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U.S. DEPARTMENT OF COMMERCE
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ABSTRACT

The National Marine Fisheries Service (NMFS) conducted aerial, land, and ship-based surveys of Steller sea lions (*Eumetopias jubatus*) in Alaska during June and July 2005, 2006, and 2007. Surveys were timed to assess trends in pup production (late June through mid-July) or abundance of adults and juveniles (non-pups; early through late June). The aerial photographic survey conducted in 2005 provided the first estimate of Steller sea lion pup (newborn) production at all rookeries and major haulouts in Alaska in a single year (n = 15,460; 5,510 in southeast Alaska, and 9,950 within the range of the western stock of Steller sea lion in Alaska (west of 144°W)). Pups were also surveyed during ship and land-based surveys at selected terrestrial locations in 2005 and 2007. Aerial surveys to count non-pups on terrestrial sites within the range of the western stock were conducted in both 2006 and 2007, but neither resulted in a range-wide assessment because of delays caused by weather, maintenance, and issuance of scientific permits. The non-pup aerial survey conducted in 2007 was the first to use both vertical digital and medium-format film photography (both with forward-motion compensation), allowing multiple comparisons of counts at the same sites.

Despite incomplete surveys conducted in 2006 and 2007, the available data indicate that the western Steller sea lion population (non-pups) was stable since 2004 (when the last complete assessment was done). However, there was considerable regional variability in non-pup trends, with increases in the central and western Gulf of Alaska and eastern Aleutian Islands being largely offset by decreases in the eastern Gulf of Alaska and central and western Aleutian Islands. Overall, counts of non-pups

increased at an annual rate of 2.1% between 2000 and 2007, but this rate was not significantly different from zero (P = 0.08).

Western stock pup counts exhibited the same regional variability in recent trends as counts of non-pups, but overall they were approximately 4% higher in 2005-2007 than in 2001-2002. Pup counts in southeast Alaska (part of the eastern stock) increased 13% between 2002 and 2005.

CONTENTS

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) following a 15% per year decline between 1985 and 1989 (Merrick et al. 1991, 1992). This short period of rapid decline was preceded by a longer period of relatively slow decline (~5% per year) during the 1970s and early 1980s (Merrick et al. 1987).

In 1997, two stocks of Steller sea lion were identified based on differences in genetics and population trends (Bickham et al. 1996, Loughlin 1997, 62 Federal Register 24345). 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", while the eastern stock, which breeds on rookeries in southeast Alaska southward to California, retained its "threatened" classification. Between 1990 and 2000, the rate of population decline for the western stock slowed to 5% (Sease et al. 2001),

possibly in response to the enactment of management measures designed to reduce human-related direct mortality (e.g., prohibition of shooting at or near Steller sea lions, reduction in the allowable incidental catch in fisheries, and establishment of 3 nautical mile (nmi) no-entry zones around rookeries). Between 2000 and 2004, the western stock increased at about 3% per year (Fritz and Stinchcomb 2005). In contrast, the eastern stock has increased at an annual rate of approximately 3% since at least the late 1970s (Pitcher et al. 2007) and may be a candidate for removal from the list of threatened and endangered species (NMFS 2008).

As part of its responsibilities under the ESA and Marine Mammal Protection Act (MMPA), 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 2005, 2006, and 2007. 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, 1992; Merrick et al. 1991; 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; Fritz and Stinchcomb 2005). 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 1976 to 2007. A longer historical perspective (1956 to 1990) is available in Merrick et al. (1991). Rookeries are those sites where adult male sea lions actively defend territories, pups are born, and mating takes place. Haulout 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 sea lion population size are determined by

analyzing time series of pup and non-pup counts at 'trend' sites that have been consistently surveyed over time.

The revised Steller Sea Lion Recovery Plan (NMFS 2008) contains recovery criteria to change the listing of the western stock from endangered to threatened ('down-listing') and to remove it from the list of species requiring ESA protection ('delisting'). Parts of both 'down-listing' and 'delisting' criteria involve increases in counts of adults and juveniles (non-pups) within the range of the western stock in Alaska. In order to be a candidate species for 'down-listing', non-pup counts need to increase (statistically significant slope > 0) for 15 years on average, while to 'delist', counts need to increase at a minimum of 3% for 30 years (approximately three generations). Counts reported here are relevant in the assessment of the population's status relative to these recovery goals.

METHODS

Definition of Terrestrial Sites

In addition to the functional definition of a rookery (where adult male sea lions actively defend territories, pups are born, and mating takes place), we define a rookery as any site at which 50 or more pups have been counted since 1978. This definition differs from previous definitions by both the specification of a minimum number of pups as well as a time period. Using this rookery definition, some sites listed as rookeries in the designation of critical habitat (50 CFR 226.202) are not included as rookeries in this analysis, while some sites listed as major haulouts (> 200 animals counted at any time)

are now treated as rookeries. The following sites were reclassified from rookery to haulout (Table 1):

- Agligadak, Semisopochnoi, and Amchitka (East Cape) in the central Aleutian Islands.

The following sites were reclassified from haulout to rookery (Table 1):

- Chiswell Islands in the eastern Gulf of Alaska.
- Ushagat in the central Gulf of Alaska.
- Jude and Lighthouse Rocks in the western Gulf of Alaska.
- Kanaga/Ship Rock in the central Aleutian Islands.

Analyses presented here do not alter the designation of critical habitat since all sites that moved from the rookery to the major haulout category still meet the abundance threshold used for critical habitat designation.

Counts at rookeries and haulout sites were aggregated separately within each sub-area to determine relative abundance at each type of site. Rookeries have a greater proportion of mature animals, as well as those that are reproductively active, while haulouts have a greater proportion of juvenile animals and presumably non-reproductive adults. Aggregating and comparing trends at rookeries and haulouts may provide insight into changes in age structure and recruitment to the population.

Sub-areas Within the Range of the Western Stock in Alaska

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; Sease et al. 2001; Sease and Gudmundson 2002; Fritz and Stinchcomb 2005) and those adopted in the Steller Sea Lion Recovery Plan (NMFS 2008). These include three regions in the Gulf of Alaska, three regions in the Aleutian Islands, and one in the eastern Bering Sea (Fig. 1):

- Eastern Gulf of Alaska (E GULF: approximately 145°-150°W).
- Central Gulf of Alaska (C GULF: 150°-157°W).
- Western Gulf of Alaska (W GULF: 157°-163°W).
- Eastern Aleutian Islands (E ALEU: 163°-169°W).
- Central Aleutian Islands (C ALEU: 169°W–177°E).
- Western Aleutian Islands (W ALEU: 172°-177°E).

Another geographical region used during the analyses of survey data extends from the Kenai Peninsula (Outer Island; 150°W) to Kiska Island (177°E; Fig. 1). 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 2008). In past surveys (Fritz and Stinchcomb 2005), the Kenai-to-Kiska region has included between 74% and 88% of the western Steller sea lion population in Alaska.

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 assume 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 that were similar to those used here to present survey results. The differences between the rookery clusters identified by York et al. (1996) and those used here are: 1) York et al. (1996) did not include western stock rookeries in the E GULF, 2) York et al. (1996) grouped Atkins Island with the C GULF instead of the W GULF, and 3) York et al. (1996) grouped Buldir Island with the C ALEU instead of the W ALEU.

Aerial Surveys for Pups and Non-Pups

Aerial surveys for non-pups are conducted in mid-June through early July which corresponds to the middle and end of the breeding season (Pitcher et al. 2001) when the greatest proportion of adults is onshore. Pup surveys are conducted in late June through mid-July which is after the peak in pupping, when most pups are ≤ 1 month old, and prior to the age when most pups enter the water (Pitcher et al. 2001). For non-pup surveys, daily effort was restricted to the hours between approximately 0900 and 1800 local time when sea lions are most likely to be hauled-out (Sease and Gudmundson 2002).

2005 (Pups)

An aerial survey to assess Steller sea lion pup production in Alaska (from Dixon Entrance at 133°W to Attu Island at 172°E) was conducted from 21 June to 10 July 2005 (Fig. 1). This was the first Alaska-wide survey conducted using medium-format (MF) vertical (film plane parallel to the ground) photography to assess Steller sea lion pup production. The 2005 MF aerial photographic survey was conducted by the Marine Mammal Division of the NMFS' Southwest Fisheries Science Center (SWFSC). The

survey was conducted using a Rockwell Aero Commander aircraft (i.e., high-wing, low-speed survey plane) operated by Commanders NorthWest and photographs of rookeries and major haulouts were taken with a 5-inch military reconnaissance camera (with image-motion compensation) mounted in the belly of the aircraft. Since the primary objective of the 2005 aerial survey was to assess pup production, all rookeries within the Alaskan range of the western (n = 39) and eastern (n = 5) stocks of Steller sea lion were surveyed, along with major haulouts within the Alaskan range of the western stock (n = 15) where 10 or more pups had been observed in previous surveys (Table 2).

Photographs were taken vertically over terrestrial sea lion sites at altitudes of at least 700 ft between 0900 and 2000 local time. Steller sea lion pups less than 2 months of age do not forage on their own and thus, do not enter the water as often or as regularly as adults and juveniles. Therefore, timing (within each day) of an aerial survey for pups is not as critical as during a non-pup survey (Sease and Gudmundson 2002). Pups, as well as adults and juveniles (non-pups), were counted off the photographic images using a zoom dissecting scope mounted on a light table. Clear acetate sheets were placed over the film and individual animals counted using a fine-tip permanent marker and a digital manual counter. Non-pups were assigned to one of four age-sex categories (juveniles, adult females, sub-adult males, and adult males) based on size, shape, and location within the rookery (which reflect age and gender differences in behavior during the breeding season; Chumbley et al. 1997). Sea lion numbers from the 2005 survey (Table 2) are those of a single counter (M. Lynn).

2006 (Non-pups)

An aerial survey to assess trends in numbers of western stock adult and juvenile Steller sea lions in Alaska (from Cape St. Elias at 145°W to Attu Island at 172°E) was conducted by NMFS from 14 to 30 June 2006 (Fig. 1). As in 2004 (Fritz and Stinchcomb 2005) and 2005, the 2006 survey was conducted using MF vertical photography by SWFSC using the same Aero Commander survey aircraft. At sites with fewer than 10 animals, a visual count was obtained by a forward observer in the airplane and no photographs were taken. Aerial surveys for non-pups are conducted in mid-late June, when the greatest proportion of adults is onshore to give birth and breed. The 2006 survey, however, did not result in a complete assessment of numbers at trend sites across the Alaska range of the western stock of Steller sea lion. Trend sites are those that have been consistently surveyed since the mid-1970s (1970s trend sites) or 1991 (1990s trend sites; see section below "Population Trend Analysis"). In 2006, only 53 of 87 1970s trend sites, and 106 of 161 1990s trend sites were surveyed (Table 1) due to: 1) a delayed start of the survey, as well as a hard termination date of 30 June because of a court-ordered cessation (issued on 26 May 2006) of all Steller sea lion research authorized by permits issued by NMFS under the MMPA and ESA, and 2) low clouds and fog which reduced the number of flying days.

In June 2006, all 1970s and 1990s trend sites were surveyed in the E GULF and the E ALEU. In addition, all 1970s and 1990s trend sites except one were surveyed in the W GULF (missed the rookery on Chernabura Island) and the W ALEU (missed the rookery on Buldir Island). However, in the C GULF, only 7 of 16 1970s and 14 of 33 1990s trend sites were surveyed in June 2006, while in the C ALEU, only 15 of 38 1970s

and 24 of 58 1990s trend sites were surveyed. Counting methodologies for the 2006 survey were the same as those employed for the 2005 survey, and sea lion numbers (Table 1) are those of a single counter (M. Lynn). Sea lions were counted off photographs from 13 sites by two additional counters; all site non-pup totals were within 5% of those of the primary counter and 70% of the duplicate counts were within 1%.

2007 (Non-pups)

Since the 2006 survey was unable assess trends throughout the Alaskan range of the western stock, an aerial survey for non-pups was conducted from 9 June-6 July 2007 by personnel from both SWFSC and the National Marine Mammal Laboratory (NMML), NMFS Alaska Fisheries Science Center. The 2007 survey was conducted using medium-format photography as described for the 2004-2006 surveys, but also employed simultaneous digital, vertically-oriented photography (with forward motion compensation); both cameras were mounted side-by-side in a single belly port of a NOAA deHavilland Twin Otter aircraft (NOAA, Aircraft Operations Center, Tampa FL). The firing rate for both cameras was set for 60% overlap between successive pictures (based on altitude and speed over ground of the plane) to ensure complete site coverage and to obtain multiple views of individual animals. The 2007 survey was the first use of a digital camera (Canon EOS-1DS Mark II with a 50 mm lens) with forward motion compensation in the aerial survey for adult and juvenile Steller sea lions.

A total of 112 terrestrial sites were photographed with either the digital or film camera or both. The film camera had mechanical problems that resulted in 23 sites being photographed solely by the digital camera. Photographs taken by the digital camera

(Fig. 2) with a 50 mm lens had a slightly smaller footprint (side-to-side) than those taken by the film camera. Consequently, at sites where sea lions occupied a wide beach area (e.g., Pinnacle Rock), the digital camera was unable to photograph the same swath width as the film camera. Therefore, at these sites (n = 17), only the photographs from the film camera were counted.

In 2007, 65 of the 87 trend sites from the 1970s, and 124 of the 161 trend sites from the 1990s were surveyed across the western stock in Alaska. Only in the E GULF were all trend sites surveyed. In the remaining sub-areas in 2007, the survey:

- Missed one 1970s and 1990s trend haulout (Long Island) in the C GULF.
- Photographed all 1970s trend sites but missed one 1990s trend haulout (Kak Island) in the W GULF.
- Missed one 1970s and 1990s trend haulout (Umnak/Cape Aslik) in the E ALEU.
- Was limited to the eastern portion of the C ALEU between Yunaska and Tanaga Islands (170° 30'-178°W), with very little effort occurring west of Amchitka Pass.
- Had no effort in the W ALEU (Table 1).

To analyze trends at the largest number of 1990s trend sites through 2007, new sub-area clusters of sites were created in the C GULF, W GULF, and E ALEU that eliminated the single missed haulout in each sub-area for the entire 1991-2006 time series. In addition, the C ALEU sub-area was divided roughly in half creating eastern (Islands of Four Mountains through Tanaga Island; 169°30'–178°W) and western (Delarof Islands through Attu Island; 178°W–172°E) portions. Sites within the eastern C ALEU were surveyed in either 2006 or in 2007, or in both years, while most of the sites in the western C ALEU were missed in both years. Counts at trend sites in the eastern C

ALEU from 2006 and 2007 were averaged to obtain a single composite count for the 2 years.

Two researchers working independently counted all adult and juvenile Steller sea lions at each terrestrial site photographed during the 2007 survey. Each researcher counted all sea lions on both the digital (Fig. 2) and MF film images. Counts were statistically compared between researchers for each media type as well as between media types for each counter using paired sample *t*-tests (Snedecor 1946).

Land-Based Surveys of Pups

Pups were counted directly during visits to selected rookeries during cruises conducted by NMFS from 20 June to 7 July 2005 and 22 June to 6 July 2007 aboard the U.S. Fish and Wildlife Service RV *Tiglax*. During the 2005 cruise, beach counts of pups were conducted at 10 rookeries and major haulouts from the eastern Aleutian Islands to the eastern Gulf of Alaska; in 2007, beach counts were conducted at 4 rookeries in the Aleutian Islands (Table 1). 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.

Pup counts conducted from overlooks were done at several sites without disturbing sea lions on the beach. This was done at sites 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 2007. Complete counts of pups were available on two separate beach rookeries on Marmot Island and one of two on

Ugamak Island (south side at Ugamak Bay). Counts at each beach by separate observers were averaged; the maximum daily sum for Marmot Island in 2007 is reported here.

Population Trend Analyses

Analyses of trends in pup and non-pup counts were focused on counts at a series of 'trend' sites. Trend sites are those rookeries and haulout sites surveyed consistently over a period of time, thus allowing analyses of population trends on decadal scales. The following groups of trend sites were used:

- '1970s trend sites' (n = 87): 32 rookeries and 55 haulouts consistently surveyed from the 1970s to the present. The '1970s trend sites' have between 70% and 80% of the total number of animals observed on all sites during a 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 74 other rookeries and haulouts surveyed routinely since 1991. The '1990s trend sites' have had between 90% and 98% of the total number of animals observed on all sites during a survey.
- Trend rookeries (n = 31): sites at which pup production has been assessed on a regular basis since the late 1970s. This includes all sites identified as rookeries in Table 1 with the exception of Chiswell Islands, Ushagat, Lighthouse Rocks, Jude, Sea Lion Rock (Amak), Ogchul, Kanaga (Ship Rock), and Walrus.

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

- The western stock in Alaska (Cape St. Elias to Attu Island; 144°W-172°E).

- The Kenai-to-Kiska index area.
- Each of the three sub-areas in both the Gulf of Alaska and Aleutian Islands.
- Modified (minus one haulout) sub-area site groups in the C GULF, W GULF, E ALEU and eastern and western portions of the C ALEU.

Overall regional changes in numbers of non-pups for various time periods are expressed as a percentage of the earlier count. Estimates of annual rates 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 ($\alpha < 0.05$). Trends in pup counts on trend rookeries were analyzed only by calculating the percent change in numbers for similar time periods and regions used in the non-pup analyses.

