinnacle Rock</i>	1,588	1,366	1,305	1,048	1,092	977	1,026	1,007	864		868	1,034	1,011
<i>Clubbing Rocks</i>	1,251	856	1,021	920	970	931	957	934	858		712	830	911
South Rocks	892		332	290	232	342	345	402	408		161	262	528

Table 7. --(Continued).

Sub-Area and Rookery	1985	1989	1990	1991	1992	1994	1996	1997	1998	1999	2000	2002	2004
<b>Eastern Aleutian Islands</b>													
<i>Sea Lion Rock (Amak)</i>	410	344	286	300	329	480	590	452	444		258	507	456
Amak	430	98	273	610	869	681	980	919	946		946	563	733
Aiktak	0	0	12	60	63	93	52	52	102		92	75	101
<i>Ugamak (and Round)</i>	1,503		945	1,062	954	971	854	840	742		746	1,044	1,304
<i>Akun (Billings Head)</i>	435	150	118	156	271	220	346	247	212		254	275	307
<i>Akutan (Cape Morgan)</i>	1,269	578	765	818	1,061	908	934	760	681		739	783	1,021
<i>Bogoslof</i>	1,287	682	713	558	540	413	382		274		347	356	380
<i>Ogchul</i>	547	217	240	228	235	208	155	166	136		117	105	139
<i>Adugak</i>	955	392	350	394	322	314	277		230		270	201	259
<b>Central Aleutian Islands</b>													
<i>Yunaska</i>	1,071	466	391	398	394	461	340		210		241	276	260
<i>Seguam (Saddleridge)</i>	2,942	602	833	684	696	658	553		586		570	666	923
Seguam (Turf Point)*					101	146	0		0		82	84	58
<i>Agligadak</i>	514	132	274	231	125	8	73		40		48	82	61
<i>Amlia (Sviechnikof Harbor)*</i>	376	50	214	200	103	116	86		117		120	98	144
<i>Kasatochi</i>	1,170	659	641	466	376	288	330		350		390	529	667
<i>Adak (Lake Point-Cape Yakak)</i>	1,289	424	592	847	615	765	618		683		874	821	1,008
Kanaga (Ship Rock)*	314	0		92	93	175	146		164		156	242	229
<i>Gramp Rock</i>	1,290	747	712	773	691	537	582		570		580	600	679
<i>Tag</i>	944	590	478	440	370	309	320		370		301	279	242
<i>Ulak (Hasgox Point)</i>	2,729	1,123	1,324	1,046	1,059	866	844		698		663	481	531
Semisopochnoi				443	372	363	166		143		144	106	72
Amchitka (East Cape)	1,005	20	106	150	162	89	122		148		101	186	178
Amchitka (Column Rocks)	728		197	233	194	188	137		112		92	71	85
<i>Ayugadak</i>	702	389	401	324	313	285	281		179		146	182	152
<i>Kiska (Lief Cove)</i>	1,715	510	528	506	357	359	341		284		272	174	170
<i>Kiska (Cape St. Stephen)</i>	1,351	464	564	380	248	233	258		224		152	126	210

Table 7. --(Continued).

Sub-Area and Rookery	1985	1989	1990	1991	1992	1994	1996	1997	1998	1999	2000	2002	2004
<b>Western Aleutian Islands</b>													
<i>Buldir</i> **	1,396	1,058		587	454	344	312		336		129	94	108
<i>Agattu (Cape Sabak)</i>	3,130	2,486		1,428	1,304	961	1,001		826		480	307	325
<i>Agattu (Gillon Point)</i>				670	773	508	594		481		306	258	374
<i>Attu (Cape Wrangell)</i>				736	754	839	721		584		310	264	257

\* Haul-out sites where pups have been observed.

\*\* 1988 Buldir Island count used for 1985.

Table 8.--Counts of Steller sea lion pups at principal western stock rookeries in Alaska during June and July surveys, 1985-2004. Count-type refers to method of counting pups: OS = on-site - pups counted after adults moved from area, from a skiff/ship nearby, or from an observation point on-land; MF= pups counted from medium-format aerial photographs. Counts at italicized rookeries highlighted in bold were used for time period/sub-area summaries in Table 9. Data for haul-out sites where significant numbers of pups have been counted are also shown (\*).

Sub-Area and Rookery	1985	1986	1989	1990	1991	1992	1994	1996	1997	1998	1998	1999
Count type	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	MF	OS
<b>Eastern Gulf of Alaska</b>												
<i>Seal Rocks</i>			553	571	657		<b>598</b>	352		<b>542</b>		542
<i>Fish (Wooded)</i>							<b>305</b>	232		<b>147</b>		140
Chiswell Islands*												
<b>Central Gulf of Alaska</b>												
<i>Outer (Pye)</i>			<b>557</b>	<b>363</b>	180		<b>119</b>			<b>113</b>		108
<i>Sugarloaf</i>			<b>2,109</b>	<b>1,683</b>		1,000	<b>958</b>		673	<b>703</b>		673
Ushagat (NW, SW, and Rocks S) *												
<i>Marmot</i>		<b>4,381</b>	2,199		<b>1,611</b>		<b>804</b>	632	762	<b>642</b>		624
Two-headed*												
<i>Chowiet</i>		<b>1,731</b>	820	343		<b>636</b>	<b>625</b>			<b>234</b>		
<i>Chirikof</i>		<b>1,476</b>		607	<b>656</b>		<b>325</b>			<b>184</b>		
Nagai Rocks*												
<b>Western Gulf of Alaska</b>												
Lighthouse Rocks*												
<i>Atkins</i>				433	<b>485</b>		<b>324</b>	366		<b>352</b>		
<i>Chernabura</i>		379		197		<b>211</b>	<b>139</b>			<b>54</b>		
The Haystacks*												
The Whaleback*												
Jude*												
<i>Pinnacle Rock</i>					<b>794</b>		<b>652</b>			<b>639</b>		
<i>Clubbing Rocks</i>						<b>433</b>	<b>547</b>			<b>448</b>		
South Rocks*												



Table 8. --(Continued).

Sub-Area and Rookery Count type	2000 OS	2000 MF	2001 OS	2001 MF	2002 OS	2002 MF	2003 OS	2004 OS
<b>Eastern Gulf of Alaska</b>								
<i>Seal Rocks</i>		522	<b>500</b>			475	<b>543</b>	
<i>Fish (Wooded)</i>	149	97		85		<b>86</b>	<b>173</b>	
Chiswell Islands*	58		54	45		52		
<b>Central Gulf of Alaska</b>								
<i>Outer (Pye)</i>	108	148		<b>104</b>	58	92		<b>59</b>
<i>Sugarloaf</i>		645	<b>490</b>	419		444		<b>488</b>
Ushagat (NW, SW, and Rocks S)*		54		24		42		
<i>Marmot</i> <sup>1</sup>		514		466		<b>515</b>	<b>505</b>	474
Two-headed*		16		8		20	20	
<i>Chowiet</i>			278	<b>387</b>			<b>368</b>	
<i>Chirikof</i>	187			90	<b>225</b>			<b>189</b>
Nagai Rocks*				31	19	26		22
<b>Western Gulf of Alaska</b>								
Lighthouse Rocks*	5			4	7	4		
<i>Atkins</i>	262			172	224	<b>274</b>		<b>266</b>
<i>Chernabura</i>			92	<b>138</b>		115	<b>82</b>	
The Haystacks*				0		0		
The Whaleback*	12			13	16	16		
Jude*				182	119	130		187
<i>Pinnacle Rock</i>	634			501	<b>769</b>	466		<b>663</b>
<i>Clubbing Rocks</i>			<b>490</b>	417			<b>566</b>	
South Rocks*						36		

Table 8. --(Continued).