Fritz and Stinchcomb (2005) reported that non-pup counts from vertical MF images were significantly higher than those from 35 mm slides. This difference required an adjustment factor of -3.64% be applied to all vertical MF (and now vertical digital) counts in order to properly analyze time series trends in sub-areas or throughout the western stock that include years when only counts from 35 mm oblique images are available.

RESULTS

Counts of Steller sea lions from aerial and land-based surveys conducted in 2005, 2006, and 2007 are shown in Tables 1 and 2. Aerial and land-based surveys in 2005

provided the first Alaska-wide assessment of pup production for a single year (Table 2). At 10 sites, both aerial and land-based counts were available. If the greater of these counts is used for the site total and it is assumed that these counts are a complete census, then Steller sea lion pup production (assessed at approximately 1 month of age) in Alaska in 2005 totaled 15,460 (5,510 in southeast Alaska, and 9,950 in the range of the western stock).

From the 2007 aerial survey, there were 45 sites at which both digital images and MF photographs were available for comparison of counts from the two media and between counters (Table 3). Additionally, another group of 95 sites were photographed using a digital camera, while another group of 62 were photographed with the MF camera (Table 3). None of the groups of paired counts were statistically different from each other (all $P > 0.1$; Table 4), indicating that counts by either counter using either media were replicate estimates of the true count. Counts listed by site for the 2007 aerial survey in Table 1 are the means of all available counts for each site ($n = 2$ if images from only one media type were available, otherwise $n = 4$; Table 3).

Complete 1970s trend site counts are available only from the E GULF in 2006 and 2007, from the W GULF in 2007, and from the E ALEU in 2006 (Table 5). Consequently, complete 1970s trend site counts across the range of the western stock in Alaska are only available through 2004. Between 2004 and either 2006 or 2007 within the three sub-areas listed above, counts at 1970s trend sites were essentially stable in the E GULF and E ALEU. Counts in these two sub-areas had increased over 20% in the previous 4 years (2000 to 2004), indicating that the population in these sub-areas may have stabilized in recent years. Counts at 1970s trend sites in the W GULF increased

17% between 2004 and 2007, which continued the increase observed there since 2000 (Fig. 3).

Complete 1990s trend site counts are available only from the E GULF in 2006 and 2007 and from the E ALEU in 2006 (Table 6). During both the 2006 and 2007 aerial surveys, researchers observed that sea lions at each of two 1990s trend sites, Aialik Cape in the E GULF and Unalaska/Makushin Bay in the E ALEU had moved from their previous locations. At Aialik Cape, sea lions (103 non-pups in 2006 and 161 in 2007) were hauled out approximately 1 nautical mile to the west of the Cape itself. Similarly, at Makushin Bay (60 in 2006), they were using small rock outcroppings nearer the mouth of the Bay than in the past. Since these are relatively small changes in distribution, non-pup counts at these two new locations were added to those at the individual trend sites. As a result, counts at 1990s trends sites in 2006 in the E GULF and E ALEU reported here (Tables 1 and 5) are higher than those reported in a 2006 Memorandum to the Record by Fritz et al. (see Appendix). As with the 1970s trend sites, complete Alaskan western stock 1990s trend site counts are available only through 2004. At the complete group of 1990s trend sites between 2004 and either 2006 or 2007, counts declined 8% in the E GULF but were essentially stable in the E ALEU (Fig. 4).

Counts at the modified group of 1990s trend sites (missing one site in each sub-area) were available from the C GULF and W GULF in 2007, from the E ALEU in both 2006 and 2007, and from the W ALEU in 2006; all 1990s trend sited were surveyed in the E GULF (Table 7). Counts at this modified list of sites were not available in 2006 in the C GULF, W GULF, C ALEU, or W ALEU (Table 1). In the eastern portion of the C ALEU, the sum of the mean of 2006 and 2007 counts (Table 1) at each site was

computed; no data have been collected since 2004 in the western portion of the C ALEU. Trends in total non-pup counts at the modified group of trend sites are identical to those at the complete list in each sub-area between 1991 and 2004 (Tables 6 and 7; Fig. 4). In the C GULF, W GULF, and E ALEU, counts at the modified group of 1990s trend sites increased between 3% and 13% between 2004 and 2006-2007 (Fig. 4). In the C GULF, this is the first increase in counts since the beginning of the survey time series in the 1970s (Table 5). In the W GULF and E ALEU, recent increases, while encouraging, were considerably less than those observed between 2000 and 2004 (33% and 20%, respectively). In the eastern portion of the C ALEU, non-pup counts declined between 1991 and 1996, and then increased through 2004. Summing the average site counts from the 2006 and 2007 surveys suggests that the non-pup population in this area declined 16% between 2004 and 2006-2007.

The best estimate of recent (2004-2007) trend of adults and juveniles in the western stock of Steller sea lion in Alaska is available by comparing counts in the three Gulf of Alaska areas, the E ALEU, the eastern portion of the C ALEU and the W ALEU in 2004, with the same sub-areas in 2006-2007. In 2004, non-pup counts in these sub-areas totaled 24,502, which was adjusted downward by 3.64% to 23,610 (Table 7) to allow comparisons with counts from previous years using 35 mm oblique photos (Fritz and Stinchcomb 2005). The best estimate of the non-pup total for these same sub-areas in 2006-2007 is 24,440 (adjusted count of 23,550 in Table 7), a difference of only 62 sea lions or essentially unchanged from 2004. This suggests that the increase in the non-pup population observed between 2000 and 2004 (14% in the sub-areas summarized in Table 7) was not sustained through 2007, and that the current trend of western Steller sea lions

in Alaska is stable. Regressing the natural log of the counts on the years from 2000 to 2006-2007 (value of 2006.5) yields a non-significant relationship (P = 0.08) with an estimated annual rate of change of 2.1% (with 95% confidence bounds of -0.6% to 4.8%).

Trends and comparisons of counts of non-pups at rookeries and haulouts can indicate demographic changes in the population that may be related to trends in the overall population (Tables 8 and 9; Fig. 5). During the breeding season, haulouts are composed predominately of juvenile and non-reproductive adults, while the majority of the breeding population (and pups) are at rookeries. An increase in haulout numbers could be the result of increases in natality and/or juvenile survival, while a decrease could mean a decline in the rate of recruitment. In all western Alaska sub-areas, numbers of non-pups on rookeries declined from 1991 through 2000, while numbers on haulouts were largely without trend through 1998. In two sub-areas where non-pup counts have been either stable or increasing since 2000, the W GULF and E ALEU, non-pups on rookeries steadily increased from 2000 through 2007, while numbers on haulouts declined or remained steady. This pattern of increases on rookeries and decreases on haulouts is evident, though to a lesser degree, in the eastern portion of the C ALEU as well. In those sub-areas that have continued to decline (C GULF and western portion of the C ALEU through at least 2004, and the W ALEU through 2006), non-pup numbers on both rookeries and haulouts declined. Across most of the western stock in Alaska (Fig. 5 H and I), rookery counts increased 21% between 2000 (n = 12,842) and 2006-2007 (n = 15,486), while counts at haulouts increased only 2% in the same time period (7,958 to 8,064; Table 9; Fig. 5). Trends at rookeries and haulouts since 2000 are consistent with a population whose mean age is increasing (increases at rookeries and declines or

stability at haulouts) possibly due to high survivorship of juveniles and adults along with a drop in pup production.

In the E GULF, there have been approximately the same number of non-pups on rookeries as on haulouts, indicating that the adult and juvenile (including non-reproductive adult) portions of the population in this region are generally equivalent. In all other western stock sub-areas in Alaska, non-pup counts on rookeries exceed those on haulouts in the vast majority of years. The E GULF pattern indicates that this sub-area has a higher concentration of juvenile Steller sea lions than others. Sightings of large numbers of animals branded as pups on rookeries in the C GULF, E GULF, and southeast Alaska (eastern stock) in Prince William Sound and the surrounding E GULF waters support this conclusion (NMML, unpublished data).

Recent (since 2000) trends in pup production by sub-area (Tables 10 and 11; Fig. 6) have lagged behind trends in counts of non-pups. Overall pup production at trend rookeries in the western stock in Alaska has essentially been stable between 2001-2002 and 2005-2007, showing an increase of only 4% in as many as 6 years. By contrast, non-pup counts increased by 11-14% over much of this same period (2000 to 2004; Tables 5-7). Non-pup counts in the E GULF, W GULF, and E ALEU increased by 20-43% between 2000 and 2004, then their rate of increase either slowed (W GULF and E ALEU) or non-pup numbers declined (E GULF). Pup counts increased by 22% in the E GULF and 25% in the E ALEU between 2001-2002 and 2005-2007, but only by 2% in the W GULF. Where non-pup numbers have stabilized or are slowly declining (C GULF and C ALEU), pup production also declined slowly (-2%). However, where the non-pup

population continued to decline (W ALEU), pup production dropped precipitously (-30%).

DISCUSSION

Despite incomplete adult and juvenile surveys across the range of the western stock in Alaska in 2006 and 2007, there is sufficient information to indicate that the overall population increase observed between 2000 and 2004 did not continue through 2007. Apparent overall stability, however, was not uniform across the range; increases in the C GULF, W GULF, and E ALEU sub-areas were largely offset by decreases toward the eastern and western edges of the Alaskan range.

Trends in counts of non-pups on rookeries and haulouts since 1991, particularly in the area from the W GULF through the eastern C ALEU, are consistent with recent changes in sea lion vital rates (Holmes et al. 2007). Modeling of the female Steller sea lion population in the C GULF indicated that survivorship (particularly of juveniles) increased between the late 1980s and early 2000s, while birth rates steadily declined to a level 64% of that estimated for the mid-1970s (Holmes et al. 2007). Greater survivorship of juveniles may be reflected by increasing number of animals counted on haulouts in the early 1990s followed by increases at rookeries in the late 1990s and early 2000s (Fig. 5 and in particular, panels C, D, and E). However, the numbers on haulouts did not continue to increase in parallel with those on rookeries after 1998, perhaps reflecting the continued estimated decline in birth rates. Recent (since 1998) trends in rookery and haulout numbers could also reflect declines in juvenile survivorship; however,

preliminary results from 6 years of observations of animals marked as pups between 2000 and 2005 indicate otherwise (Fritz et al. 2008).

Values of the *t*-statistic from the series of paired sample tests comparing counts between media and counters using data from the 2007 aerial non-pup survey indicate that differences between counters were larger than differences between media. This suggests that individual counter differences in recognizing sea lions in photographic images were greater than any differences in resolution between the two media types, though none of the differences were statistically significant. This result is different than the comparison of counts from oblique 35 mm and vertical MF photographs, in which, MF counts were significantly higher than those from 35 mm slides, requiring a 3.6% correction factor (Fritz and Stinchcomb 2005).

Calkins and Pitcher (1982) and Pitcher et al. (2007) evaluated a range of factors that, when multiplied by an estimate of the total number of pups born, could be used to estimate the total sea lion population. For a stable population at equilibrium, the multiplier was 4.5. If this is applied to the most recent estimate of pup production in the range of the western stock in Alaska (9,950 in 2005), a population estimate of 44,775 Steller sea lions is obtained; this estimate does not account for any pup mortality between birth and the survey. Recent (2000-2005) counts of dead pups at selected rookeries during land-based surveys have averaged about 4% (dead pup count/total pup count; NMML, unpublished data). Accounting for this early pup mortality would increase the total population estimate of Steller sea lions in the range of the western stock in Alaska to 46,160.

While the trend in counts of non-pups in the western stock in Alaska since 2000 remains positive (2.1% per year), it is not significantly different from a slope of zero ($P = 0.08$). One of the recovery criteria for down-listing the western stock from endangered to threatened status states that non-pup counts should be increasing for at least 15 years. From 2000 to 2004, non-pup counts increased between 11% and 14% depending on which index area is evaluated within Alaska, but since then, population growth has stalled. Based on the retrospective analysis of sea lion vital rates, population increases appear to be dependent on improvements in birth rates of adult females, as well as maintenance of the high rates of adult and juvenile survival observed in recent years (Holmes et al. 2007).

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Table 1.--Counts of adult and juvenile (non-pup) Steller sea lions at rookery (1 = rookery; Rook.) and haulout sites in Alaska, June and July 2005-2007 (M = month, D = day). In 2005 and 2006, non-pups were counted from medium format (MF) photographs taken vertically over each site. Non-pup counts in 2007 are from both MF photographs and digital images taken vertically over each site (mean of two counters and two media types if available). *The primary objective of the 2005 survey was to assess pup production at all rookery and major haulout sites; some sites were surveyed outside of the normal time range of other non-pup surveys. **Adult and juvenile counts in 2007 at these locations were from land-based overlooks. For 'boxed' sites under rookery or trend site columns, see notes at end.

		Trend sites		2005*			2006			2007		
Site Name and Region	**Rook.**	**1970s**	**1990s**	**M**	**D**	**Count**	**M**	**D**	**Count**	**M**	**D**	**Count**
Southeast Alaska												
WHITE SISTERS	1			7	10	1,078						
BIALI ROCK	1			7	10	598						
HAZY	1			7	10	2,293						
FORRESTER/SEA LION RK				7	10	962						
FORRESTER/EAST RK				7	10	258						
FORRESTER/NORTH	1			7	10	1,389						
FORRESTER/C HORN RK				7	10	414						
FORRESTER/LOWRIE				7	10	2,534						
GRAVES ROCK	1			7	10	1,326						
Southeast Alaska Total	**5**					**10,852**						
Eastern Gulf of Alaska												
CAPE ST. ELIAS		1	1				6	14	414	6	9	728
HOOK POINT							6	14	101	6	9	132
CAPE HINCHINBROOK			1				6	14	237	6	9	95
SEAL ROCKS	1	1	1	6	21	1,049	6	14	1,119	6	9	803
WOODED (FISH)	1	1	1	6	21	436	6	14	619	6	9	282
MIDDLETON							6	14	0	6	9	0
GLACIER		1	1				6	14	466	6	9	531
THE NEEDLE		1	1				6	14	127	6	9	145
POINT ELEANOR							6	14	0	6	9	0
PERRY							6	14	218	6	9	437
PLEIADES							6	14	0	6	9	0
POINT LaTOUCHE							6	14	0	6	9	0
DANGER							6	14	10	6	9	119
POINT ELRINGTON		1	1				6	14	58	6	9	37
PROCESSION ROCKS							6	14	67	6	9	77
CAPE PUGET			1				6	14	0	6	9	0
CAPE JUNKEN							6	14	0	6	9	0

Table 1.-- Cont.

		Trend sites		2005*			2006			2007		
Site Name and Region	**Rook.**	**1970s**	**1990s**	**M**	**D**	**Count**	**M**	**D**	**Count**	**M**	**D**	**Count**
CAPE FAIRFIELD			1				6	14	0	6	9	10
CAPE RESURRECTION							6	14	0	6	9	12
RUGGED		1	1				6	14	0	6	9	0
AIALIK CAPE			1				6	14	103	6	9	161
CHISWELL ISLANDS	1	1	1	6	21	93	6	14	71	6	9	74
GRANITE CAPE							6	14	89	6	9	25
SEAL ROCKS (KENAI)		1	1				6	14	4	6	9	2
STEEP POINT							6	14	11	6	9	0
Unnamed rock between STEEP & RABBIT										6	9	90
RABBIT							6	14	0	6	9	0
Eastern Gulf of Alaska Total	**3**	**9**	**13**			**1,578**			**3,714**			**3,755**
Central Gulf of Alaska												
OUTER (PYE)	1		1	6	21	367	6	14	251	6	9	268
NUKA POINT							6	14	0	6	9	0
GORE POINT			1				6	14	0	6	9	0
EAST CHUGACH			1							6	9	0
PERL			1							6	9	241
PERL ROCKS										6	9	0
NAGAHUT ROCKS			1							6	9	2
ELIZABETH/CAPE ELIZABETH			1							6	9	0
FLAT										6	9	44
WEST AMATULI							6	14	0	6	10	0
SUGARLOAF	1	1	1	6	21	767	6	14	733	7	6	662
USHAGAT/NW		1	1				6	14	0	6	10	0
USHAGAT/SW	1	1	1				6	14	141	6	10	74
USHAGAT/ROCKS SOUTH		1	1				6	14	9	7	6	0
SUD							6	14	0	6	10	0
LATAX ROCKS		1	1							6	10	115
SEA OTTER			1							6	10	100
RK NEAR SEA OTTER			1							6	10	0
AFOGNAK/TONKI CAPE			1							6	10	0
SEA LION ROCKS (MARMOT)		1	1							6	10	1
MARMOT	1	1	1	6	23	765	6	30	686	6	10	551
LONG ISLAND		1	1									
KODIAK/CAPE CHINIAK		1	1							6	10	241
UGAK			1							6	10	0
KODIAK/GULL POINT			1							6	10	148
KODIAK/CAPE BARNABAS		1	1							6	10	140
TWOHEADED		1	1	6	23	367				6	10	228
SITKINAK/CAPE SITKINAK		1	1							6	10	104
KODIAK/SUNDSTROM										6	10	0
KODIAK/CAPE ALITAK										6	10	0
KODIAK/CAPE IKOLIK							6	15	52	6	10	33
KODIAK/TOMBSTONE ROCKS							6	15	0	6	10	0

Table 1.-- Cont.