Sub-Area and Rookery Count type	1985 OS	1986 OS	1989 OS	1990 OS	1991 OS	1992 OS	1994 OS	1996 OS	1997 OS	1998 OS	1998 MF	1999 OS
<b>Eastern Aleutian Islands</b>												
Sea Lion Rock (Amak)										134		
Amak*												
Aiktak*												
<i>Ugamak (and Round)</i>	<b>1,635</b>	1,386		<b>847</b>	813		<b>574</b>	706	589	<b>558</b>		
<i>Akun (Billings Head)</i>	<b>60</b>			<b>63</b>			<b>69</b>			<b>56</b>		
<i>Akutan (Cape Morgan)</i>	<b>1,130</b>			<b>442</b>			<b>631</b>			<b>505</b>		
<i>Bogoslof<sup>2</sup></i>	<b>1,109</b>			461	<b>501</b>		<b>302</b>		281	<b>220</b>		
Ogchul	172						94			42		
<i>Adugak</i>	<b>844</b>			<b>262</b>			<b>180</b>			<b>135</b>		
<b>Central Aleutian Islands</b>												
<i>Yunaska</i>	<b>1,026</b>			<b>230</b>			<b>217</b>		192	<b>161</b>		
<i>Seguam (Saddleridge)</i>	<b>2,635</b>		529	<b>684</b>			<b>444</b>		463	<b>479</b>		
Seguam (Turf Point)*												30
Agligadak				0						0		
Amlia (Sviechnikof Harbor)*				26						13		
<i>Kasatochi</i>	<b>892</b>			<b>178</b>			<b>215</b>		268	<b>247</b>		
<i>Adak (Lake Point-Cape Yakak)</i>	<b>558</b>			<b>137</b>			<b>327</b>			<b>340</b>		
Kanaga (Ship Rock)*												
<i>Gramp Rock</i>	<b>909</b>			<b>448</b>			<b>425</b>			<b>456</b>		
<i>Tag</i>	<b>703</b>			<b>357</b>			<b>234</b>			<b>238</b>		
<i>Ulak (Hasgox Point)</i>	<b>1,236</b>			<b>790</b>			<b>638</b>			<b>521</b>		
Semisopochnoi							21			6		
Amchitka (East Cape)							6			9		
<i>Amchitka (Column Rocks)</i>				<b>148</b>			<b>114</b>			<b>70</b>		
<i>Ayugadak</i>	<b>329</b>			<b>163</b>			<b>142</b>			<b>89</b>		
<i>Kiska (Lief Cove)</i>	<b>882</b>		293	<b>221</b>			<b>233</b>			<b>179</b>		
<i>Kiska (Cape St. Stephen)</i>			<b>258</b>	<b>212</b>			<b>120</b>			<b>54</b>		

Table 8. --(Continued).

Sub-Area and Rookery Count type	2000 OS	2000 MF	2001 OS	2001 MF	2002 OS	2002 MF	2003 OS	2004 OS
<b>Eastern Aleutian Islands</b>								
Sea Lion Rock (Amak)				161	160	138		185
Amak*				0	3	1		
Aiktak*				21	10	5		7
<i>Ugamak (and Round)</i>			<b>570</b>				<b>686</b>	541
<i>Akun (Billings Head)</i>	41				<b>55</b>			<b>85</b>
<i>Akutan (Cape Morgan)</i>			<b>508</b>				<b>497</b>	
<i>Bogoslof</i>	249			<b>256</b>	180	219		<b>278</b>
Ogchul			47	57		53	69	
<i>Adugak</i>	153			<b>172</b>	160	151		<b>185</b>
<b>Central Aleutian Islands</b>								
<i>Yunaska</i>	136			96	<b>145</b>			145
<i>Seguam (Saddleridge)</i>			<b>468</b>	410				517
Seguam (Turf Point)*			24		23			
Agligadak								2
Amlia (Sviechnikof Harbor)*					22			28
<i>Kasatochi</i>				258	<b>302</b>	300		354
<i>Adak (Lake Point-Cape Yakak)</i>				<b>395</b>	363	370		
Kanaga (Ship Rock)*				92		113		
<i>Gramp Rock</i>				430	<b>444</b>	432		
<i>Tag</i>				<b>155</b>	153	148		
<i>Ulak (Hasgox Point)</i>				<b>332</b>	331	322		
Semisopochnoi				2		24		
Amchitka (East Cape)			5			16		
<i>Amchitka (Column Rocks)</i>					<b>52</b>	43		
<i>Ayugadak</i>					<b>90</b>	85		
<i>Kiska (Lief Cove)</i>					<b>158</b>	136		
<i>Kiska (Cape St. Stephen)</i>					<b>71</b>	62		

Table 8. --(Continued).

Sub-Area and Rookery	1985	1986	1989	1990	1991	1992	1994	1996	1997	1998	1998	1999
Count type	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	MF	OS
<b>Western Aleutian Islands</b>												
<i>Buldir</i> <sup>3</sup>			494	381			120		<b>120</b>	<b>122</b>		
<i>Agattu (Cape Sabak)</i>									<b>379</b>	<b>314</b>		
<i>Agattu (Gillon Point)</i>			907	1,127					<b>258</b>	<b>213</b>		
<i>Attu (Cape Wrangell)</i>									<b>222</b>	<b>154</b>		

Sub-Area and Rookery	2000	2000	2001	2001	2002	2002	2003	2004
Count type	OS	MF	OS	MF	OS	MF	OS	OS
<b>Western Aleutian Islands</b>								
<i>Buldir</i>					<b>42</b>	42		
<i>Agattu (Cape Sabak)</i>					<b>212</b>			
<i>Agattu (Gillon Point)</i>					<b>159</b>			
<i>Attu (Cape Wrangell)</i>					<b>75</b>			

<sup>1</sup> Maximum daily field camp counts for Marmot in 2003 and 2004.

<sup>2</sup> 1994 Bogoslof count is mean of 1993 and 1995 counts.

<sup>3</sup> 1995 Buldir count reported for 1994.

Table 9.-- Counts of Steller sea lion pups at selected rookeries (italicized in Table 7) in seven sub-areas of the western stock in Alaska from 1985-89 to 2003-2004. The maximum count during each period at the selected rookeries (n) was used (bold numbers in Table 8). Blank cells indicate incomplete counts in the period and sub-area. Percentage change in counts between periods is also shown.

Period	Gulf of Alaska			Aleutian Islands			Kenai to Kiska	Western Stock in Alaska
	Eastern n = 2	Central n = 5	Western n = 4	Eastern n = 5	Central n = 11*	Western n = 4		
1985-1989		10,254		4,778	9,428			
1990-1992		4,904	1,923	2,115	3,568		12,510	
1994	903	2,831	1,662	1,756	3,109		9,358	
1997	611					979		
1998	689	1,876	1,493	1,474	2,834	803	7,677	9,169
2001-2002	586	1,721	1,671	1,561	2,612	488	7,565	8,639
2003-2004	716	1,609	1,577	1,731				
Percent Change								
1985-89 to 2001-2002		-83.2%		-67.3%	-72.3%			
1990-92 to 2001-2002		-64.9%	-13.1%	-26.2%	-26.8%		-39.5%	
1998 to 2001-2002	-14.9%	-8.3%	11.9%	5.9%	-7.8%	-39.2%	-1.5%	-5.8%
1998 to 2003-2004	3.9%	-14.2%	5.6%	17.4%				
2001-2002 to 2003-2004	22.2%	-6.5%	-5.6%	10.9%				

\* 1985-89 CAI count does not include Amchitka/Column Rocks (n = 10).

Table 10.--Steller sea lion pup counts from medium-format (vertical) photographs and from the beach at the same sites, 1998-2002. Counts were made 1-4 days apart (Time Diff relative to the beach count). The percent difference (Percent Diff) for each site is calculated with the medium-format count relative to the beach count.

SITENAME	Time	Medium Format (MF)				Beach (B)				Count	Percent Diff
	Diff (days) (MF-B)	Year	Month	Day	Count	Year	Month	Day	Count	Diff (MF-B)	
ADAK/LAKE POINT	-4	2002	6	25	379	2002	6	29	363	16	4.2%
GRAMP ROCK	-4	2002	6	26	432	2002	6	30	444	-12	-2.7%
OUTER (PYE)	-4	2000	6	29	148	2000	7	3	108	40	27.0%
TAG	-4	2002	6	26	148	2002	6	30	153	-5	-3.4%
ULAK/HASGOX POINT	-4	2002	6	26	322	2002	6	30	331	-10	-3.0%
CHERNABURA	-3	2001	6	27	138	2002	6	30	92	46	33.3%
KASATOCHI/NORTH POINT	-3	2002	6	25	311	2002	6	28	302	9	2.9%
KISKA/CAPE ST STEPHEN	-3	2002	6	29	62	2002	7	2	71	-10	-15.4%
KISKA/LIEF COVE	-3	2002	6	29	136	2002	7	2	158	-23	-16.6%
MARMOT	-3	1998	6	28	624	1998	7	1	642	-18	-2.9%
SEA LION ROCK (AMAK)	-3	2002	6	23	138	2002	6	26	160	-22	-15.9%
SEAL ROCKS	-2	1998	6	27	542	1998	6	29	542	0	0.1%
CLUBBING ROCKS	-2	2001	6	27	417	2001	6	29	490	-74	-17.6%
ADUGAK	-1	2002	6	24	151	2002	6	25	160	-9	-6.0%
ADAK/LAKE POINT	1	2002	6	30	354	2002	6	29	363	-10	-2.7%
KASATOCHI/NORTH POINT	2	2002	6	30	289	2002	6	28	302	-13	-4.5%
THE WHALEBACK	3	2002	7	2	16	2002	6	29	16	0	0.0%
OGCHUL	4	2001	6	29	57	2001	6	25	47	10	17.5%

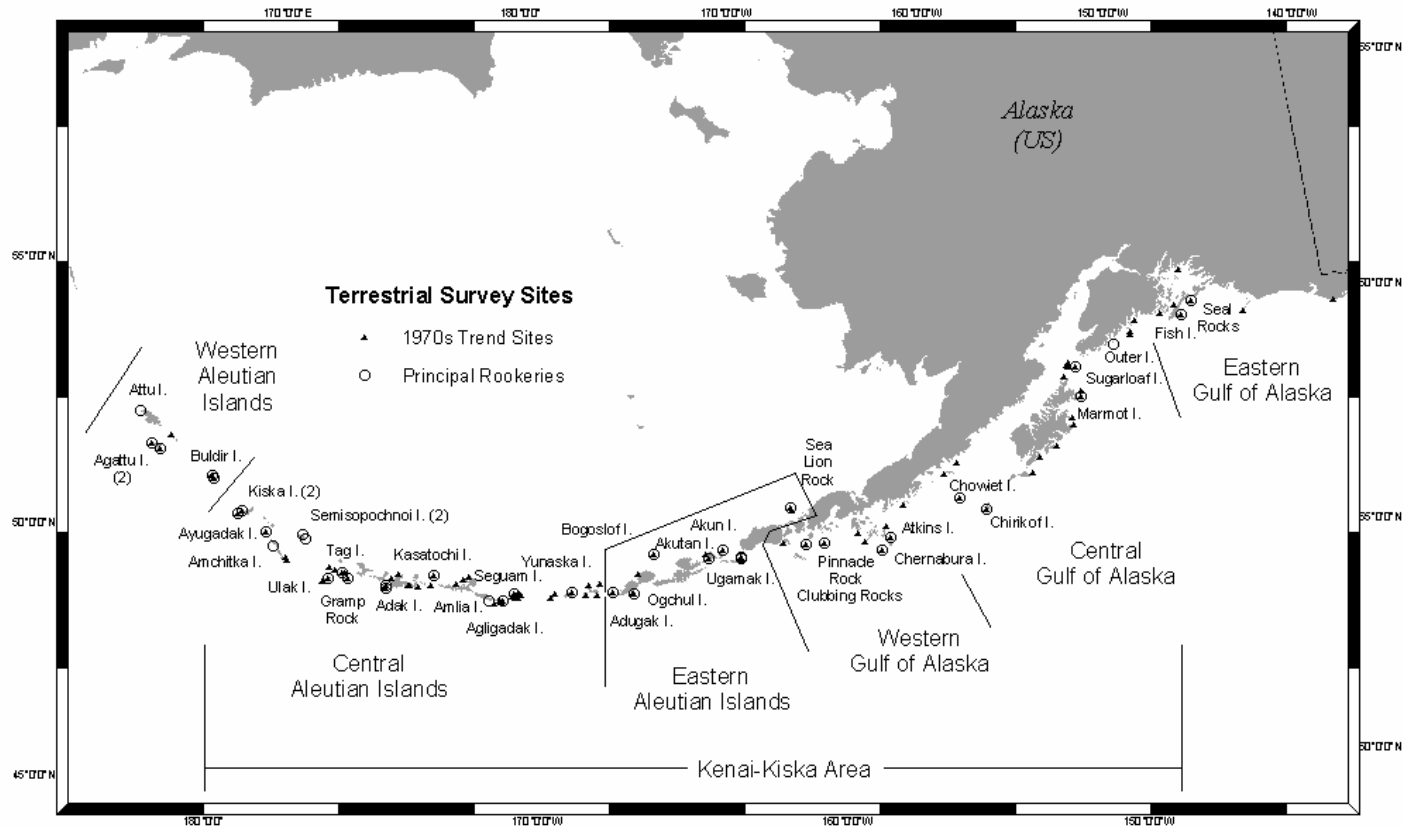


Figure 1.--Map of Alaska showing the seven population sub-areas used to compile western Steller sea lion survey data, 1970s trend sites used for population analyses, and the principal rookeries (named).