		Trend sites		2005*			2006			2007		
Site Name and Region	**Rook.**	**1970s**	**1990s**	**M**	**D**	**Count**	**M**	**D**	**Count**	**M**	**D**	**Count**
KODIAK/CAPE KULIUK							6	15	0	6	10	0
KODIAK/CAPE UGAT			1				6	15	167	6	10	248
NOISY							6	15	0	6	10	0
KODIAK/MALINA POINT							6	15	0	6	10	0
KODIAK/STEEP CAPE			1				6	15	14	6	10	61
KODIAK/CAPE PARAMANOF							6	15	0	6	10	0
SHAW							6	15	162	7	6	1
CAPE DOUGLAS							6	15	0	7	6	0
SHAKUN ROCKS			1				6	15	67	7	6	113
CAPE NUKSHAK							6	15	0	7	6	0
CAPE UGYAK							6	15	0	7	6	0
CAPE GULL							6	15	0	7	6	0
CAPE KULIAK							6	15	0	7	6	4
TAKLI			1				6	15	157	7	6	92
KODIAK/CAPE UYAK							6	15	0	6	10	0
KODIAK/STURGEON HEAD							6	15	0	6	10	0
PUALE BAY			1				6	15	2	7	6	1
KILOKAK ROCKS							6	15	144	7	6	198
AIUGNAK COLUMNS							6	15	24	7	6	7
UGAIUSHAK		1	1				6	15	0	7	6	2
SUTWIK		1	1				6	15	114	7	6	127
AGHIYUK							6	30	5	6	14	9
CHOWIET	1	1	1	6	23	624				6	14	424
CHIRIKOF	1	1	1	6	23	392				6	14	300
NAGAI ROCKS			1	6	23	329				6	14	449
Central Gulf of Alaska Total	**6**	**16**	**33**			**3,611**			**2,728**			**4,984**
Western Gulf of Alaska												
LIGHTHOUSE ROCKS	1		1	6	23	182	6	30	153	6	14	152
ATKULIK							6	15	0			
KAK			1				6	15	24			
CHANKLIUT							6	30	0			
SEAL CAPE							6	30	0			
MITROFANIA			1				6	30	103	6	14	116
SPITZ		1	1				6	15	0	6	14	11
KUPREANOF POINT			1				6	15	116	6	14	53
CASTLE ROCK		1	1				6	15	15	6	14	38
BIG KONIUJI							6	15	0	6	14	0
ATKINS	1	1	1	6	23	682	6	15	663	6	14	585
CHERNABURA	1	1	1	7	9	873				6	14	1,228
TWINS							6	30	0	6	14	0
THE HAYSTACKS			1				6	15	1	6	14	41
THE WHALEBACK			1	6	23	88	6	16	99	6	14	83
NAGAI/MOUNTAIN POINT		1	1				6	30	56	6	14	148
NAGAI/RK W OF CAPE WEDGE							6	15	0	6	14	0

Table 1.-- Cont.

		Trend sites		2005*			2006			2007		
Site Name and Region	**Rook.**	**1970s**	**1990s**	**M**	**D**	**Count**	**M**	**D**	**Count**	**M**	**D**	**Count**
EGG (SAND POINT)							6	16	0	6	14	0
SEA LION ROCKS (SHUMAGINS)		1	1				6	30	142	6	14	44
UNGA/CAPE UNGA							6	30	0	6	14	0
UNGA/ACHEREDIN POINT			1				6	30	152	6	14	229
JUDE	1		1	6	23	418	6	30	338	6	14	445
OMEGA							6	28	1	6	14	0
WOSNESENSKI							6	18	113	6	14	110
OLGA ROCKS NE							6	18	28	6	14	36
OLGA ROCKS SW							6	18	102	6	14	95
SUSHILNOI ROCKS				6	25	62	6	18	327	6	16	289
PINNACLE ROCK	1	1	1	6	25	892	6	18	1,167	6	16	1,057
HUNT							6	18	0	6	16	0
SOZAVARIKA							6	18	0	6	16	0
UMGA							6	18	0	6	16	0
CLUBBING ROCKS	1	1	1	6	25	709	6	18	1,037	6	16	1,063
CHERNI			1				6	18	0	6	16	0
HAGUE ROCK							6	18	0	6	16	0
CATON							6	18	368	6	16	416
SOUTH ROCKS			1	7	9	270	6	18	320	6	16	457
SANAK							6	18	0	6	16	0
BIRD		1	1				6	18	62	6	16	97
ROCK			1				6	18	0	6	16	0
Western Gulf of Alaska Total	**6**	**9**	**20**			**4,176**			**5,387**			**6,790**
Eastern Aleutian Islands												
UNIMAK/CAPE LAZAREF										6	16	0
UNIMAK/OKSENOF POINT										6	25	269
UNIMAK/CAPE LUTKE							6	18	0	6	16	0
UNIMAK/SCOTCH CAP							6	18	0	6	16	0
UNIMAK/CAVE POINT												
UNIMAK/SENNETT POINT							6	18	1	6	21	0
UNIMAK/CAPE SARICHEF			1				6	18	6	6	21	0
AMAK+ROCKS		1	1				6	18	410	6	25	220
SEA LION ROCK (AMAK)	1	1	1	6	23	524	6	18	447	6	25	385
UGAMAK/NORTH	1	1	1	6	25	650	6	18	635	6	25	669
UGAMAK/UGAMAK BAY				6	25	518	6	18	543	6	25	654
UGAMAK/ROUND				6	25	89	6	18	141	6	25	170
AIKTAK			1				6	18	111	6	21	49
KALIGAGAN							6	18	0	6	21	6
TIGALDA/ROCKS NE			1				6	18	202	6	21	236
TIGALDA/SOUTH SIDE			1				6	18	83	6	21	105
Unnamed rock between TIGALDA & AVATANAK										6	21	42
BASALT ROCK							6	17	4	6	16	0
ROOTOK/EAST			1				6	17	69	6	21	2
ROOTOK/NORTH							6	17	27	6	21	139

Table 1.-- Cont.

		Trend sites		2005*			2006			2007		
Site Name and Region	**Rook.**	**1970s**	**1990s**	**M**	**D**	**Count**	**M**	**D**	**Count**	**M**	**D**	**Count**
TANGINAK			1				6	17	6	6	16	4
AKUN/JACKASS POINT							6	17	0	6	16	0
AKUN/AKUN BAY							6	18	0	6	16	18
AKUN/BILLINGS HEAD	1	1	1	6	25	422	6	14	338	6	16	523
AKUN/AKUN HEAD							6	18	0	6	16	0
AKUTAN/NORTH HEAD										6	16	0
AKUTAN/REEF-LAVA		1	1				6	17	103	6	25	57
AKUTAN/CAPE MORGAN	1	1	1	6	25	1,059	6	17	1,249	6	25	1,172
AKUTAN/BATTERY POINT							6	17	0	6	17	0
BABY							6	17	4	6	20	0
OLD MAN ROCKS			1				6	17	112	6	20	81
EGG			1				6	17	0	6	20	0
OUTER SIGNAL			1				6	17	0	6	20	0
INNER SIGNAL							6	17	0	6	20	47
UNALASKA/CAPE SEDANKA			1				6	17	0	6	20	0
UNALASKA/PRIEST ROCK							6	17	1	6	20	3
UNALASKA/CAPE WISLOW							6	17	0	6	21	0
UNALASKA/BISHOP POINT			1				6	17	285	6	21	186
Unnamed rock between BISHOP & KOVRIZHKA										6	21	10
UNALASKA/KOVRIZHKA							6	17	0	6	21	0
UNALASKA/MAKUSHIN BAY			1				6	17	88	6	21	154
UNALASKA/CAPE STARICHKOF							6	17	0	6	21	0
UNALASKA/SPRAY CAPE			1				6	17	0	6	21	0
UNALASKA/WHALEBONE CAPE							6	17	0	6	22	0
UNALASKA/CAPE IZIGAN			1	7	9	306	6	17	329	6	20	304
BOGOSLOF/FIRE ISLAND	1	1	1	6	23	320	6	17	358	6	21	405
UMNAK/CAPE IDAK							6	17	0	7	5	0
UMNAK/REINDEER POINT							6	17	0			
UMNAK/CAPE CHAGAK							6	17	0			
UMNAK/AGULIUK POINT							6	17	0			
UMNAK/CAPE ASLIK		1	1				6	17	73			
EMERALD										6	20	0
POLIVNOI ROCK			1				6	17	42	6	20	96
THE PILLARS			1				6	17	0	6	20	0
OGCHUL	1	1	1	7	9	143	6	17	132	6	20	152
VSEVIDOF		1	1				6	17	41	6	20	35
SAMALGA							6	17	0	6	20	0
ADUGAK	1	1	1	7	9	397	6	17	429	6	20	473
Eastern Aleutian Is. Total	**7**	**11**	**27**			**4,428**			**6,269**			**6,663**
Central Aleutian Islands												
ULIAGA			1				6	17	99			
KAGAMIL		1	1				6	17	0			
CHUGINADAK		1	1				6	17	79			
CARLISLE		1	1				6	17	0			
HERBERT		1	1				6	17	66			

Table 1.-- Cont.

		Trend sites		2005*			2006			2007		
Site Name and Region	**Rook.**	**1970s**	**1990s**	**M**	**D**	**Count**	**M**	**D**	**Count**	**M**	**D**	**Count**
YUNASKA	1	1	1				6	17	255	6	19	279
CHAGULAK		1	1				6	17	13			
AMUKTA+ROCKS		1	1				6	17	18	6	19	56
SEGUAM/FINCH POINT		1	1							6	19	0
SEGUAM/SW RIP		1	1							6	19	31
SEGUAM/SADDLERIDGE	1	1	1	6	28	724				6	19	668
SEGUAM/TURF POINT		1	1	7	9	36				6	19	8
SEGUAM/LAVA COVE		1	1							6	19	0
SEGUAM/LAVA POINT		1	1							6	19	0
SEGUAM/WHARF POINT		1	1							6	19	121
AGLIGADAK		1	1	7	9	13				6	19	15
AMLIA/EAST CAPE		1	1							6	19	55
AMLIA/CAPE MISTY										6	19	72
AMLIA/SVIECH. HARBOR			1	7	9	268				6	19	113
TANADAK (AMLIA)		1	1							6	19	0
SAGIGIK		1	1							6	19	10
ATKA/NORTH CAPE		1	1				6	20	279	6	20	140
ATKA/CAPE KOROVIN		1	1				6	20	0	6	20	30
SALT		1	1							6	20	0
AMTAGIS										6	19	0
SAGCHUDAK										6	19	0
KONIUJI/NORTH POINT							6	20	0	6	20	0
KASATOCHI/NORTH POINT	1	1	1	6	28	542	6	20	610	6	28	613
OGLODAK			1				6	20	111	6	19	58
IKIGINAK		1	1				6	20	8	6	19	16
FENIMORE			1				6	20	10	6	19	9
TAGALAK							6	20	134	6	28	162
CHUGUL							6	20	69	6	28	73
ANAGAKSIK		1	1				6	20	52	6	28	14
IGITKIN/SW POINT							6	20	0	6	20	0
GREAT SITKIN			1				6	20	0	6	20	0
LITTLE TANAGA STRAIT		1	1							6	28	15
SILAK							6	20	32	6	28	88
KAGALASKA			1				6	20	0	6	28	3
ADAK/CAPE MOFFET							6	20	0	7	1	0
ADAK/ARGONNE POINT							6	28	12	6	28	10
ADAK/LAKE POINT	1	1	1	7	8	705				6	28	693
ADAK/CAPE YAKAK				7	8	131				6	28	86
ADAK/CRONE ISLAND												
KANAGA/N CAPE			1				6	20	13	6	28	2
KANAGA/CAPE MIGA			1				6	20	0	6	28	0
KANAGA/SHIP ROCK	1		1	7	6	247				6	28	331
KANAGA/CAPE CHUNU										6	28	82
BOBROF							6	20	21			
TANAGA/BUMPY POINT			1							6	28	33
TANAGA/CAPE SASMIK			1							6	28	63

Table 1.-- Cont.

		Trend sites		2005*			2006			2007		
Site Name and Region	**Rook.**	**1970s**	**1990s**	**M**	**D**	**Count**	**M**	**D**	**Count**	**M**	**D**	**Count**
ILAK												
GRAMP ROCK	1	1	1	7	6	583						
UGIDAK		1	1									
TAG	1	1	1	7	6	272						
OGLIUGA												
SKAGUL/S. POINT												
KAVALGA		1	1									
GARELOI												
UNALGA+DINKUM ROCKS		1	1									
ULAK/HASGOX POINT	1	1	1	7	8	602						
AMATIGNAK/KNOB POINT			1							7	1	0
AMATIGNAK/NITROF POINT		1	1				6	28	38			
SEMISOPOCHNOI/POCHNOI			1	7	8	79	6	28	41			
SEMISOPOCHNOI/PETREL							6	28	43			
SEMISOPOCHNOI/TUMAN POINT							6	28	0			
SEMISOPOCHNOI/SW KNOB							6	28	0			
AMCHITKA/CAPE IVAKIN		1	1				6	28	0	7	1	0
AMCHITKA/EAST CAPE		1	1	7	8	99	6	28	103			
AMCHITKA/OMEGA POINT							6	28	0	7	1	0
AMCHITKA/ST. MAKARIUS			1				6	28	0	7	1	0
AMCHITKA/COLUMN ROCK	1		1	7	5	90						
AMCHITKA/BIRD										7	1	0
AMCHITKA/CHITKA POINT										7	1	0
AYUGADAK	1	1	1	7	5	171						
LITTLE SITKIN												
RAT			1									
SEGULA/GULA POINT							6	28	1			
SEGULA/CHUGUL POINT												
SEA LION ROCK (KISKA)			1									
TANADAK (KISKA)			1									
TWIN ROCKS (KISKA)												
KISKA/SOUTH HEAD							6	28	0			
KISKA/GERTRUDE-BUKHTI							6	28	0			
KISKA/SOBAKA-VEGA			1									
KISKA/CAPE ST STEPHEN**	1	1	1	7	5	181				6	27	211
KISKA/LIEF COVE**	1	1	1	7	5	205				6	27	164
KISKA/WITCHCRAFT POINT												
KISKA/PILLAR ROCK			1									
KISKA/SIRIUS POINT												
KISKA/WOLF POINT												
Central Aleutian Is. Total	**12**	**38**	**58**			**4,948**			**2,107**			**4,320**
Western Aleutian Islands												
BULDIR/EAST CAPE							6	28	0			
BULDIR/ROOKERY	1	1	1									
BULDIR/NW ROCKS												

Table 1.-- Cont.

		Trend sites		2005*			2006			2007		
Site Name and Region	**Rook.**	**1970s**	**1990s**	**M**	**D**	**Count**	**M**	**D**	**Count**	**M**	**D**	**Count**
INGENSTREM ROCKS							6	21	1			
SHEMYA			1				6	21	18			
NIZKI							6	21	0			
ALAID		1	1	7	2	184	6	21	86			
AGATTU/CAPE SABAK**	1	1	1	7	2	307	6	28	282	6	28	203
AGATTU/GILLON POINT	1	1	1	7	2	306	6	28	308			
DAN'S ROCKS							6	21	0			
ATTU/MASSACRE BAY			1				6	21	0			
ATTU/CHIRIKOF POINT			1				6	21	30			
ATTU/CHICHAGOF POINT			1				6	21	13			
ATTU/KRESTA POINT			1				6	21	0			
ATTU/CAPE WRANGELL	1		1	7	8	274	6	21	260			
Western Aleutian Is. Total	**4**	**4**	**10**			**1,071**			**998**			**203**
Eastern Bering Sea												
WALRUS	1			6	27	111						
Western Stock in Alaska Total	**39**	**87**	**161**			**19,923**			**21,203**			**26,714**
Aerial survey only												**26,136**

Notes regarding sites pooled (boxed) under the Rookery and Trend Sites columns:

1) In SE Alaska, Forrester/Sea Lion Rk, Forrester/East Rk, Forrester/North, Forrester/C Horn Rk, and Forrester/Lowrie are often combined into a single Forrester Complex site.
2) In the W Gulf of Alaska, Clubbing Rocks is often separated into Clubbing Rocks North and South.
3) In the E Aleutians, Ugamak/Ugamak Bay, Ugamak/North and Ugamak/Round are often combined into a single Ugamak Complex site.
4) In the E Aleutians, Rootok/North and Rootok/East are often combined into a single Rootok Island site.
5) In the C Aleutians, Adak/Lake Point, Adak/Cape Yakak, Adak/Cape Moffet and Adak/Argonne Point are often combined into a single Adak Island site.
6) In the W Aleutians, Buldir/East Cape, Buldir/Rookery, and Buldir/NW Rocks are often combined into a single Buldir Island site.

Table 2.--Counts of Steller sea lion pups at rookery (1 = rookery; Rook.) and selected haulout sites in Alaska, June and July 2005-2007 (M = month, D = day). In 2005, pups were counted from MF aerial photographs and during site visits (OS); in 2007, pups were counted from land-based overlooks (OV). Trend sites are those sites used for analyses of trends in survey counts and have been consistently surveyed since the 1970s or 1990s. * Site visit pup counts conducted in 2004 are used for these locations. For 'boxed' sites under rookery or trend site columns, see notes at end.