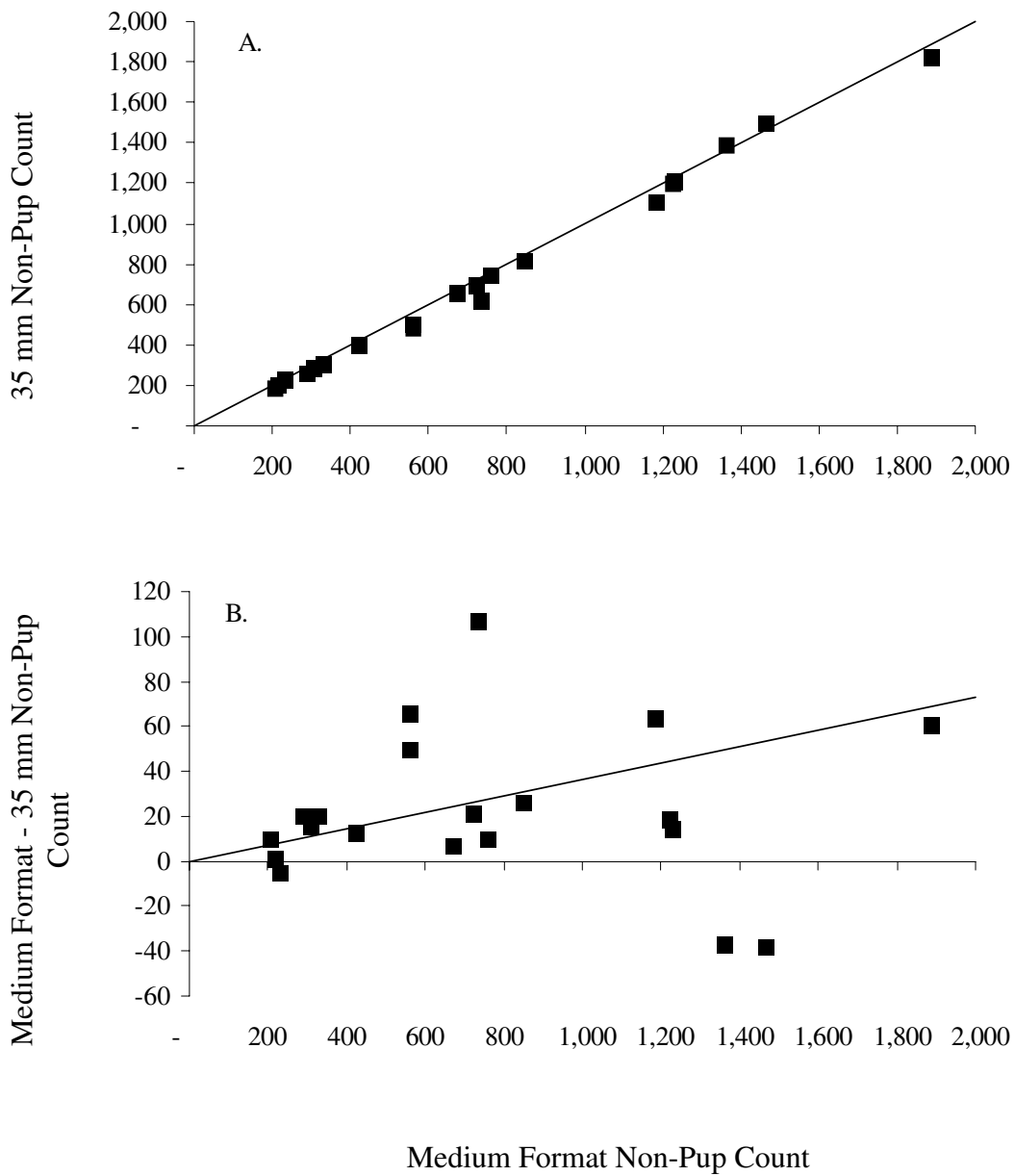


Figure 2.—Comparison of counts of adult and juvenile (non-pup) Steller sea lions made from medium-format and 35 mm images taken at the same site on the same day (Table 2). A. 35 mm count plotted against medium-format count; 1:1 line also shown. B. Difference of medium-format and 35 mm counts plotted against the medium-format count; line = medium-format count  $\times$  3.64%.



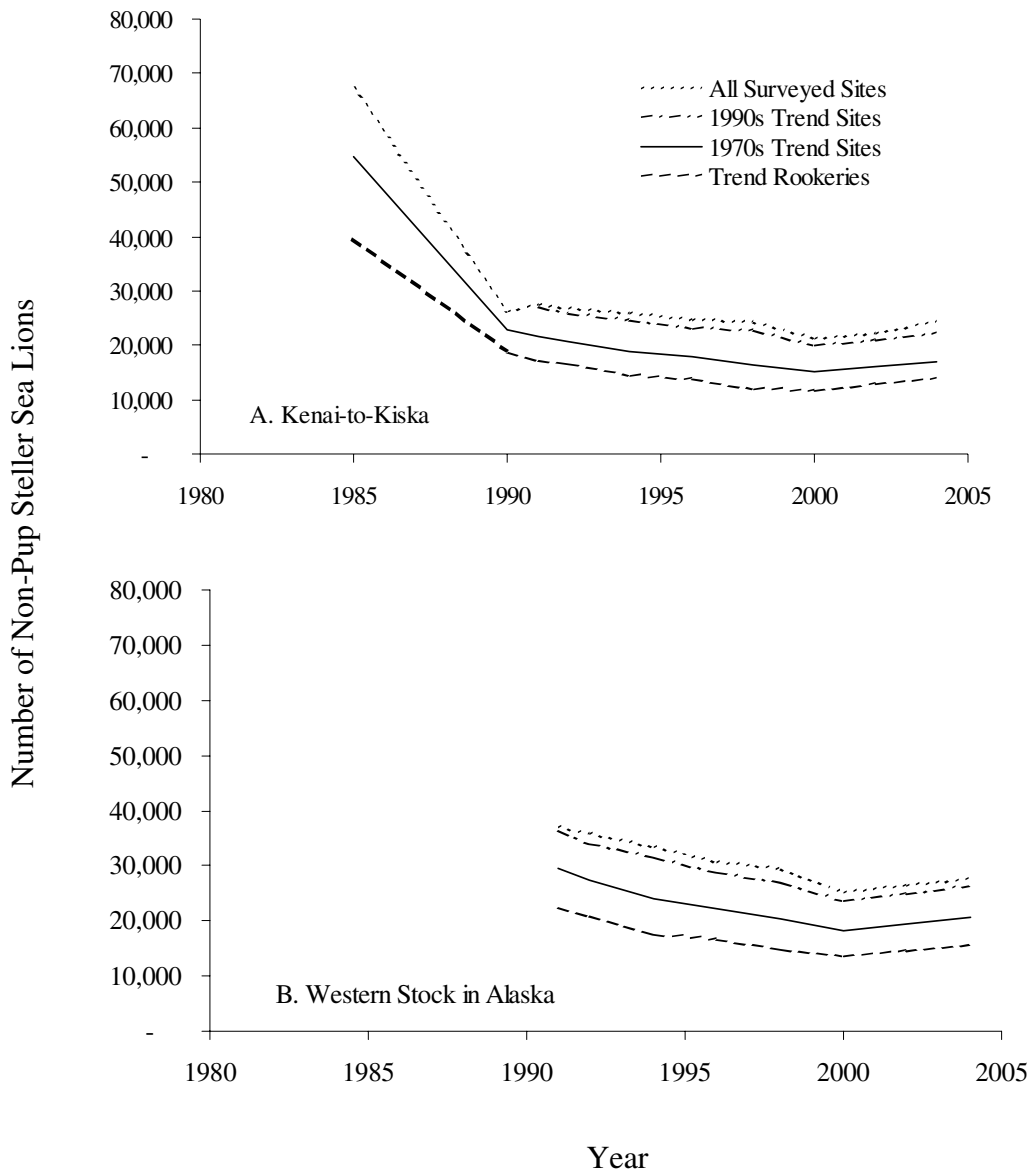


Figure 3.--Number of adult and juvenile (non-pup) Steller sea lions at all surveyed sites, 1970s and 1990s trend rookery and haul-out sites, and trend rookeries in the Kenai-Kiska area (A) and throughout the range of the western stock in Alaska (B). Legend in A also applies to B. Data are in Table 3.

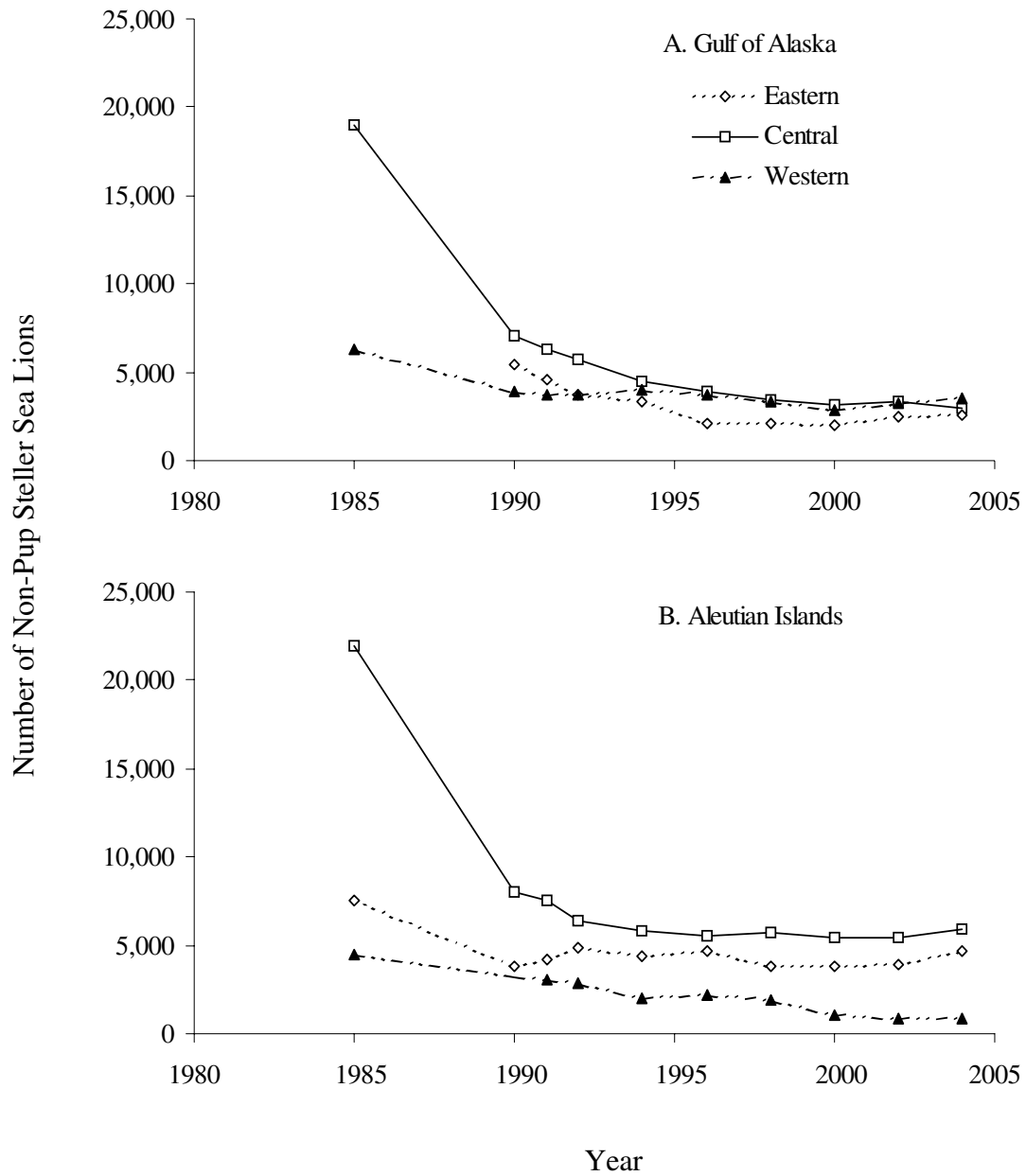


Figure 4.--Number of adult and juvenile (non-pup) Steller sea lions at 1970s trend rookery and haul-out sites in three sub-areas of the Gulf of Alaska (A) and Aleutian Islands (B). Legend in A also applies to B. Data are in Table 4.