		Trend sites		2005-MF			2005-OS			2005	2007-OV		
Site Name and Region	**Rook.**	**1970s**	**1990s**	**M**	**D**	**Count**	**M**	**D**	**Count**	**Max**	**M**	**D**	**Count**
Southeast Alaska													
WHITE SISTERS	1			7	10	520							
BIALI ROCK	1			7	10	100							
HAZY	1			7	10	1,286							
FORRESTER/SEA LION RK				7	10	533							
FORRESTER/EAST RK				7	10	134							
FORRESTER/NORTH	1			7	10	951							
FORRESTER/C HORN RK				7	10	303							
FORRESTER/LOWRIE				7	10	1,508							
GRAVES ROCK	1			7	10	175							
Southeast Alaska Total						**5,510**							
Eastern Gulf of Alaska													
SEAL ROCKS	1	1	1	6	21	508	7	2	556	556			
WOODED (FISH)	1	1	1	6	21	96	7	3	159	159			
CHISWELL ISLANDS	1	1	1	6	21	44				44			
Eastern Gulf of Alaska Total						**648**			**715**	**759**			
Central Gulf of Alaska													
OUTER (PYE)	1		1	6	21	104				104			
SUGARLOAF	1	1	1	6	21	559				559			
USHAGAT/SW	1	1	1	6	21	55				55			
SEA OTTER			1				6	30	1	1			
MARMOT	1	1	1	6	23	433				433	7	13	465
TWOHEADED		1	1	6	23	16				16			
CHOWIET	1	1	1	6	23	432	6	28	309	432			
CHIRIKOF	1	1	1	6	23	123				123			
NAGAI ROCKS			1	6	23	31				31			
Central Gulf of Alaska Total						**1,753**			**310**	**1,754**			

Table 2.-- Cont.

Site Name and Region	Rook.	Trend sites 1970s	Trend sites 1990s	2005-MF M	2005-MF D	2005-MF Count	2005-OS M	2005-OS D	2005-OS Count	2005 Max.	2007-OV M	2007-OV D	2007-OV Count
Western Gulf of Alaska													
LIGHTHOUSE ROCKS	1		1	6	23	11				11			
ATKINS	1	1	1	6	23	328				328			
CHERNABURA	1	1	1	7	9	153				153			
THE WHALEBACK			1	6	23	24				24			
JUDE	1		1	6	23	168	6	26	206	206			
SUSHILNOI ROCKS				6	25	12				12			
PINNACLE ROCK	1	1	1	6	25	643				643			
CLUBBING ROCKS	1	1	1	6	25	528	6	25	583	583			
SOUTH ROCKS			1	7	9	44				44			
Western Gulf of Alaska Total						**1,911**			**789**	**2,004**			
Eastern Aleutian Islands													
SEA LION ROCK (AMAK)	1	1	1	6	23	158				158			
UGAMAK/NORTH	1	1	1	6	25	404	6	23	426	426			
UGAMAK/UGAMAK BAY				6	25	239	6	24	298	298	6	23	313
UGAMAK/ROUND				6	25	44	6	24	45	45			
AIKTAK			1	6	25	8				8			
ROOTOK/EAST			1										
ROOTOK/NORTH							6	22	1	1			
AKUN/BILLINGS HEAD*	1	1	1						85	85	7	3	119
AKUTAN/CAPE MORGAN	1	1	1	6	25	485	6	22	657	657			
UNALASKA/CAPE IZIGAN			1	7	9	21				21			
BOGOSLOF/FIRE ISLAND	1	1	1	6	23	225				225			
OGCHUL	1	1	1	7	9	78	6	21	65	78			
ADUGAK	1	1	1	7	9	185				185			
Eastern Aleutian Islands Total						**1,847**			**1,577**	**2,187**			
Central Aleutian Islands													
YUNASKA*	1	1	1						145	145			
SEGUAM/SADDLERIDGE	1	1	1	6	28	530				530			
SEGUAM/TURF POINT		1	1	7	9	7				7			
AGLIGADAK		1	1	7	9	0				0			
AMLIA/SVIECH. HARBOR			1	7	9	28				28			
KASATOCHI/NORTH POINT	1	1	1	6	28	372				372			
ADAK/LAKE POINT	1	1	1	7	8	311				311			
ADAK/CAPE YAKAK				7	8	0							
KANAGA/SHIP ROCK	1		1	7	6	221				221			
GRAMP ROCK	1	1	1	7	6	387				387			
TAG	1	1	1	7	6	144				144			
ULAK/HASGOX POINT	1	1	1	7	8	338				338			

Table 2.-- Cont.

		Trend sites		2005-MF			2005-OS			2005	2007-OV		
Site Name and Region	**Rook.**	**1970s**	**1990s**	**M**	**D**	**Count**	**M**	**D**	**Count**	**Max.**	**M**	**D**	**Count**
SEMISOPOCHNOI/POCHNOI			1	7	8	16				16			
AMCHITKA/EAST CAPE		1	1	7	8	24				24			
AMCHITKA/COLUMN ROCK	1		1	7	5	44				44			
AYUGADAK	1	1	1	7	5	83				83			
KISKA/CAPE ST STEPHEN	1	1	1	7	5	82				82	6	27	86
KISKA/LIEF COVE	1	1	1	7	5	115				115	6	27	48
Central Aleutian Islands Total						**2,702**			**145**	**2,847**			
Western Aleutian Islands													
BULDIR/EAST CAPE BULDIR/ROOKERY BULDIR/NW ROCKS	1	1	1	7	8	26				26			
ALAID		1	1	7	2	27				27			
AGATTU/CAPE SABAK	1	1	1	7	2	113				113	6	28	94
AGATTU/GILLON POINT	1	1	1	7	2	157				157			
ATTU/CAPE WRANGELL	1		1	7	8	47				47			
Western Aleutian Islands Total						**370**			**0**	**370**			
Eastern Bering Sea													
WALRUS	1			6	27	27	7	26	29	29			
Western Stock in Alaska Total										**9,950**			

Notes regarding sites pooled (boxed) under the Rookery and Trend Sites columns:

1) In SE Alaska, Forrester/Sea Lion Rk, Forrester/East Rk, Forrester/North, Forrester/C Horn Rk, and Forrester/Lowrie are often combined into a single Forrester Complex site.
2) In the E Aleutians, Ugamak/Ugamak Bay, Ugamak/North and Ugamak/Round are often combined into a single Ugamak Complex site.
3) In the E Aleutians, Rootok/North and Rootok/East are often combined into a single Rootok Island site.
4) In the C Aleutians, Adak/Lake Point, Adak/Cape Yakak, Adak/Cape Moffet and Adak/Argonne Point are often combined into a single Adak Island site.
5) In the W Aleutians, Buldir/East Cape, Buldir/Rookery, and Buldir/NW Rocks are often combined into a single Buldir Island site.

Table 3.--Counts of adult and juvenile Steller sea lions from two independent counters at terrestrial sites in Alaska. Animals were counted off digital images and medium format photographs taken in June and July 2007. 'Use' indicates whether the digital (D), medium format film (F), or both (B) counts were used in the analysis.

		Counter One		Counter Two		
Location Name	**Region**	**Digital**	**Film**	**Digital**	**Film**	**Use**
Chiswell Islands	EGOA	74	74	75	72	B
Danger	EGOA	120	114	123	118	B
Glacier	EGOA	521	529	541	532	B
Granite Cape	EGOA	25	24	24	25	B
Procession Rocks	EGOA	75	77	77	80	B
Unnamed rock between Steep & Rabbit	EGOA	91	90	88	91	B
The Needle	EGOA	143	143	145	147	B
Aialik Cape	EGOA	161	159	159	164	B
Wooded (Fish)	EGOA	287	274	285	281	B
Cape Hinchinbrook	EGOA		93		96	F
Cape St. Elias	EGOA		718		737	F
Hook Point	EGOA		130		133	F
Perry	EGOA		429		444	F
Point Elrington	EGOA		37		36	F
Seal Rocks	EGOA		807		798	F
Chirikof	CGOA	283	286	288	281	B
Chowiet	CGOA	434	419	427	410	B
Flat	CGOA	44	44	44	44	B
Kodiak/Cape Barnabas	CGOA	138	138	142	140	B
Kodiak/Cape Ikolik	CGOA	27	26	26	26	B
Kodiak/Cape Ugat	CGOA	240	249	253	251	B
Kodiak/Gull Point	CGOA	151	149	145	145	B
Kodiak/Steep Cape	CGOA	60	59	62	61	B
Latax Rocks	CGOA	116	112	116	117	B
Marmot	CGOA	540	546	546	550	B
Outer (Pye)	CGOA	260	263	271	264	B
Perl	CGOA	236	235	247	246	B
Sea Otter	CGOA	99	99	100	100	B
Sitkinak/Cape Sitkinak	CGOA	104	102	104	105	B
Twoheaded	CGOA	225	226	227	235	B
Ushagat/SW	CGOA	75	71	76	74	B
Kilokak Rocks	CGOA	196		200		D
Nagai Rocks	CGOA	444		453		D
Shakun Rocks	CGOA	114		111		D
Sugarloaf	CGOA	660		656		D
Sutwik	CGOA	127		127		D
Takli	CGOA	91		93		D
Kodiak/Cape Chiniak	CGOA		238		244	F
Atkins	WGOA	575	588	587	583	B
Bird	WGOA	97	96	95	98	B
Castle Rock	WGOA	38	38	37	37	B

Table 3.--Cont.

Location Name	Region	Counter One Digital	Counter One Film	Counter Two Digital	Counter Two Film	Use
Chernabura	WGOA	1214	1220	1254	1225	B
Clubbing Rocks South	WGOA	707	691	674	677	B
Jude	WGOA	446	449	441	444	B
Kupreanof Point	WGOA	54	53	54	52	B
Lighthouse Rocks	WGOA	150	152	155	151	B
Mitrofania	WGOA	116	113	118	118	B
Nagai/Mountain Point	WGOA	147	141	143	143	B
Olga Rocks NE	WGOA	36	35	36	36	B
Olga Rocks SW	WGOA	94	94	95	95	B
Sea Lion Rocks (Shumagins)	WGOA	44	44	44	43	B
Sushilnoi Rocks	WGOA	283	292	283	296	B
The Haystacks	WGOA	41	40	41	41	B
The Whaleback	WGOA	83	81	85	83	B
Unga/Acheredin Point	WGOA	224	231	222	228	B
Wosnesenski	WGOA	107	113	108	113	B
Caton	WGOA		416		416	F
Clubbing Rocks North	WGOA		376		375	F
Pinnacle Rock	WGOA		1037		1050	F
South Rocks	WGOA		456		457	F
Akun/Akun Bay	EAI	18	18	18	18	B
Adugak	EAI	466		477		D
Aiktak	EAI	48		49		D
Akun/Billings Head	EAI	517		525		D
Amak+Rocks	EAI	209		207		D
Bogoslof/Fire Island	EAI	406		403		D
Inner Signal	EAI	39		41		D
Kaligagan	EAI	6		6		D
Ogchul	EAI	150		152		D
Old Man Rocks	EAI	79		80		D
Polivnoi Rock	EAI	94		97		D
Rootok/North	EAI	129		140		D
Sea Lion Rock (Amak)	EAI	385		384		D
Tigalda/Rocks NE	EAI	229		225		D
Tigalda/South Side	EAI	105		105		D
Unalaska/Bishop Point	EAI	183		185		D
Unalaska/Cape Izigan	EAI	292		308		D
Unalaska/Makushin Bay	EAI	153		155		D
Unimak/Oksenof Point	EAI	263		275		D
Unnamed rock between Tigalda & Avatanak	EAI	42		42		D
Unnamed rock between Bishop & Kovrizhka	EAI	10		10		D
Vsevidof	EAI	35		35		D
Akutan/Cape Morgan	EAI		1162		1168	F
Akutan/Reef-Lava	EAI		56		56	F
Ugamak/North	EAI		689		643	F
Ugamak/Round	EAI		169		170	F
Ugamak/Ugamak Bay	EAI		661		647	F

Table 3.-- Cont.

		Counter One		Counter Two		
Location Name	**Region**	**Digital**	**Film**	**Digital**	**Film**	**Use**
Amukta+Rocks	CAI	56	56	56	56	B
Adak/Cape Yakak	CAI	84		86		D
Adak/Lake Point	CAI	697		689		D
Amlia/Cape Misty	CAI	71		72		D
Amlia/East Cape	CAI	54		56		D
Amlia/Sviech. Harbor	CAI	111		113		D
Anagaksik	CAI	14		14		D
Atka/Cape Korovin	CAI	24		24		D
Atka/North Cape	CAI	138		142		D
Chugul	CAI	71		75		D
Ikiginak	CAI	16		16		D
Kanaga/Cape Chunu	CAI	81		82		D
Kanaga/Ship Rock	CAI	335		327		D
Kasatochi/North Point	CAI	616		609		D
Little Tanaga Strait	CAI	15		15		D
Oglodak	CAI	58		58		D
Sagigik	CAI	10		10		D
Seguam/Saddleridge	CAI	650		655		D
Seguam/SW Rip	CAI	31		31		D
Seguam/Wharf Point	CAI	118		119		D
Silak	CAI	88		87		D
Tagalak	CAI	159		165		D
Tanaga/Bumpy Point	CAI	33		32		D
Tanaga/Cape Sasmik	CAI	62		62		D
Yunaska	CAI		274		275	F

Table 4.--Results of paired comparison *t*-tests for each possible pairing of non-pup counts from different counters and media (data in Table 3).

Counter	**Media**	**n**	***t***	**P**
One	Film vs. Digital	45	0.160	0.88
Two	Film vs. Digital	45	0.965	0.35
One vs. Two	Digital	95	1.503	0.14
One vs. Two	Film	62	1.611	0.12

Table 5.--Counts of adult and juvenile (non-pup) Steller sea lions observed at rookery and haulout 1970s trend sites (n = number of sites) in seven sub-areas of Alaska during June and July aerial surveys from 1976 to 2007. Kenai-Kiska consists of the combined counts in the central and western Gulf of Alaska and eastern and central Aleutian Islands. Overall percentage changes between various pairs of years are also shown. ND = no data. For western Aleutian Islands in 1985 (*), counts made in 1988 at Buldir were included. For eastern Gulf of Alaska in 1998 (**), counts made in 1999 were substituted for those sites not surveyed in 1998. Sub-area count totals for 2004-2007 (***) have been adjusted to account for film format-count differences (see text).

	Gulf of Alaska			Aleutian Islands				Western Stock
	Eastern	Central	Western	Eastern	Central	Western	Kenai-Kiska	in Alaska
Year	n = 9	n = 16	n = 9	n = 11	n = 38	n = 4	n = 74	n = 87
1976-79	7,053	24,678	8,311	19,743	36,632	14,658	89,364	111,075
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
2006***	2,773			4,721				
2007***	2,505		4,114					
Percent change								
1976-79 to 1985		-23%	-24%	-62%	-40%	-69%	-39%	
1976-79 to 1990/91	-23%							-74%
1985 to 1990		-63%	-38%	-49%	-64%		-58%	
1991 to 2000	-57%	-49%	-24%	-9%	-28%	-65%	-30%	-38%
1976-79 to 2000	-72%	-87%	-66%	-81%	-85%	-93%	-83%	-84%
2000 to 2004	28%	-7%	24%	23%	10%	-16%	12%	12%
2004 to 2006/07	-1%		17%	0%				

Table 6.--Counts of adult and juvenile (non-pup) Steller sea lions observed at 1990s rookery and haulout trend sites (n = number of sites) in seven sub-areas of Alaska during June-July aerial surveys from 1991 to 2007. Overall percentage changes between various pairs of years are also shown. * For eastern Gulf of Alaska in 1998, counts made in 1999 were substituted for those sites not surveyed in 1998. Sub-area count totals for 2004-2007 (**) have been adjusted to account for film format-count differences (see text).

	Gulf of Alaska			Aleutian Islands				Western Stock
	Eastern	**Central**	**Western**	**Eastern**	**Central**	**Western**	**Kenai-Kiska**	**In Alaska**
Year	n = 13	n = 33	n = 20	n = 27	n = 58	n = 10	n = 138	n = 161
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
2006**	3,101			6,031				
2007**	2,760							
Percent change								
1991 to 2000	-56%	-42%	-25%	-6%	-24%	-65%	-26%	-35%
2000 to 2004	43%	-12%	31%	20%	5%	-21%	10%	11%
2004 to 2006/07	-8%			1%				

Table 7.--Counts of adult and juvenile Steller sea lions at 1990s trend rookery and haulout sites in the range of the western stock in Alaska by sub-area, 1991-2007 (n = number of sites). Missed sites have been omitted from the entire sub-area time series to allow aggregation of counts at the largest number of consistently surveyed sites. A single haulout trend site was missed in the central and western Gulf of Alaska, and eastern Aleutian Islands during the 2007 survey. A single rookery trend site was missed in the western Aleutians Islands during the 2006 survey. The central Aleutian Island sub-area was divided into eastern (Uliaga through Tanaga) and western (Delarof Islands through Kiska) portions. Counts at sites within the Central-East Aleutian Islands sub-area in 2006 and 2007 were averaged and summed. * Total does not include the western portion of the Central Aleutian Islands (Central-West). ** For eastern Gulf of Alaska in 1998, counts made in 1999 were substituted for those sites not surveyed in 1998. Sub-area count totals in 2004-2007 (***) have been adjusted to account for resolution differences between film formats (see text).