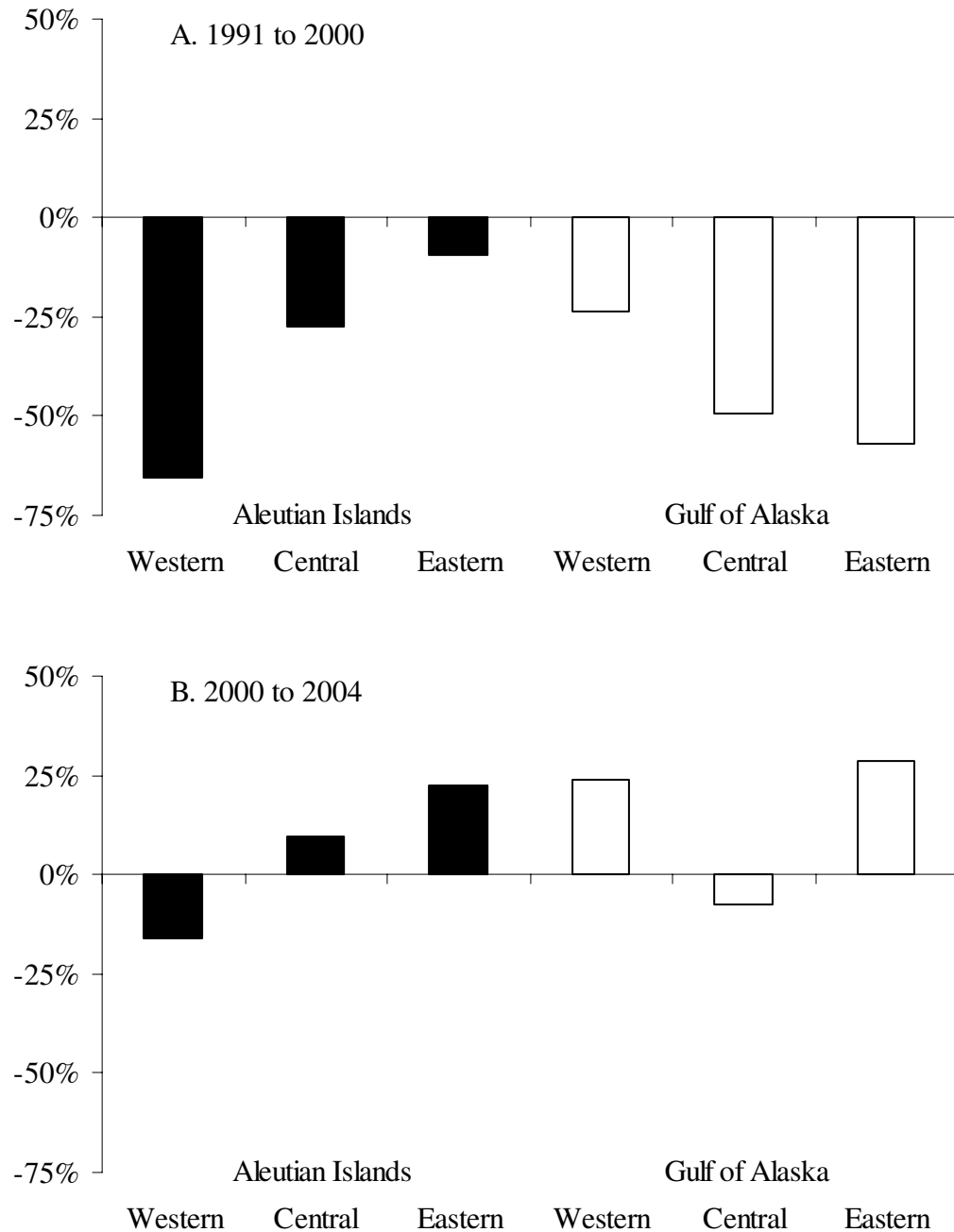


Figure 5.—Percent change in number of adult and juvenile (non-pup) Steller sea lions at 1970s trend rookery and haul-out sites by sub-area between 1991 and 2000 (A) and between 2000 and 2004 (B). Data are in Table 4.

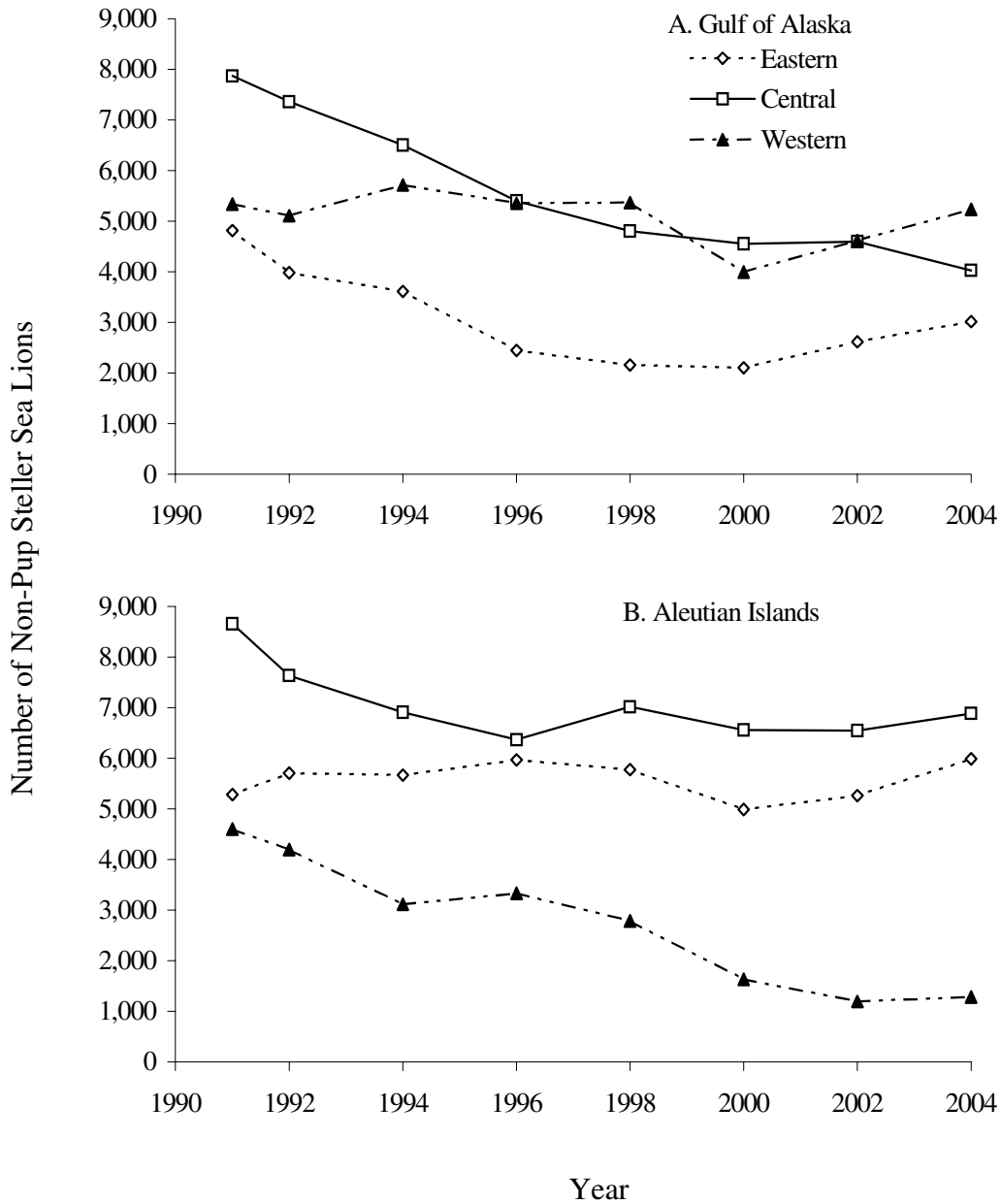


Figure 6.--Number of adult and juvenile (non-pup) Steller sea lions at 1990s trend rookery and haul-out sites in three sub-areas of the Gulf of Alaska (A) and Aleutian Islands (B). Legend in A also applies to B. Data are in Table 6.

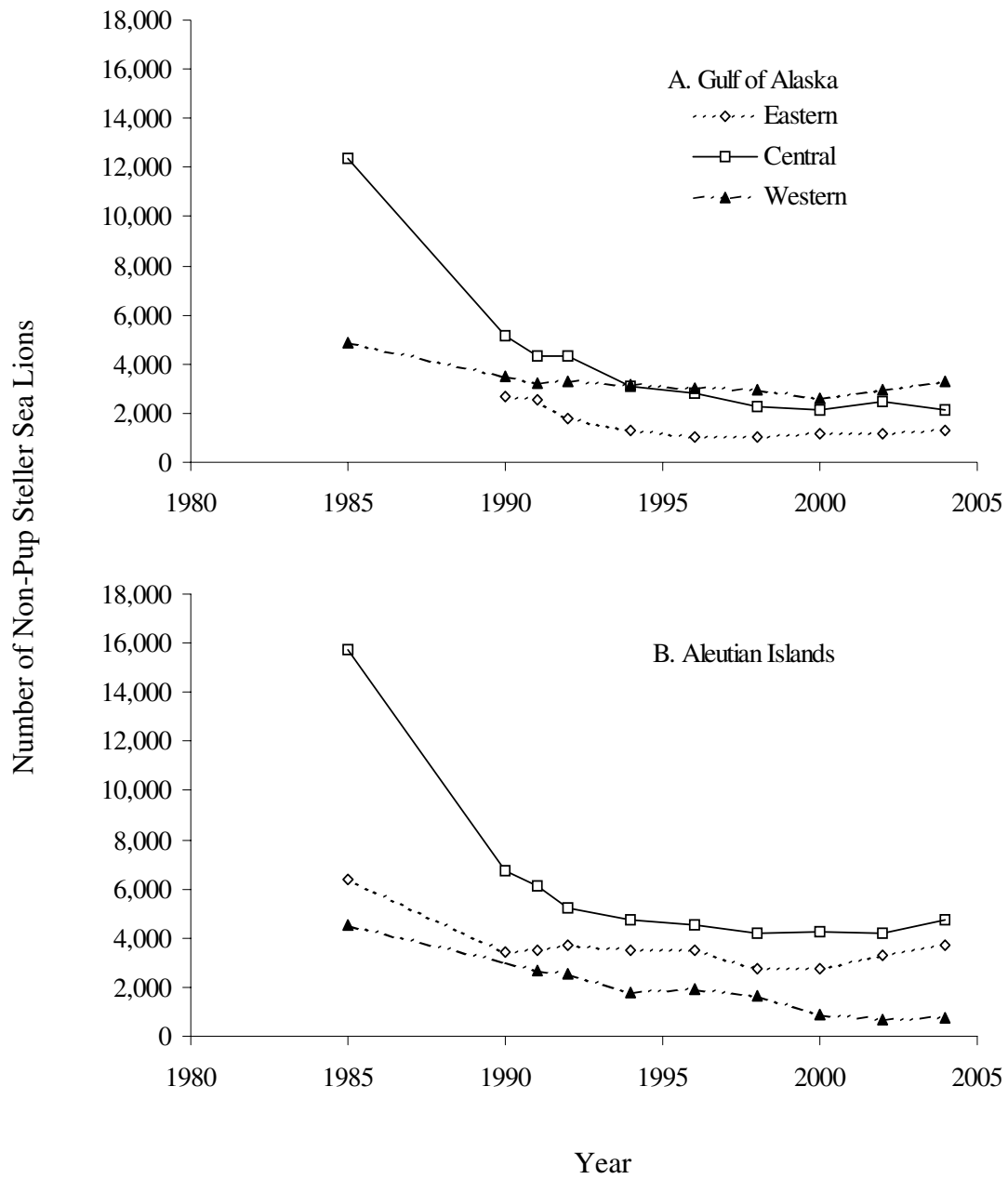


Figure 7.--Number of adult and juvenile (non-pup) Steller sea lions at trend rookeries in three sub-areas of the Gulf of Alaska (A) and Aleutian Islands (B). Legend in A also applies to B. Data are in Table 5.

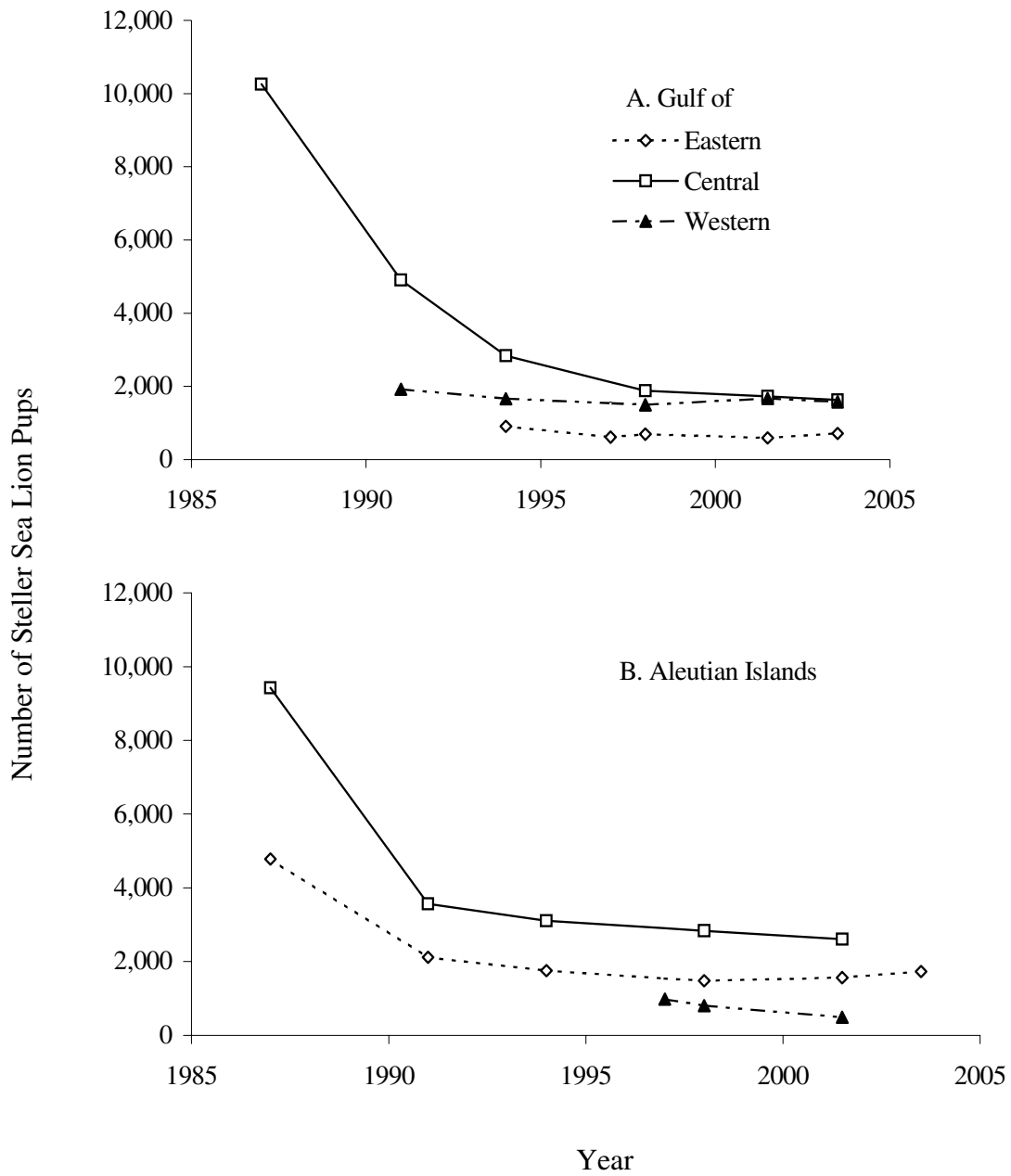


Figure 8.--Number of Steller sea lion pups counted at rookeries in each of three sub-areas of the Gulf of Alaska (A) and Aleutian Islands (B). Legend in A also applies to B. Data are in Table 9. Data for pooled groups of years are plotted at the mid-point (e.g., 1985 to 1989 plotted at 1987; 2001 and 2002 plotted at 2001.5).