	Gulf of Alaska			**Aleutian Islands**				
	Eastern	**Central**	**Western**	**Eastern**	**Central-East**	**Central-West**	**Western**	**Total***
Year	n = 13	n = 32	n = 19	n = 26	n = 37	n = 21	n = 9	n = 136
1991	4,812	7,741	5,166	5,253	3,989	4,667	4,014	30,975
1992	3,981	7,244	4,980	5,631	3,377	4,257	3,746	28,959
1994	3,612	6,364	5,534	5,575	3,431	3,478	2,769	27,285
1996	2,450	5,272	5,155	5,861	2,906	3,462	3,022	24,666
1998**	2,158	4,736	5,131	5,700	3,673	3,344	2,450	23,848
2000	2,102	4,519	3,926	4,916	3,761	2,799	1,504	20,728
2002	2,615	4,513	4,509	5,209	4,111	2,436	1,102	22,059
2004***	3,015	3,997	5,217	5,876	4,323	2,562	1,182	23,610
2006***	3,101			5,961	3,647		961	23,550
2007***	2,760	4,517	5,632	6,033				
Percent change								
1991 to 2000	-56%	-42%	-24%	-6%	-6%	-40%	-63%	-33%
2000 to 2004	43%	-12%	33%	20%	15%	-8%	-21%	14%
2004 to 2006/07	-8%	13%	8%	3%	-16%		-19%	0%
Missing Site		Long	Kak	Umnak/ C. Aslik			Buldir	

Table 8.--Counts of Steller sea lion non-pups (adults and juveniles) at principal western stock rookeries in Alaska during June and July surveys, 1976-2007. Counts from 1976 to 2002 were made from 35 mm slides or on-site counts (Walrus Island). Counts from 2004 to 2007 (except Akun-Billings Head) were made from vertically oriented medium format photographs and digital images; these are unadjusted counts and should not be used for trend analyses at individual sites because of differences in resolution between film formats (see text). Data for haulout sites (un-italicized site names) where significant number of pups were counted are also shown. Italicized site names are rookeries whose counts are summed in Table 7.

Sub-Area and Site	1976	1979	1985	1989	1990	1991	1992	1994	1996	1997	1998	2000	2002	2004	2006	2007
Eastern Gulf of Alaska																
Seal Rocks	1,709	2,961		2,159	1,471	1,220	784	636	544		730	749	768	841	1,119	803
Wooded (Fish)	878			1,333	1,232	1,350	1,005	648	502		330	396	396	523	619	282
Chiswell Islands	1,106			456	408	383	240	180	115			54	97	72	71	74
Central Gulf of Alaska																
Outer (Pye)	3,847	3,155		1,127	589	489	378	406	318	224	278	262	226	222	251	268
Sugarloaf	5,226	4,374	2,991	2,164	1,416	1,216	1,186	976	741	624	748	706	736	667	733	662
Ushagat	1,008		1,813	273	496	284	519	228	137	117	98	235	122	112	150	74
Marmot	9,862	8,450	4,983	2,331	1,766	1,458	1,581	1,091	1,102	780	726	671	848	703	686	551
Chowiet		4,441	2,059	737	897	716	771	599	592	538	515	504	582	541		424
Chirikof		5,199	2,346	1,278	1,061	946	770	432	360	294	266	276	320	303		300
Two-headed	1,615		1,240	479	268	382	330	364	216	308	378	254	227	266		228
Nagai Rocks	657		798	233	196	245	362	331	180	204	312	228	230	330		449
Western Gulf of Alaska																
Lighthouse Rocks		737		172	140	168	96	105	114	92	131	64	90	111	153	52
Atkins			1,562	755	728	616	792	571	624	544	602	537	560	651	663	585
Chernabura	1,437	1,504	487	544	442	650	459	676	422	729	624	496	496	828		1,228
Jude	302		315		200	363	352	410	355	434	450	391	374	474	338	445
Pinnacle Rock	1,745	2,731	1,588	1,366	1,305	1,048	1,092	977	1,026	1,007	864	868	1,034	1,011	1,167	1,057
Clubbing Rocks	1,217	1,162	1,251	856	1,021	920	970	931	957	934	858	712	830	911	1,037	1,063
The Whaleback				355	419	411	395	324	288		316	162	116	102	99	83
South Rocks	1,004		892		332	290	232	342	345	402	408	161	262	528	320	457

Table 8.--Cont.

Sub-Area and Site	1976	1979	1985	1989	1990	1991	1992	1994	1996	1997	1998	2000	2002	2004	2006	2007
Eastern Aleutian Islands																
Sea Lion Rock (Amak)	2,076		410	344	286	300	329	480	590	452	444	258	507	456		385
Ugamak (and Round)	5,006		1,503		945	1,062	954	971	854	840	742	746	1,044	1,304	1,319	1,493
Akun (Billings Head)	1,050		435	150	118	156	271	220	346	247	212	254	275	307	338	523
Akutan (Cape Morgan)	3,145		1,269	578	765	818	1,061	908	934	760	681	739	783	1,021	1,249	1,172
Bogoslof	3,308		1,287	682	713	558	540	413	382		274	347	356	380	358	405
Ogchul			547	217	240	228	235	208	155	166	136	117	105	139	132	152
Adugak	1,177		955	392	350	394	322	314	277		230	270	201	259	429	473
Amak	1,777		430	98	273	610	869	681	980	919	946	946	563	733	410	220
Aiktak	0		0	0	12	60	63	93	52	52	102	92	75	101	111	43
Central Aleutian Islands																
Yunaska		2,249	1,071	466	391	398	394	461	340		210	241	276	260	255	279
Seguam (Saddleridge)		4,018	2,942	602	833	684	696	658	553		586	570	666	923		668
Kasatochi		2,166	1,170	659	641	466	376	288	330		350	390	529	667	610	613
Adak (Lake Pt.-C. Yakak)		1,244	1,289	424	592	847	615	765	618		683	874	821	1,008		789
Kanaga (Ship Rock)		168	314	0		92	93	175	146		164	156	242	229		331
Gramp Rock		1,705	1,290	747	712	773	691	537	582		570	580	600	679		
Tag		1,740	944	590	478	440	370	309	320		370	301	279	242		
Ulak (Hasgox Point)		2,170	2,729	1,123	1,324	1,046	1,059	866	844		698	663	481	531		
Amchitka (Column Rocks)		1.943	728		197	233	194	188	137		112	92	71	85		
Ayugadak		1,463	702	389	401	324	313	285	281		179	146	182	152		
Kiska (Lief Cove)		4,953	1,715	510	528	506	357	359	341		284	272	174	170		
Kiska (Cape St. Stephen)		2,202	1,351	464	564	380	248	233	258		224	152	126	210		
Seguam (Turf Point)							101	146	0		0	82	84	58		8
Agligadak*		993	514	132	274	231	125	8	73		40	48	82	61		15
Amlia (Sviech. Harbor)		867	376	50	214	200	103	116	86		117	120	98	144		113
Semisopochnoi*		556				443	372	363	166		143	144	106	72	84	
Amchitka (East Cape)*		639	1,005	20	106	150	162	89	122		148	101	186	178	103	

Table 8.--Cont.

Sub-Area and Site	1976	1979	1985	1989	1990	1991	1992	1994	1996	1997	1998	2000	2002	2004	2006	2007
Western Aleutian Islands																
*Buldir***		5,024	1,396	1,058		587	454	344	312		336	129	94	108		
Agattu (Cape Sabak)		7,159	3,130	2,486		1,428	1,304	961	1,001		826	480	307	325	282	
Agattu (Gillon Point)						670	773	508	594		481	306	258	374	308	
Attu (Cape Wrangell)		4,400				736	754	839	721		584	310	264	257	260	
Alaid		2,475			429	398	534	222	280		268	156	158	125	86	
Eastern Bering Sea																
Walrus***		599		473		192		130							111	

* Sites formerly identified as rookeries but without a minimum of 50 pups born since 1975

** 1988 Buldir count used for 1985

*** Walrus: Count of 599 listed for 1979 actually from 1982; count of 473 listed for 1989 actually from 1988, and count of 111 listed for 2006 actually from 2005.

Table 9.--Counts of adult and juvenile (non-pup) Steller sea lions observed at rookery (A) and haulout (B) 1990s trend sites in sub-areas of Alaska during June-July aerial surveys from 1991 to 2007. Rookeries and haulouts are noted in Table 1. Sub-area count totals for 2004-2007 (*) have been adjusted to account for film format-count differences (see text). Counts at sites within the Central-East Aleutian Islands sub-area in 2006 and 2007 were averaged and summed.

A. Rookeries	**Gulf of Alaska**			**Kenai to**	**Western Stock**	**Western Stock in AK**
Year	**Eastern**	**Central**	**Western**	**Kiska**	**in Alaska**	**No Central-West AI**
1991	2,953	5,056	3,765	18,526	24,900	20,611
1992	2,030	4,908	3,761	17,787	23,102	19,417
1994	1,464	3,705	3,670	16,011	20,128	17,007
1996	1,161	3,223	3,498	15,009	18,798	15,723
1998	1,139	2,628	3,529	13,372	16,738	13,965
2000	1,199	2,517	3,068	12,753	15,177	12,842
2002	1,261	2,828	3,378	13,924	16,108	14,101
2004*	1,384	2,445	3,841	14,979	17,388	15,290
2006*	1,743					15,486
2007*	1,116	2,194	4,365			

A. Rookeries	**Aleutian Islands**					
Year	**Eastern**	**Central**	**Central-East**	**Central-West**	**Western**	**Western**
1991	3,516	6,189	2,487	3,702	3,421	2,834
1992	3,713	5,405	2,174	3,232	3,285	2,831
1994	3,513	5,122	2,347	2,776	2,653	2,308
1996	3,538	4,750	1,987	2,763	2,628	2,316
1998	2,785	4,430	1,993	2,437	2,227	1,891
2000	2,731	4,437	2,231	2,206	1,225	1,096
2002	3,272	4,447	2,534	1,913	923	829
2004*	3,725	4,968	2,975	1,994	1,025	921
2006*	4,116		2,559			819
2007*	4,434					
Missing Site						Buldir

Table 9.--Cont.

B. Haulouts			Gulf of Alaska			Kenai to	Western Stock
Year	Eastern	Central	Central	Western	Western	Kiska	In Alaska
1991	1,859	2,816	2,685	1,573	1,401	8,623	11,662
1992	1,951	2,450	2,336	1,351	1,219	8,024	10,889
1994	2,148	2,800	2,659	2,048	1,864	8,786	11,395
1996	1,289	2,177	2,049	1,858	1,657	8,082	10,077
1998	1,019	2,179	2,109	1,838	1,602	9,593	11,171
2000	903	2,038	2,002	928	858	7,348	8,659
2002	1,354	1,766	1,686	1,239	1,131	7,094	8,721
2004*	1,631	1,583	1,552	1,392	1,376	7,158	9,050
2006*	1,358						
2007*	1,644		2,323		1,267		
Missing Site			Long		Kak		

B. Haulouts				Aleutian Islands			Western Stock in AK
Year	Eastern	Eastern	Central	Central-East	Central-West	Western	No Central-West AI
1991	1,767	1,737	2,467	1,502	965	1,180	10,364
1992	1,994	1,918	2,228	1,203	1,025	915	9,542
1994	2,151	2,062	1,786	1,084	702	461	10,278
1996	2,429	2,323	1,618	919	699	706	8,943
1998	2,989	2,915	2,587	1,680	907	559	9,884
2000	2,259	2,185	2,123	1,530	593	408	7,886
2002	1,989	1,938	2,100	1,577	523	273	7,958
2004*	2,265	2,151	1,917	1,348	569	261	8,320
2006*	1,915	1,844		1,088		142	8,064
2007*		1,600					
		Umnak					
Missing Site		C.Aslik					

Table 10.--Counts of Steller sea lion pups at principal western stock rookeries in Alaska during June and July surveys, 1978-2007. 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=Aerial survey: pups counted from medium format photographs or high resolution digital (2007 only) images taken vertically over rookery sites. Counts at italicized rookeries that are highlighted in bold were used for time period/sub-area summaries in Table 9. Data for haulout sites where significant numbers of pups have been counted are also shown (*). ** Sites formerly identified as rookeries but without a minimum of 50 pups born since 1978.

Sub-Area and Rookery	1978	1979	1982	1984	1985	1986	1989	1990	1991	1992	1993	1994	1995	1996	1997	1997
Count type	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	MF
Eastern Gulf of Alaska																
Seal Rocks	**545**						553	571	657		566	**598**		352	487	**491**
Wooded (Fish)	**29**										514	**305**		232		**120**
Chiswell Islands																
Central Gulf of Alaska																
Outer (Pye)	431	**888**					**557**	**363**	180		181	**119**				104
Sugarloaf	**5,021**						**2,109**	**1,683**		1,000		**958**			673	541
Ushagat																
Marmot	6,140	**6,741**		5751		**4,381**	2,199		**1,611**		**986**	**804**		632	762	759
Chowiet	**4,670**					**1,731**	820	343		**636**		**625**				
Chirikof	**1,573**					**1,476**	709	607	**656**		344	**325**				
Two-headed*																
Nagai Rocks*																
Western Gulf of Alaska																
Lighthouse Rocks	250															
Atkins	2,750	**4,538**		**2,093**		1,072		433	**485**			**324**		366		
Chernabura	486	**646**		200		**379**		197		**211**		**139**				
Jude																
Pinnacle Rock		**2,748**		**2,013**					**794**		**773**	**652**				
Clubbing Rocks		**1,419**		**1,394**						**433**		**547**				
The Whaleback*																
South Rocks*	44															

Table 10.--Cont.

Sub-Area and Rookery	1978	1979	1982	1984	1985	1986	1989	1990	1991	1992	1993	1994	1995	1996	1997	1997
Count type		OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	MF
Eastern Aleutian Islands																
Sea Lion Rock (Amak)																
Ugamak (and Round)					**1,635**	1,386		**847**	813			**574**		706	589	
Akun (Billings Head)					**60**			**63**	64		51	**69**				
Akutan (Cape Morgan)					**1,130**			**442**		558		**631**				
Bogoslof		914			**1,109**		358	461	**501**		322	**302**	282		281	
Ogchul					172							94				
Adugak					**844**			**262**				**180**				
Amak*																
Aiktak*																
Central Aleutian Islands																
Yunaska		752			**1,026**			**230**				**217**			192	
Seguam (Saddleridge)		2,475			**2,635**		529	**684**				**444**			463	
Kasatochi		213			**892**			**178**				**215**			268	
Adak (Lake Point-Cape Yakak)					**558**			**137**				**327**				
Kanaga (Ship Rock)																
Gramp Rock					**909**			**448**				**425**				
Tag					**703**			**357**				**234**				
Ulak (Hasgox Point)		204			**1,236**			**790**				**638**				
Amchitka (Column Rocks)		135						**148**				**114**				
Ayugadak		22			**329**			**163**				**142**				
Kiska (Lief Cove)		476			**882**		293	**221**				**233**				
Kiska (Cape St. Stephen)		137					258	**212**				**120**				
Seguam (Turf Point)*																
Agligadak**								0								
Amlia (Sviechnikof Harbor)*								26								
Semisopochnoi**		25										21				
Amchitka (East Cape)**												6				

Table 10.--Cont.

Sub-Area and Rookery	1978	1979	1982	1984	1985	1986	1989	1990	1991	1992	1993	1994	1995	1996	1997	1997
Count type		OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	MF
Western Aleutian Islands																
Buldir		1,142					494	381				120			**120**	
Agattu (Cape Sabak)							907	1,127							**379**	
Agattu (Gillon Point)															**258**	
Attu (Cape Wrangell)		642													**222**	
Alaid*																
Eastern Bering Sea																
Walrus			334						63			61			**35**	

Sub-Area and Rookery	1998	1998	1999	2000	2000	2001	2001	2002	2002	2003	2004	2004	2005	2005	2007
Count type	OS	MF	OS	OS	MF	OS	MF	OS	MF	OS	OS	MF	OS	MF	OS
Eastern Gulf of Alaska															
Seal Rocks	**542**	542			522	**500**			475	**543**		573	**556**	508	
Wooded (Fish)	**147**	140		149	97		85		**86**	**173**		123	**159**	96	
Chiswell Islands				58		54	45		52					44	
Central Gulf of Alaska															
Outer (Pye)	**113**	108		108	148		**104**	58	92		**59**			**104**	
Sugarloaf	**703**	673			645	**490**	419		444		**488**			**559**	
Ushagat					54		24		42			43	55	55	
Marmot	**642**	624			514		466		**515**	**505**	474	494		433	**465**
Chowiet	**234**					278	**387**			**368**			309	**432**	
Chirikof	**184**			187			90	**225**			**189**			**123**	
Two-headed*					16		8		20	20		28	1	16	
Nagai Rocks*							31	19	26		22	23		31	

Table 10.--Cont.

Sub-Area and Rookery	1998	1998	1999	2000	2000	2001	2001	2002	2002	2003	2004	2004	2005	2005	2007
Count type	OS	MF	OS	OS	MF	OS	MF	OS	MF	OS	OS	MF	OS	MF	OS
Western Gulf of Alaska															
Lighthouse Rocks				5			4	7	4				5	11	
Atkins	**352**			262			172	224	**274**	128	**266**		75	**328**	
Chernabura	**54**					92	**138**		115	**82**			115	**153**	
Jude							182	119	130	61	187		206	168	
Pinnacle Rock	**639**			634			501	**769**	466		**663**			**643**	
Clubbing Rocks	**448**					**490**	417			**566**			**583**	528	
The Whaleback*				12			13	16	16	22			23	24	
South Rocks*									36					44	
Eastern Aleutian Islands															
Sea Lion Rock (Amak)	134						161	160	138		185	177		158	
Ugamak (and Round)	**558**					**570**				**686**	541		**769**	687	
Akun (Billings Head)	**56**			41				**55**			**85**				**119**
Akutan (Cape Morgan)	**505**					**508**				**497**			**657**	485	
Bogoslof	**220**			249			**256**	180	219		**278**	217		**225**	
Ogchul	42					47	57		53	69			65	78	
Adugak	**135**			153			**172**	160	151		**185**			**185**	
Amak*							0	3	1						
Aiktak*							21	10	5		7			8	
Central Aleutian Islands															
Yunaska	**161**			136			96	**145**			**145**	75			
Seguam (Saddleridge)	**479**					**468**	410				517	506		**530**	
Kasatochi	**247**						258	**302**	300		354			**372**	
Adak (Lake Point-Cape Yakak)	**340**						**395**	363	370					**311**	
Kanaga (Ship Rock)							92		113					221	
Gramp Rock	**456**						430	**444**	432			439		**387**	
Tag	**238**						**155**	153	148			150		**144**	
Ulak (Hasgox Point)	**521**						**332**	331	322			257		**338**	

Table 10.--Cont.

Sub-Area and Rookery	1998	1998	1999	2000	2000	2001	2001	2002	2002	2003	2004	2004	2005	2005	2007
Count type	OS	MF	OS	OS	MF	OS	MF	OS	MF	OS	OS	MF	OS	MF	OS
Amchitka (Column Rocks)	**70**							**52**	43		45			**44**	
Ayugadak	**89**							**90**	85			66		**83**	
Kiska (Lief Cove)	**179**							**158**	136			101		**115**	48
Kiska (Cape St. Stephen)	**54**							**71**	62			75		82	**86**
Seguam (Turf Point)*			30			24		23				15		7	
Agligadak**	0										2			0	
Amlia (Sviechnikof Harbor)*	13							22			28			28	
Semisopochnoi**	6						2		24			19		16	
Amchitka (East Cape)**	9					5		0	16			23		24	
Western Aleutian Islands															
Buldir	**122**							**42**	42					**26**	
Agattu (Cape Sabak)	**314**							**212**				159		**113**	94
Agattu (Gillon Point)	**213**							**159**			174			**157**	
Attu (Cape Wrangell)	**154**							**75**				47		**47**	
Alaid*														27	
Eastern Bering Sea															
Walrus						39							29	27	

Table 11.--Counts of Steller sea lion pups at selected rookeries (italicized in Table 8) in seven sub-areas of the western stock in Alaska from 1978-1979 to 2005-2007. The number of rookeries in each sub-area (n) selected for analysis is indicated. The maximum count during each period at the selected rookeries 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 shown.

	Gulf of Alaska			**Aleutian Islands**			**Kenai to**	**Western Stock**
	Eastern	**Central**	**Western**	**Eastern**	**Central**	**Western**	**Kiska**	**in AK**
Years	n = 2	n = 5	n = 4	n = 5	n = 11*	n = 4	n = 25	n = 31
1978-1979	574	18,893	9,351					
1985-1989		10,254	5,879	4,778	9,382		30,114	
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				
2005-2007	715	1,683	1,707	1,955	2,555	343	7,900	8,958
Percent Change								
1978-79 to 2001-2002	2%	-91%	-82%					
1985-89 to 2001-2002		-83%	-72%	-67%	-72%		-75%	
1990-92 to 2001-2002		-65%	-13%	-26%	-27%		-40%	
1998 to 2001-2002	-15%	-8%	12%	6%	-8%	-39%	-1%	-6%
2001-2002 to 2005-2007	22%	-2%	2%	25%	-2%	-30%	4%	4%

* 1985-89 CAI count does not include Amchitka/Column Rocks (n = 10);
2005-2007 CAI count includes 2004 count from Yunaska.

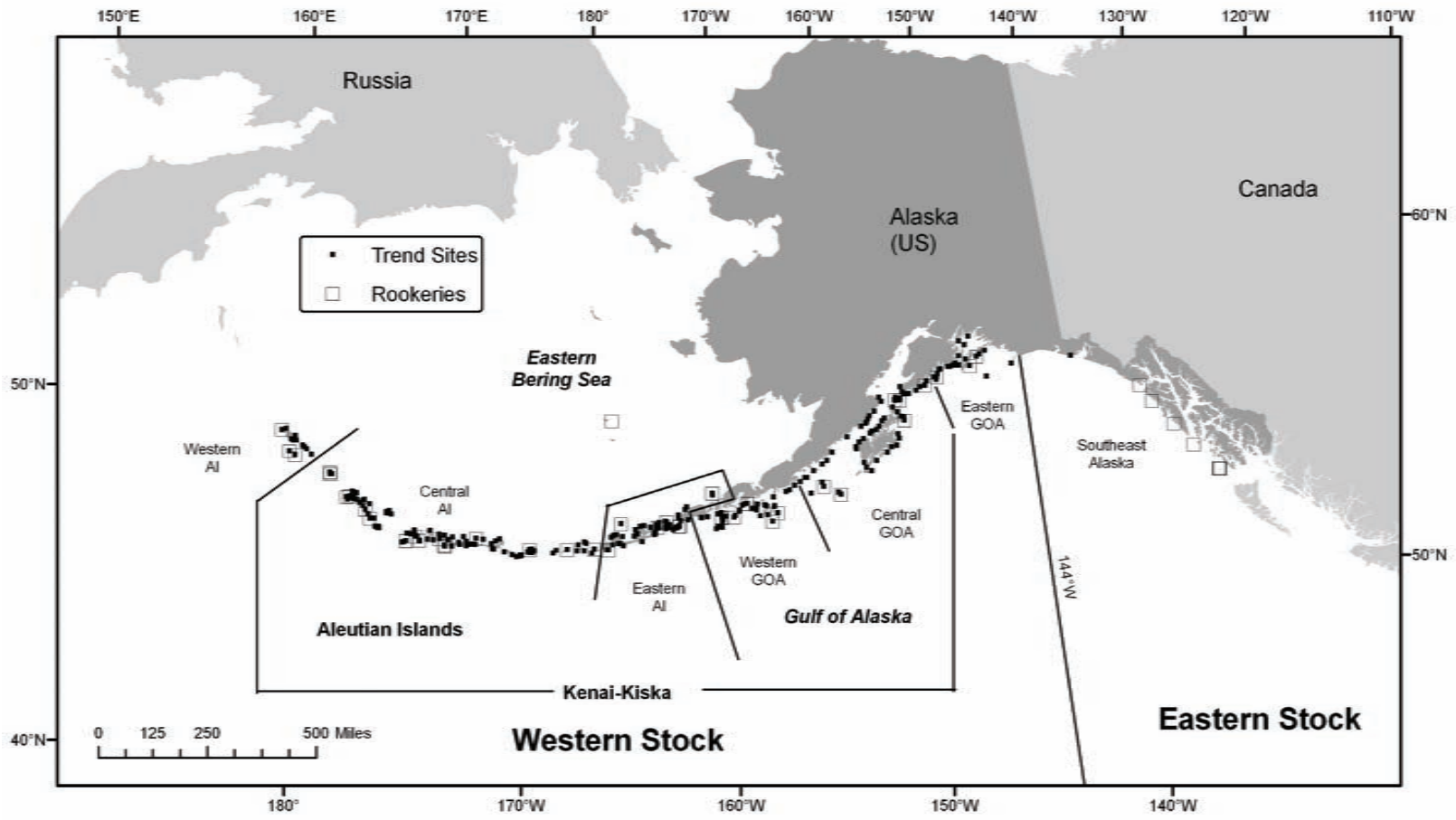

Figure 1.--Terrestrial rookery and haulout sites in the range of the eastern and western stocks of Steller sea lion in Alaska used in the analysis of population trends. Boundaries of the eastern, central, and western sub-areas of the Gulf of Alaska (GOA) and Aleutian Islands (AI), as well as the Kenai-Kiska area are shown. The eastern and western stocks breed on rookeries east and west of 144°W, respectively.

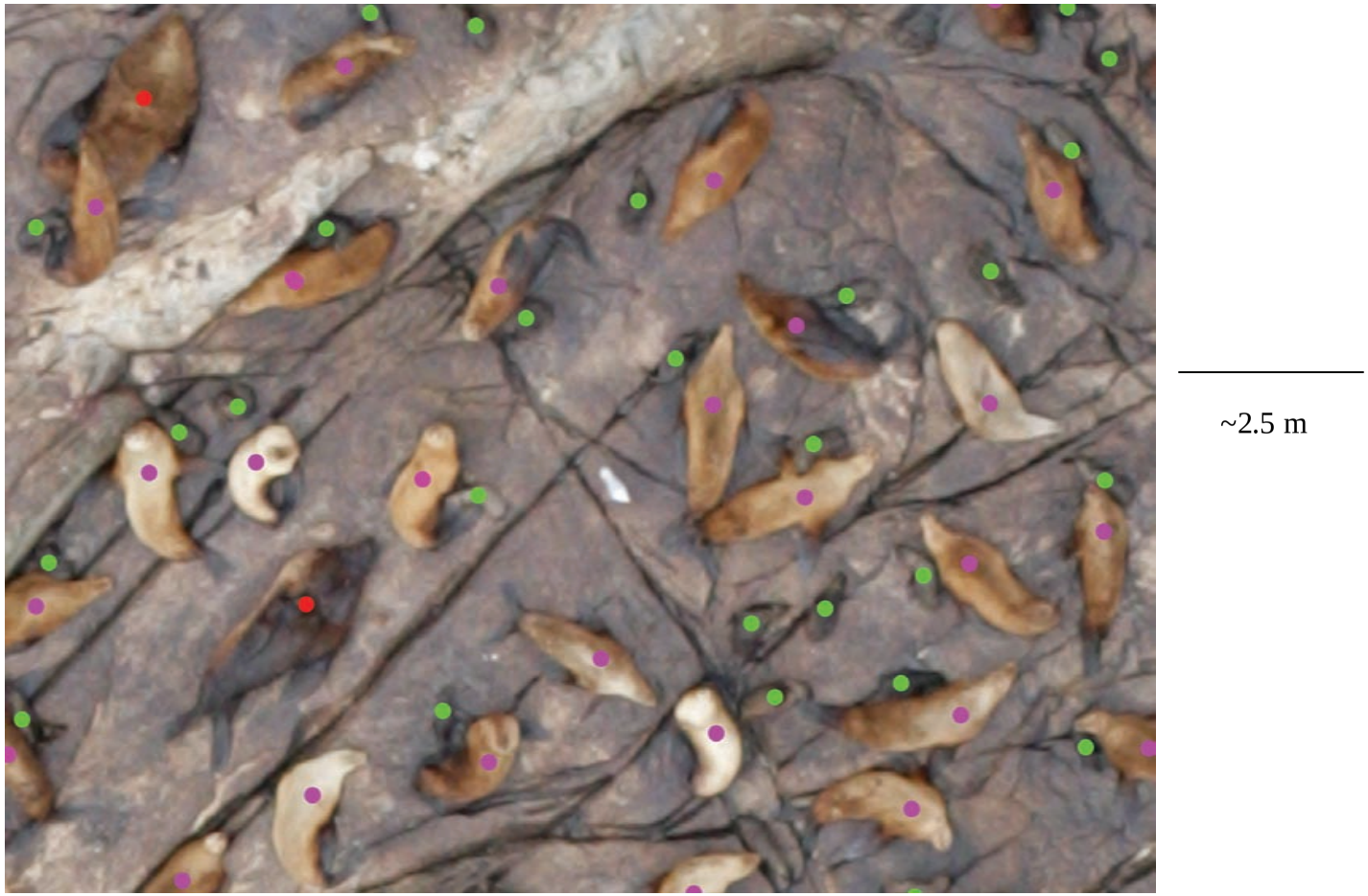

Figure 2.--Detail of digital photograph (taken at an altitude of 622 ft) of Steller sea lions hauled out on Atkins Island, 14 June 2007. Colored dots were used to individually count adult male (red), adult female (pink), sub-adult male (blue; none in photo), juvenile (yellow; none in photo), and newborn (pups: green) sea lions; counts of each sex/age class were tallied by the photo management software.

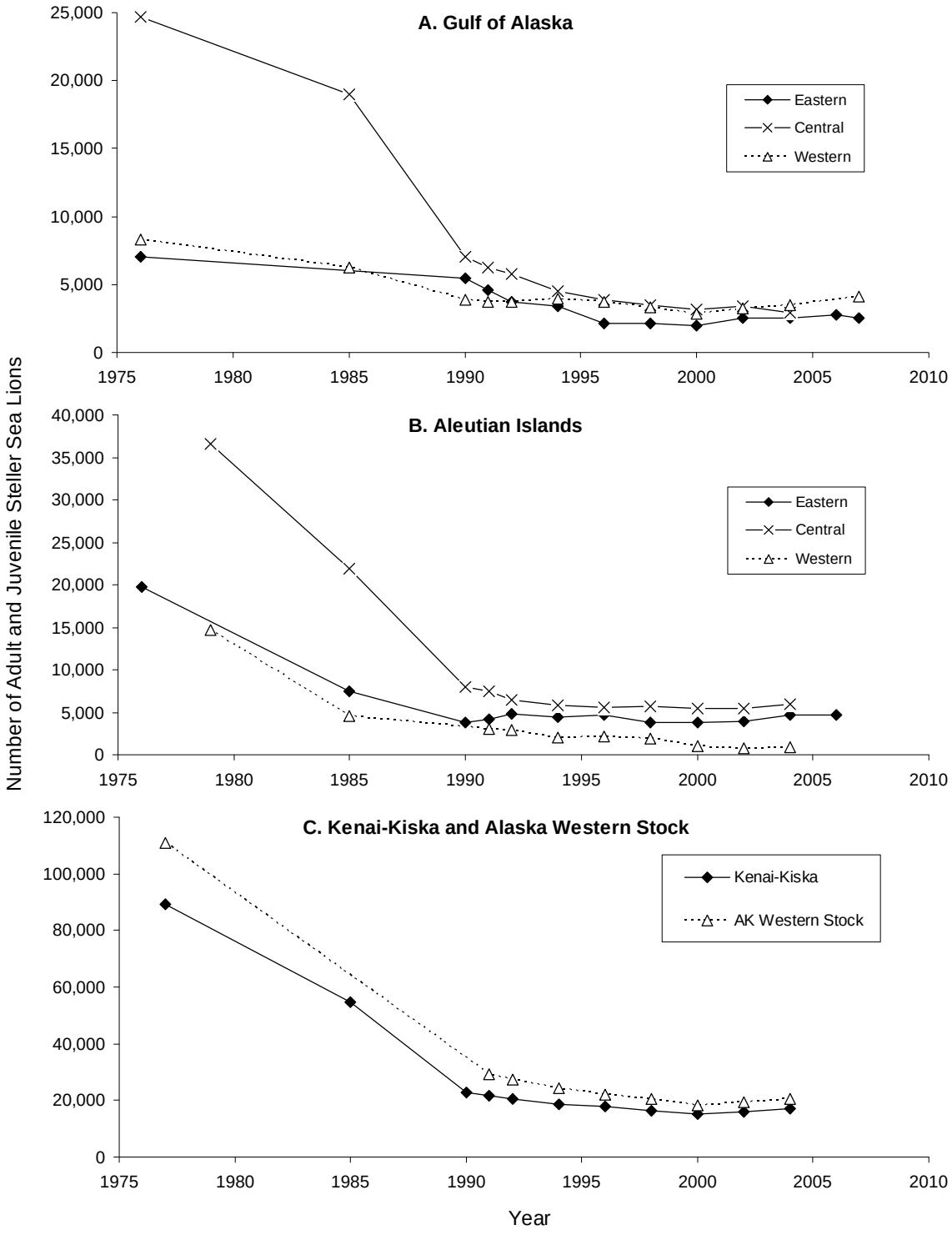

Figure 3.--Number of adult and juvenile Steller sea lions on 1970s trend sites (Table 1) from the late 1970s through 2007 (data in Table 5) in the Gulf of Alaska (A), Aleutian Islands (B), Kenai-Kiska area (C) and throughout the range of the western stock in Alaska. Summary counts for the late 1970s in C are plotted at year = 1977.