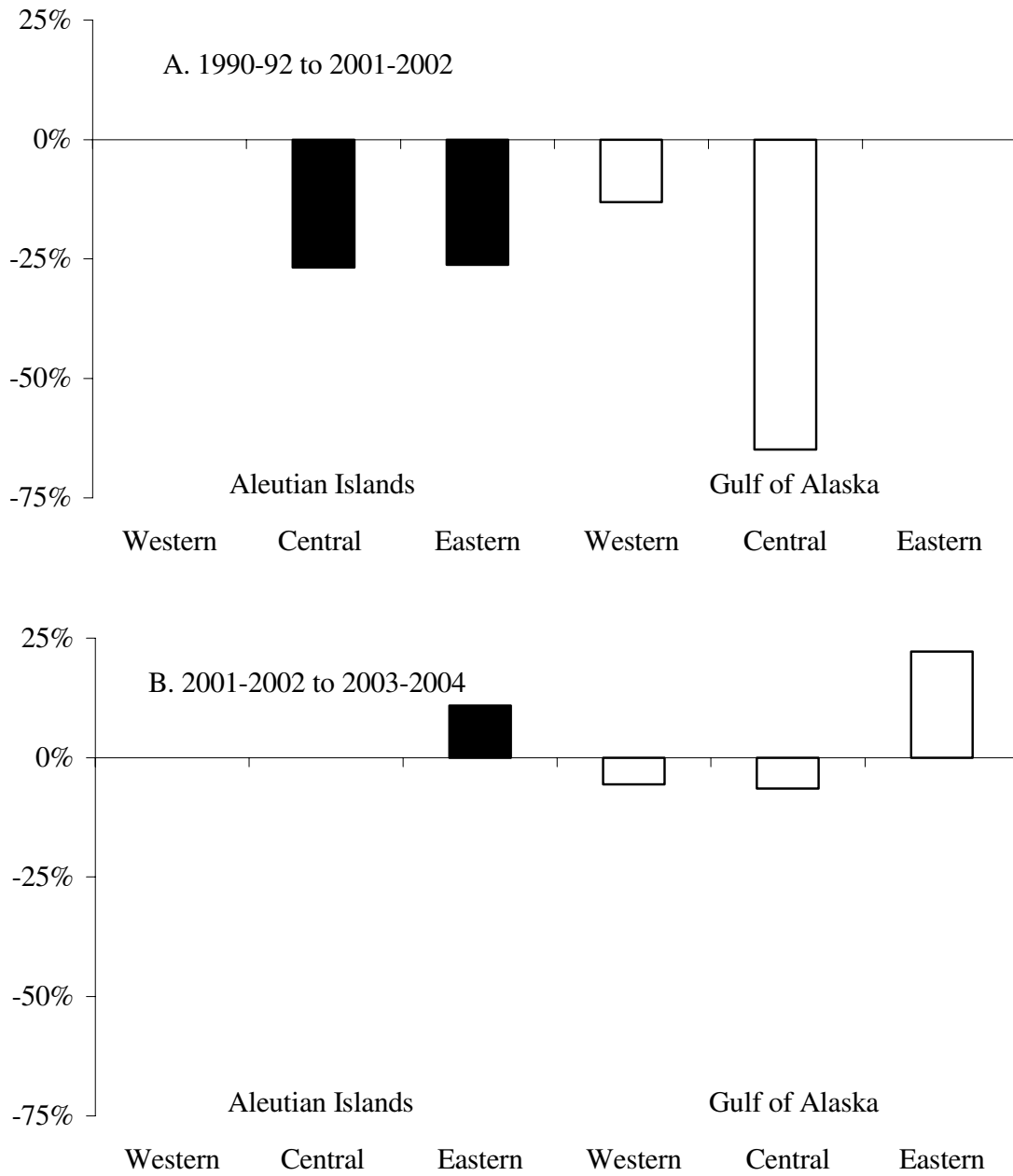


Figure 9.—Percent change in number of Steller sea lion pups at rookeries by sub-area between 1990-92 and 2001-2002 (A) and between 2001-2002 and 2003-2004 (B). Data are in Table 9.

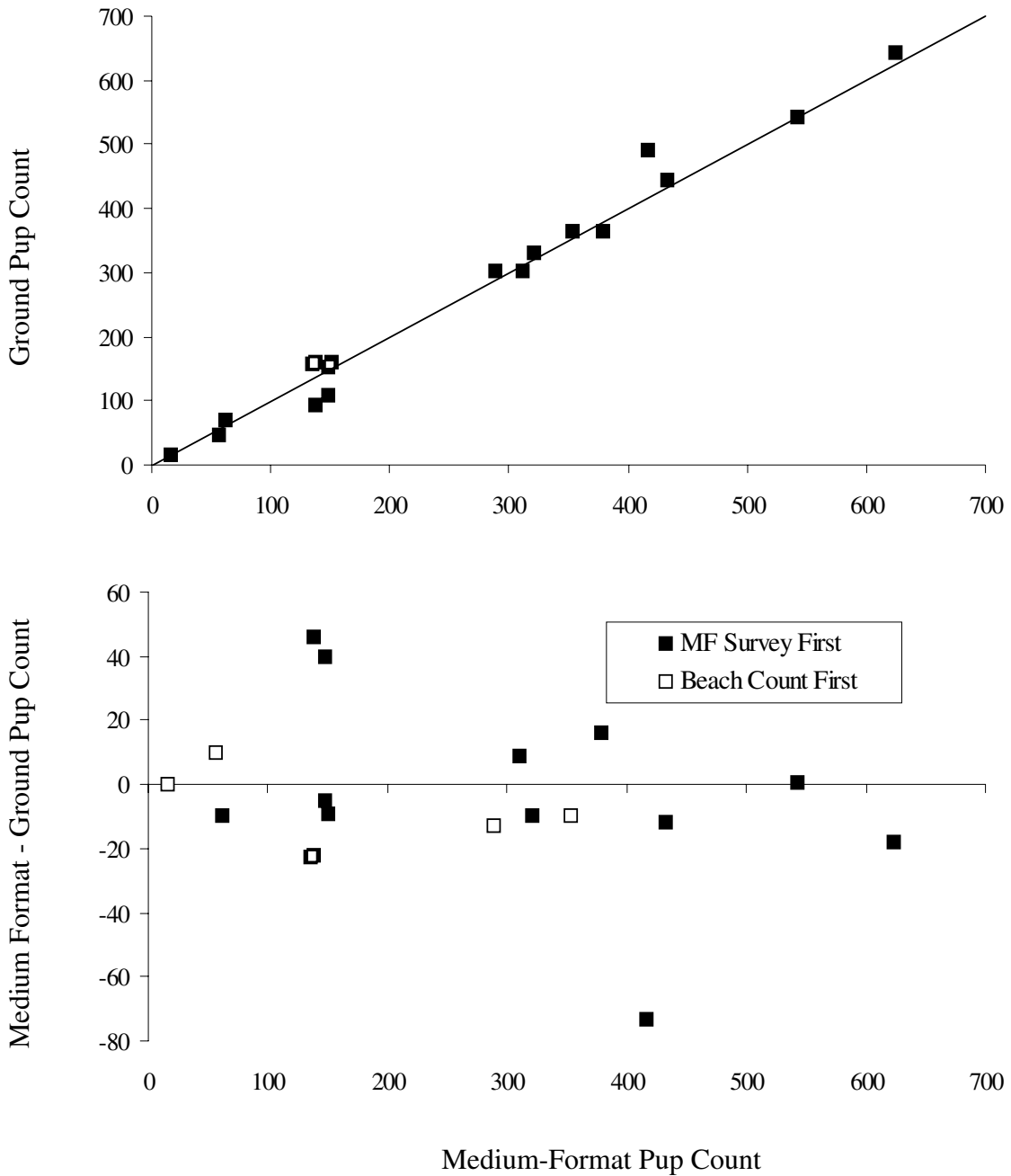


Figure 10.—Comparison of Steller sea lion pup counts from medium-format (MF) photographs and from the beach at the same site within 4 days of each other (Table 9). A. Beach count plotted against MF count; 1:1 line also shown. B. Difference between MF and beach counts plotted against the MF count for pairs where the MF survey occurred first (solid squares) and the beach count occurred first (open squares).



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