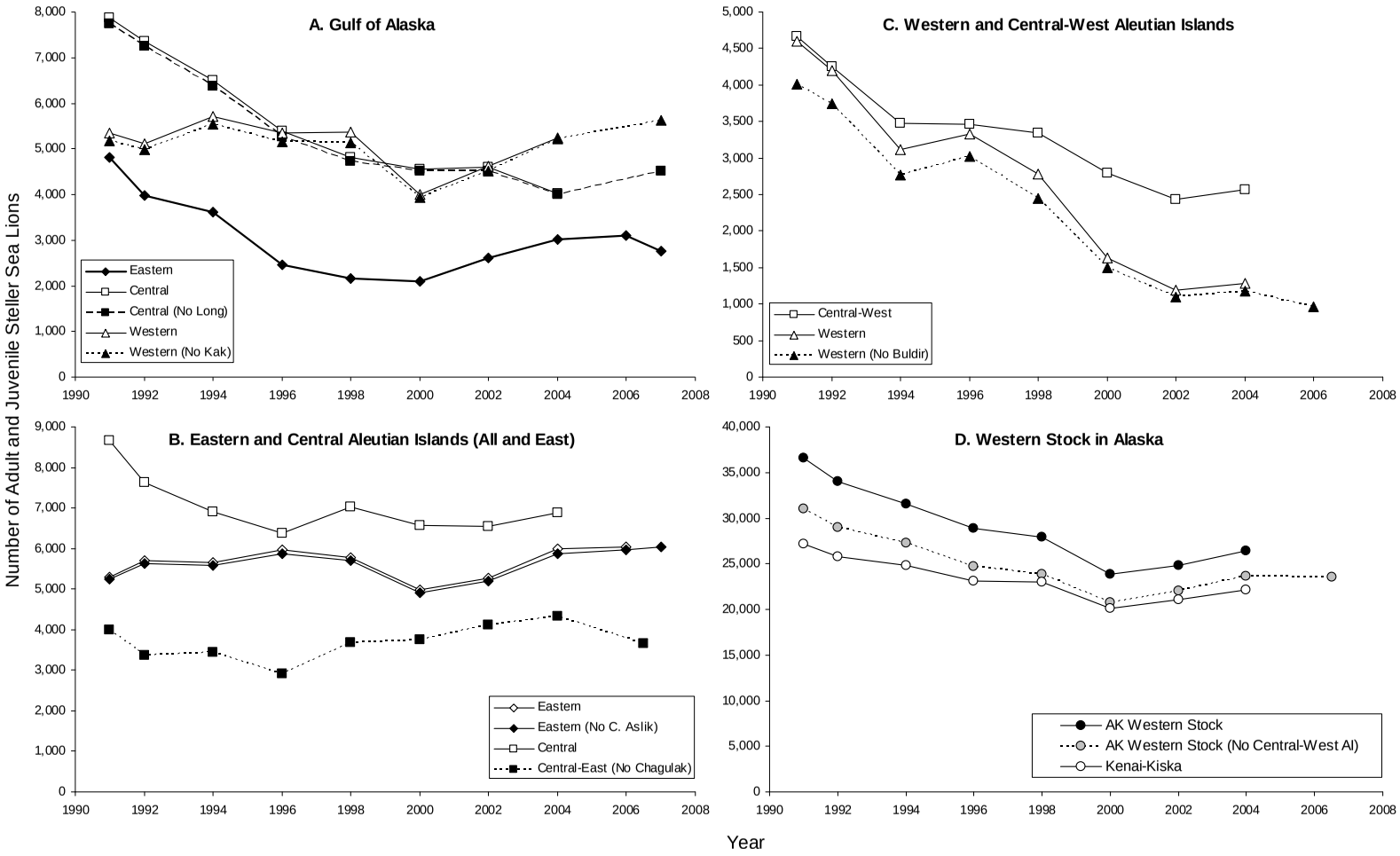

Figure 4.--Number of adult and juvenile Steller sea lions on 1990s trend sites (Table 1) from 1991 through 2007 (data in Tables 6 and 7) in the Gulf of Alaska (A), Eastern and Central (including Central-East) Aleutian Islands (B), Western and Central-West Aleutian Islands (C), and in the range of the western stock in Alaska (D). Central-East subarea counts by site in 2006 and 2007 were averaged and the total is plotted at year = 2006.5.

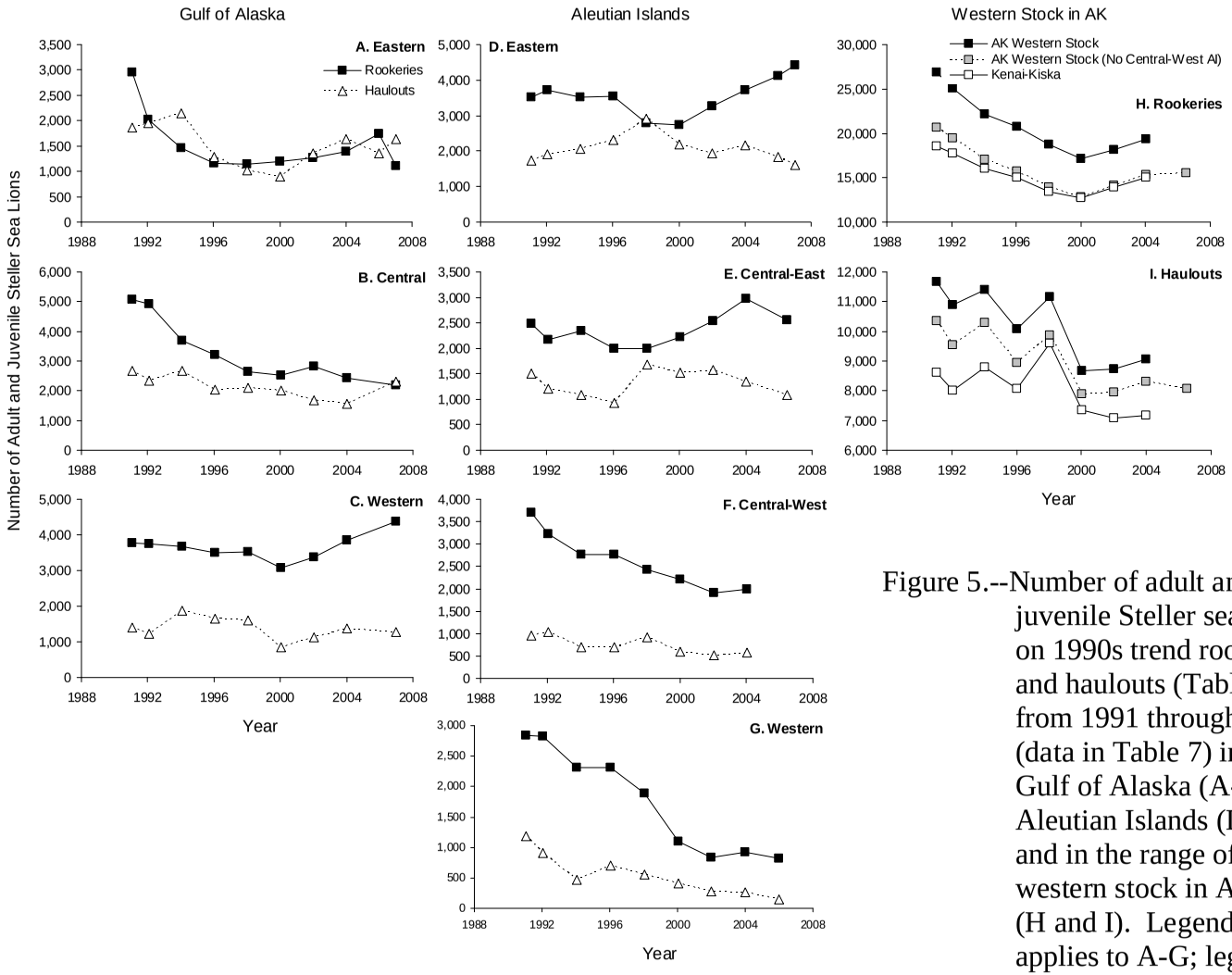

Figure 5.--Number of adult and juvenile Steller sea lions on 1990s trend rookeries and haulouts (Table 1) from 1991 through 2007 (data in Table 7) in the Gulf of Alaska (A-C), Aleutian Islands (D-G), and in the range of the western stock in Alaska (H and I). Legend in A applies to A-G; legend in H applies to I.

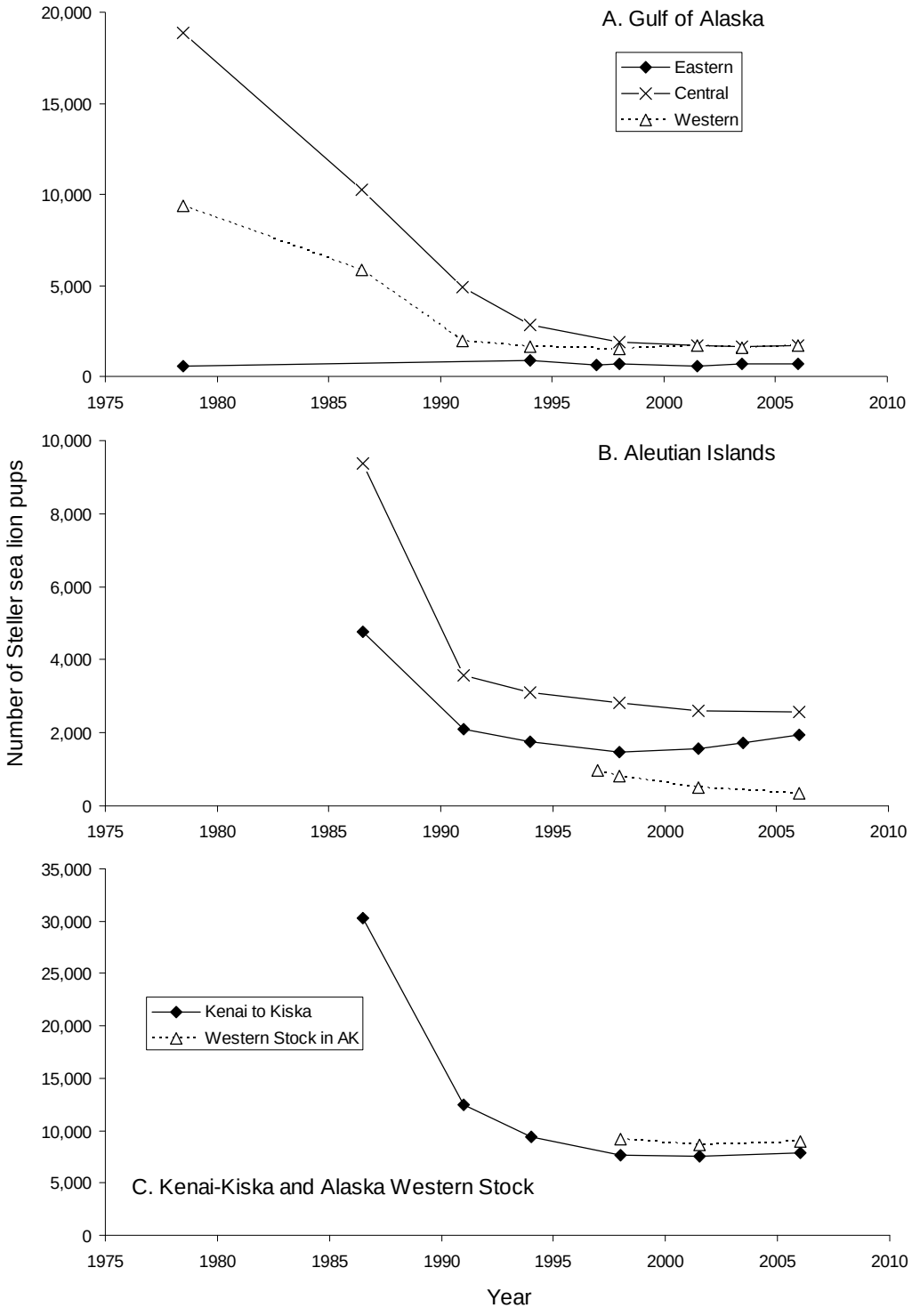

Figure 6.--Number of Steller sea lion pups counted on trend rookeries (Table 10) from the late 1970s through 2007 (data in Table 9) in the Gulf of Alaska (A), Aleutian Islands (B), Kenai-Kiska area (C) and throughout the range of the western stock in Alaska. Pup counts for time periods are plotted at the average year.

Appendix. Memorandum to the Record by Fritz et al. (25 September 2006).

United States Department of Commerce
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National Marine Fisheries Service
Alaska Fisheries Science Center
National Marine Mammal Laboratory
7600 Sand Point Way NE
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25 September 2006 F/AKC3:lwf

Memorandum For: The Record

From: Lowell Fritz and Tom Gelatt, NMML
Morgan Lynn and Wayne Perryman, SWFSC

Subject: Survey of Adult and Juvenile Steller Sea Lions, June 2006

An aerial survey to assess trends in numbers of western stock (wDPS) adult and juvenile Steller sea lions in Alaska (from Cape St. Elias at 145°W to Attu Island at 172°E) was conducted by NMFS from 14-30 June 2006. As in 2004 (Fritz and Stinchcomb 2005), the 2006 survey was conducted using medium format, vertical photogrammetric techniques by NMFS Southwest Fisheries Science Center. Aerial surveys for non-pups are conducted in mid-late June, when the greatest proportion of adults is onshore to give birth and breed. The 2006 survey, however, did not result in a complete assessment of numbers at trend sites across the Alaskan range of the wDPS of Steller sea lion (Tables 1, 2, and 3). Trend sites are those that have been consistently surveyed since the mid-1970s (70s Trend Sites) or 1990 (90s Trend Sites). In 2006, we were able to survey only 53 of 87 70s Trend Sites, and only 106 of 161 90s Trend Sites because: 1) the start of the survey was delayed because of a court-ordered cessation (beginning 26 May 2006) of all Steller sea lion research authorized by permits issued by NMFS, and 2) bad weather (e.g., low clouds, fog) reduced the number of days on which it was possible to conduct a survey. Between 2000 and 2004, counts of non-pups at wDPS trend sites in Alaska increased 11-12%, and this was the first increase observed across 3 surveys (2000, 2002, and 2004) since the late 1970s. Because of the incomplete nature of the 2006 aerial survey, there is no new information to update the non-pup abundance trend for the entire western stock of Steller sea lions in Alaska.

Although not all wDPS 90s trend sites in Alaska were surveyed in 2006, all 90s trend sites were surveyed in two of the six Alaskan sub-areas:

- eastern Gulf of Alaska (E GULF: 145°-150°W; N=13) and
- eastern Aleutian Islands (E ALEU: 163°-169°W; N=27) (Tables 1 and 3).

All 90s trend sites except one were surveyed in two other sub-areas:

- western Gulf of Alaska (W GULF: 157°-163°W; N=19 of 20) and

- western Aleutian Islands (W ALEU: 172°-176° E; N=9 of 10) (Tables 1 and 3).

These complete or nearly complete sub-area surveys in 2006 convey some information about local trends (Figure 1). Counts of non-pup sea lions on 90s trend sites in the E GULF, E ALEU, and W GULF were essentially unchanged between 2004 and 2006. For each of these 3 sub-areas, counts had increased considerably (20-43%) between 2000 and 2004. Thus, the 2006 count indicates that the population of adult and juvenile Steller sea lions in these areas may have stabilized. In the W ALEU, non-pup counts on the 9 trend sites surveyed in 2006 declined 19% from 2004, suggesting that the decline observed in the W ALEU sub-area may be continuing.

Literature Cited

Fritz, L. W., and C. Stinchcomb. 2005. Aerial, ship, and land-based surveys of Steller sea lions (*Eumetopias jubatus*) in the western stock in Alaska, June and July 2003 and 2004. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-153, 56 p.

Appendix Table 1. Counts of adult and juvenile (non-pup Steller sea lions) at TREND ROOKERIES AND HAUL-OUTS from medium-format aerial photos taken in June 2004 and June 2006. Trend Sites surveyed regularly since the 1970s, 1990s, and those that are rookeries are noted. Rookeries labelled Y* are 'new' rookeries; originally not included as rookeries but have had 50 pups since 1975. Rookeries labelled N* are listed as critical habitat rookeries, but no record of 50 pups since 1975.

SITENAME	REGION	70s TREND	90s TREND	Rookery	2004	2006
CAPE ST. ELIAS	E GULF	X	X		318	414
CAPE HINCHINBROOK	E GULF		X		496	237
SEAL ROCKS	E GULF	X	X	Y	841	1,119
WOODED (FISH)	E GULF	X	X	Y	523	619
GLACIER	E GULF	X	X		620	466
THE NEEDLE	E GULF	X	X		123	127
POINT ELRINGTON	E GULF	X	X		132	58
CAPE PUGET	E GULF		X		0	0
CAPE FAIRFIELD	E GULF		X		0	0
RUGGED	E GULF	X	X		0	0
AIALIK CAPE	E GULF		X		1	0
CHISWELL ISLANDS	E GULF	X	X	Y*	72	71
SEAL ROCKS (KENAI)	E GULF	X	X		3	4
OUTER (PYE)	C GULF		X	Y	222	251
GORE POINT	C GULF		X		0	0
EAST CHUGACH	C GULF		X		0	
PERL	C GULF		X		49	
NAGAHUT ROCKS	C GULF		X		1	
ELIZABETH/CAPE ELIZABETH	C GULF		X		28	
SUGARLOAF	C GULF	X	X	Y	667	733
USHAGAT/NW	C GULF	X	X		3	0
USHAGAT/SW	C GULF	X	X	Y*	101	141
USHAGAT/ROCKS SOUTH	C GULF	X	X		8	9
LATAX ROCKS	C GULF	X	X		56	
SEA OTTER	C GULF		X		127	
RK NEAR SEA OTTER	C GULF		X		10	
AFOGNAK/TONKI CAPE	C GULF		X		0	
SEA LION ROCKS (MARMOT)	C GULF	X	X		2	
MARMOT	C GULF	X	X	Y	703	686
LONG ISLAND	C GULF	X	X		32	
KODIAK/CAPE CHINIAK	C GULF	X	X		87	
UGAK	C GULF		X		0	
KODIAK/GULL POINT	C GULF		X		109	
KODIAK/CAPE BARNABAS	C GULF	X	X		0	
TWOHEADED	C GULF	X	X		266	
SITKINAK/CAPE SITKINAK	C GULF	X	X		80	
KODIAK/CAPE UGAT	C GULF		X		2	167
KODIAK/STEEP CAPE	C GULF		X		0	14
SHAKUN ROCKS	C GULF		X		104	67

Appendix Table 1 (continued) SITENAME	REGION	70s TREND	90s TREND	Rookery	2004	2006
TAKLI	C GULF		X		85	157
PUALE BAY	C GULF		X		58	2
UGAIUSHAK	C GULF	X	X		0	0
SUTWIK	C GULF	X	X		206	114
CHOWIET	C GULF	X	X	Y	541	
CHIRIKOF	C GULF	X	X	Y	303	
NAGAI ROCKS	C GULF		X		330	
CHERNABURA	W GULF	X	X	Y	828	
LIGHTHOUSE ROCKS	W GULF		X	Y*	111	153
KAK	W GULF		X		17	24
MITROFANIA	W GULF		X		182	103
SPITZ	W GULF	X	X		1	0
KUPREANOF POINT	W GULF		X		53	116
CASTLE ROCK	W GULF	X	X		70	15
ATKINS	W GULF	X	X	Y	651	663
THE HAYSTACKS	W GULF		X		38	1
THE WHALEBACK	W GULF		X		102	99
NAGAI/MOUNTAIN POINT	W GULF	X	X		80	56
SEA LION ROCKS (SHUMAGINS)	W GULF	X	X		36	142
UNGA/ACHEREDIN POINT	W GULF		X		264	152
JUDE	W GULF		X	Y*	474	338
PINNACLE ROCK	W GULF	X	X	Y	1,011	1,167
CLUBBING ROCKS	W GULF	X	X	Y	911	1,037
CHERNI	W GULF		X		0	0
SOUTH ROCKS	W GULF		X		528	320
BIRD	W GULF	X	X		57	62
ROCK	W GULF		X		17	0
UNIMAK/CAPE SARICHEF	E ALEU		X		250	6
AMAK+ROCKS	E ALEU	X	X		733	410
SEA LION ROCK (AMAK)	E ALEU	X	X	Y	456	447
UGAMAK COMPLEX	E ALEU	X	X	Y	1,304	1,319
AIKTAK	E ALEU		X		101	111
TIGALDA/ROCKS NE	E ALEU		X		141	202
TIGALDA/SOUTH SIDE	E ALEU		X		46	83
ROOTOK	E ALEU		X		96	96
TANGINAK	E ALEU		X		4	6
AKUN/BILLINGS HEAD	E ALEU	X	X	Y	307	338
AKUTAN/REEF-LAVA	E ALEU	X	X		119	103
AKUTAN/CAPE MORGAN	E ALEU	X	X	Y	1,021	1,249
OLD MAN ROCKS	E ALEU		X		71	112
EGG	E ALEU		X		5	0
OUTER SIGNAL	E ALEU		X		0	0
UNALASKA/CAPE SEDANKA	E ALEU		X		0	0
UNALASKA/BISHOP POINT	E ALEU		X		265	285
UNALASKA/MAKUSHIN BAY	E ALEU		X		20	28
UNALASKA/SPRAY CAPE	E ALEU		X		0	0

Appendix Table 1 (eontinued) SITENAME	REGION	70s TREND	90s TREND	Rookery	2004	2006
UNALASKA/CAPE IZIGAN	E ALEU		X		238	329
BOGOSLOF/FIRE ISLAND	E ALEU	X	X	Y	380	358
UMNAK/CAPE ASLIK	E ALEU	X	X		119	73
POLIVNOI ROCK	E ALEU		X		91	42
THE PILLARS	E ALEU		X		4	0
OGCHUL	E ALEU	X	X	Y	139	132
VSEVIDOF	E ALEU	X	X		48	41
ADUGAK	E ALEU	X	X	Y	259	429
ULIAGA	C ALEU		X		0	99
KAGAMIL	C ALEU	X	X		1	0
CHUGINADAK	C ALEU	X	X		129	79
CARLISLE	C ALEU	X	X		0	0
HERBERT	C ALEU	X	X		38	66
YUNASKA	C ALEU	X	X	Y	260	255
CHAGULAK	C ALEU	X	X		0	13
AMUKTA+ROCKS	C ALEU	X	X		2	18
SEGUAM/FINCH POINT	C ALEU	X	X		2	
SEGUAM/SW RIP	C ALEU	X	X		40	
SEGUAM/SADDLERIDGE	C ALEU	X	X	Y	923	
SEGUAM/TURF POINT	C ALEU	X	X		58	
SEGUAM/LAVA COVE	C ALEU	X	X		0	
SEGUAM/LAVA POINT	C ALEU	X	X		5	
SEGUAM/WHARF POINT	C ALEU	X	X		90	
AGLIGADAK	C ALEU	X	X	N*	61	
AMLIA/EAST CAPE	C ALEU	X	X		34	
AMLIA/SVIECH. HARBOR	C ALEU		X		144	
TANADAK (AMLIA)	C ALEU	X	X		1	
SAGIGIK	C ALEU	X	X		30	
ATKA/NORTH CAPE	C ALEU	X	X		383	279
ATKA/CAPE KOROVIN	C ALEU	X	X		4	0
SALT	C ALEU	X	X		0	
KASATOCHI/NORTH POINT	C ALEU	X	X	Y	667	610
OGLODAK	C ALEU		X		86	111
IKIGINAK	C ALEU	X	X		0	8
FENIMORE	C ALEU		X		30	10
ANAGAKSIK	C ALEU	X	X		2	52
GREAT SITKIN	C ALEU		X		0	0
LITTLE TANAGA STRAIT	C ALEU	X	X		49	
KAGALASKA	C ALEU		X		48	0
ADAK	C ALEU	X	X	Y	1,008	
KANAGA/N CAPE	C ALEU		X		7	13
KANAGA/CAPE MIGA	C ALEU		X		0	0
KANAGA/SHIP ROCK	C ALEU		X	Y*	229	
TANAGA/BUMPY POINT	C ALEU		X		33	
TANAGA/CAPE SASMIK	C ALEU		X		122	
GRAMP ROCK	C ALEU	X	X	Y	679	
UGIDAK	C ALEU	X	X		25	

Appendix Table 1 (continued) SITENAME	REGION	70s TREND	90s TREND	Rookery	2004	2006
TAG	C ALEU	X	X	Y	242	
KAVALGA	C ALEU	X	X		56	
UNALGA+DINKUM ROCKS	C ALEU	X	X		19	
ULAK/HASGOX POINT	C ALEU	X	X	Y	531	
AMATIGNAK/KNOB POINT	C ALEU		X		1	
AMATIGNAK/NITROF POINT	C ALEU	X	X		76	38
SEMISOPOCHNOI/POCHNOI	C ALEU		X	N*	55	41
AMCHITKA/CAPE IVAKIN	C ALEU	X	X		0	0
AMCHITKA/EAST CAPE	C ALEU	X	X	N*	178	103
AMCHITKA/ST. MAKARIUS	C ALEU		X		0	0
AMCHITKA/COLUMN ROCK	C ALEU		X	Y	85	
AYUGADAK	C ALEU	X	X	Y	152	
RAT	C ALEU		X		45	
SEA LION ROCK (KISKA)	C ALEU		X		0	
TANADAK (KISKA)	C ALEU		X		34	
KISKA/SOBAKA-VEGA	C ALEU		X		101	
KISKA/CAPE ST STEPHEN	C ALEU	X	X	Y	210	
KISKA/LIEF COVE	C ALEU	X	X	Y	170	
KISKA/PILLAR ROCK	C ALEU		X		0	
BULDIR	W ALEU	X	X	Y	108	
SHEMYA	W ALEU		X		17	18
ALAID	W ALEU	X	X		125	86
AGATTU/CAPE SABAK	W ALEU	X	X	Y	325	282
AGATTU/GILLON POINT	W ALEU	X	X	Y	374	308
ATTU/MASSACRE BAY	W ALEU		X		0	0
ATTU/CHIRIKOF POINT	W ALEU		X		75	30
ATTU/CHICHAGOF POINT	W ALEU		X		54	13
ATTU/KRESTA POINT	W ALEU		X		0	0
ATTU/CAPE WRANGELL	W ALEU		X	Y	257	260
90s Trend Site Counts					**27,437**	**18,895**
Other Site Counts (Table 2)					**1,600**	**2,394**
Total Count					**29,037**	**21,289**

Appendix Table 2. Counts of adult and juvenile (non-pup Steller sea lions) at NON-TREND HAUL-OUTS from medium-format aerial photos taken in June 2004 and June 2006.

A. Gulf of Alaska		
EASTERN GULF OF ALASKA		
SITENAME	**2004**	**2006**
HOOK POINT	96	101
STEEP POINT	1	11
MIDDLETON	4	0
POINT ELEANOR		0
PERRY		218
PLEIADES		0
POINT LaTOUCHE	0	0
DANGER	12	10
PROCESSION ROCKS	36	67
CAPE JUNKEN	0	0
CAPE RESURRECTION	3	0
GRANITE CAPE	1	89
RABBIT	0	0
NEAR AIALIK CAPE		103
HOOF POINT		52
CENTRAL GULF OF ALASKA		
FLAT	4	
SHAW	81	162
NUKA POINT	0	0
PERL ROCKS	0	
WEST AMATULI	0	0
SUD	0	0
KODIAK/CAPE PARAMANOF	0	0
CAPE DOUGLAS	0	0
KODIAK/MALINA POINT	0	0
NOISY	0	0
KODIAK/CAPE KULIUK	0	0
CAPE NUKSHAK	0	0
CAPE UGYAK	0	0
KODIAK/SUNDSTROM	0	
CAPE GULL	0	0
CAPE KULIAK		0
KODIAK/CAPE ALITAK	0	
KODIAK/CAPE UYAK		0
KODIAK/STURGEON HEAD		0
KODIAK/CAPE IKOLIK	108	52
KODIAK/TOMBSTONE ROCKS	0	0
KILOKAK ROCKS	85	144
AIUGNAK COLUMNS	1	24
AGHIYUK	27	5
WESTERN GULF OF ALASKA		
OLGA ROCKS NE	11	28
OLGA ROCKS SW	117	102
SUSHILNOI ROCKS	290	327
CATON	109	368
ATKULIK	0	0
CHANKLIUT	0	0
SEAL CAPE	0	0
BIG KONIUJI	0	0
TWINS	0	0
NAGAI/RK W OF CAPE WEDGE	0	0
EGG (SAND POINT)	0	0
UNGA/CAPE UNGA	0	0
OMEGA	0	1
WOSNESENSKI	166	113
HUNT	0	0
HAGUE ROCK	0	0
SOZAVARIKA	0	0
SANAK	0	0
UMGA	0	0

B. Aleutian Islands		
EASTERN ALEUTIAN ISLANDS		
SITENAME	**2004**	**2006**
UNIMAK/CAPE LAZAREF	0	
UNIMAK/CAPE LUTKE	0	0
UNIMAK/SCOTCH CAP	0	0
UNIMAK/S OF SARICHEF		19
KALIGAGAN	1	0
UNIMAK/SENNETT POINT	0	1
BASALT ROCK	1	4
AKUN/AKUN BAY	0	0
AKUN/JACKASS POINT	0	0
AKUN/AKUN HEAD	0	0
AKUTAN/BATTERY POINT	0	0
AVATANAK		15
BABY	0	4
INNER SIGNAL	38	0
UNALASKA/PRIEST ROCK	0	1
UNALASKA/WHALEBONE CAPE	0	0
UNALASKA/CAPE WISLOW	0	0
UNALASKA/CAPE STARICHKOF	0	0
UNALASKA/KOVRIZHKA	0	0
UNALASKA/RK NEAR MAKUSHIN		60
UMNAK/CAPE IDAK		0
EMERALD	0	
UMNAK/REINDEER POINT		0
UMNAK/CAPE CHAGAK		0
UMNAK/AGULIUK POINT		0
SAMALGA	1	0
CENTRAL ALEUTIAN ISLANDS		
TAGALAK	91	134
SILAK	38	32
ADAK/CAPE MOFFET	0	0
ADAK/ARGONNE POINT	35	12
BOBROF	49	21
SEMISOPOCHNOI/PETREL	0	43
SEMISOPOCHNOI/SW KNOB	17	0
SEMISOPOCHNOI/TUMAN POINT	0	0
SEGULA/GULA POINT		1
AMLIA/CAPE MISTY	21	
KONIUJI/NORTH POINT	0	0
CHUGUL	39	69
IGITKIN/SW POINT	0	0
ADAK/CRONE ISLAND	0	
KANAGA/CAPE CHUNU	9	
ILAK	45	
SKAGUL/S. POINT	1	
OGLIUGA	49	
AMCHITKA/OMEGA POINT	0	0
AMCHITKA/CHITKA POINT	0	
AMCHITKA/BIRD	0	
TWIN ROCKS (KISKA)	13	
KISKA/SOUTH HEAD	0	0
KISKA/WITCHCRAFT POINT	0	
KISKA/GERTRUDE-BUKHTI	0	0
WESTERN ALEUTIAN ISLANDS		
INGENSTREM ROCKS	0	1
NIZKI	0	0
DAN'S ROCKS	0	0
TOTAL OTHER SITES	**1,600**	**2,394**

Appendix Table 3. Summary of TREND SITES surveyed (A& B) and counts of adult and juvenile (non-pup) Steller sea lions at 1990s Trend Sites (C & D) from medium-format aerial photos taken in June 2004 and June 2006. Counts are unadjusted counts from medium format photographs.

A. Number of 70s Trend Sites Surveyed

Sub-Area	2004	2006
E GULF	9	9
C GULF	16	7
W GULF	9	8
E ALEU	11	11
C ALEU	38	15
W ALEU	4	3
Total	**87**	**53**

B. Number of 90s Trend Sites Surveyed

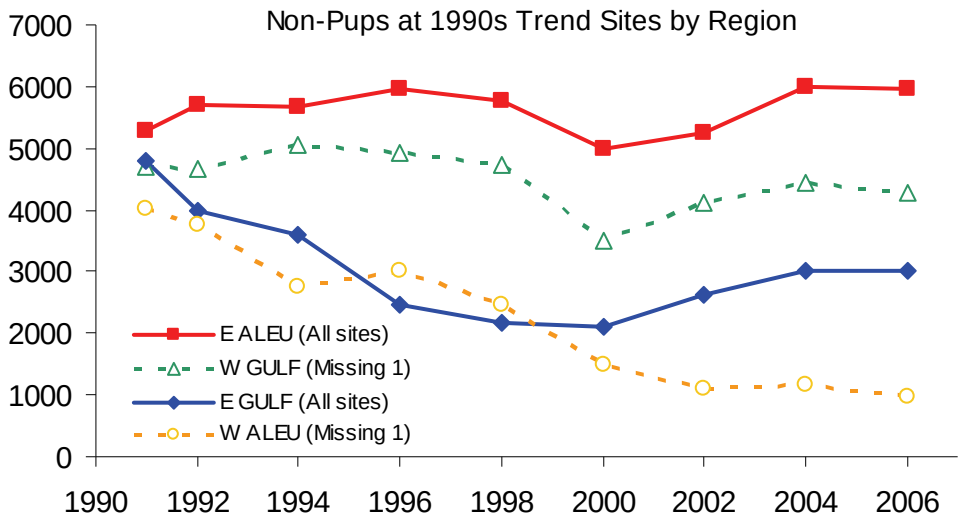
Sub-Area	2004	2006
E GULF	13	13
C GULF	33	14
W GULF	20	19
E ALEU	27	27
C ALEU	58	24
W ALEU	10	9
Total	**161**	**106**

C. Counts of Non-Pup Steller Sea Lions
Only Completely Surveyed Sub-Areas

Sub-Area	2004	2006
E GULF	3,129	3,115
C GULF	4,180	
W GULF	5,431	
E ALEU	6,217	6,199
C ALEU	7,145	
W ALEU	1,335	
Total	**27,437**	

D. Counts of Non-Pup Steller Sea Lions
Sub-Areas Missing Only 1 Trend Site
(removed from both years)

Sub-Area	2004	2006
W GULF	4,603	4,448
W ALEU	1,227	997



Appendix Figure 1. Counts of adult and juvenile (non-pup) Steller sea lions at 1990s Trend Sites (Table 1) by region (=sub-area) in the range of the western stock in Alaska. Only those regions with complete (eastern Aleutian Islands=E ALEU and eastern Gulf of Alaska=E GULF) or nearly complete (missing only 1 trend site: western Gulf of Alaska=W GULF and western Aleutian Islands=W ALEU) surveys of trend sites are shown. Sea lions in 2004 and 2006 were counted on medium format photographs taken vertically over trend sites; sea lions in all other years were counted on 35 mm slides shot obliquely from side windows of aircraft. Region totals for 2004 and 2006 reflect a reduction of 3.64% from the actual medium format count to account for the higher resolution and higher counts available from medium format vs. 35 mm film (Fritz and Stinchcomb 2005).

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