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U.S. DEPARTMENT OF COMMERCE
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ABSTRACT

There is strong evidence that both the western and eastern distinct population segments (DPSs) of Steller sea lion (*Eumetopias jubatus*) increased in overall abundance in Alaska between 2000 and 2012. Counts of both non-pups (adults and juveniles) and pups during the breeding season in the western DPS were lowest in 2000, and increased at average rates of 1.67% per year (95% credible interval of 1.01-2.38% per year) and 1.45% per year (0.69-2.22% per year), respectively through 2012. However, there was considerable regional variability in non-pup and pup trends in 2000-2012 across the western DPS, with strong evidence of increases in three of the four regions east of Samalga Pass (eastern and western Gulf of Alaska, and eastern Aleutian Islands; ranges of 2.39% per year to 4.51% per year for non-pups and 3.03% per year to 3.97% per year for pups) being offset somewhat by both weak and strong declines in the two regions west of Samalga Pass (central and western Aleutian Islands; slow, uncertain declines in the central [-0.56% per year and -0.46% per year for non-pups and pups, respectively] and steep, certain declines in the western Aleutians [-7.23% per year and -9.36% per year for non-pups and pups, respectively]). Within the central Aleutian Islands, non-pup and pup trends varied east and west of 177°W (roughly Tanaga Pass): in the two rookery cluster areas to the east, trends were generally positive (0.51% per year and 2.25% per year for non-pups, and 2.56% per year and 0.45% per year for pups), while to the west, there was strong evidence of decline (-4.48% per year and -3.24% per year for non-pups, and -4.83% per year and -1.74% per year for pups). In southeast Alaska (eastern DPS of Steller sea lion), both non-pup and pup counts increased between 2000 and 2010, continuing the upward trend begun in the mid-1970s.

Movement of young Steller sea lions into and out of the eastern Gulf of Alaska was observed during surveys conducted ‘early’ and ‘late’ in 2008, 2009 and 2010. Analysis of the

movement of sea lions branded as pups in 2000-2011 on rookeries extending from southeast Alaska through the Kodiak archipelago (including work by Jemison et al. in review) suggests a net movement from the central to the eastern Gulf of Alaska of ~1,600 sea lions during the breeding season, as well as a smaller net movement (of ~180 sea lions) from southeast Alaska to the western DPS. Inter-regional movement of this magnitude within the western DPS could affect regional trend estimation, and therefore it may be inappropriate to treat the eastern and central Gulf of Alaska as 'closed' populations; non-pup counts in the combined eastern-central Gulf of Alaska increased at 2.40% per year between 2000 and 2012. Average annual inter-DPS movement represents < 0.5% of the total number of sea lions counted in the western DPS and < 1% of those counted in southeast Alaska, and likely had a negligible impact on overall trend estimates in either area.

If the overall western non-pup count in Alaska continues to increase through 2015, the western DPS appears to be on a trajectory to satisfy the first demographic criterion for down-listing from 'endangered' to 'threatened' status under the Endangered Species Act (NMFS 2008). The second demographic criterion, however, involves regional population performance, which has varied across the range. The western DPS may satisfy the first part of criterion #2 if non-pup counts in the eastern, central and western Gulf of Alaska, eastern Aleutian Islands, and Russia (overall) continue to increase through 2015. However, persistent declines in the western Aleutian Islands and the western half of the central Aleutian Islands may preclude it from satisfying the second part of criterion #2, and indicate that the western DPS is responding to meso-scale variability in factors affecting recovery.

CONTENTS

INTRODUCTION

The Steller sea lion (*Eumetopias jubatus*) is the largest otariid pinniped species in the world (Loughlin et al. 1987, Hoover 1988). Steller sea lions inhabit coastal and continental shelf regions of the North Pacific Ocean extending 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, their breeding range continues into the Commander Islands, along the Kamchatka Peninsula, on various Kuril Islands, and on islands within the Sea of Okhotsk in Russia (Loughlin et al. 1987, Hoover 1988, Burkanov and Loughlin 2005).

The National Marine Fisheries Service (NMFS) listed the Steller sea lion as "threatened" range-wide under the U.S. Endangered Species Act (ESA) in November 1990 (U.S. Federal Register 1990) following a 15% per year decline between 1985 and 1989 (Merrick et al. 1991, Merrick et al. 1992). This short period of rapid decline was preceded by a period of relatively slow decline (~5% per year) during the 1970s and early 1980s (Merrick et al. 1987).

In 1997, two distinct population segments (DPS) of Steller sea lion were identified based on differences in genetics, distribution, phenotypic traits, and population trends (Bickham et al. 1996, Loughlin 1997, US Federal Register 1997a). The western DPS breeds on rookeries located west of 144°W in Alaska and Russia, whereas the eastern DPS breeds on rookeries in southeast Alaska through California. The ESA status of the western DPS was elevated to "endangered" in 1997 (U.S. Federal Register 1997b), while the eastern DPS retained a "threatened" classification. Between 1990 and 2000, the rate of population decline for the western DPS in Alaska slowed to 5% per year (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).

As part of its responsibilities under the ESA and Marine Mammal Protection Act (MMPA), NMML conducts aerial surveys of Steller sea lions in Alaska each year during the breeding season (June through mid-July). 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, 1990, 1992, Merrick et al. 1987, 1991, 1992, Sease et al. 1993, 1999, 2001, Strick et al. 1997, Sease and Loughlin 1999, Sease and Gudmundson 2002, Fritz and Stinchcomb 2005, Fritz et al. 2008). This report focuses primarily on counts of Steller sea lion pups (new-born) and non-pups (juveniles and adults 1+ years old) at terrestrial rookery and haulout sites from surveys conducted in the breeding seasons of 2008 through 2012, and trends observed in the populations since 1976 with a particular focus on the 2000-2012 period. A longer historical perspective (back to the mid-1950s) is available in Merrick et al. (1991).

At rookeries, adult male sea lions actively defend territories, the vast majority of pups are born, and most mating takes place. Haulouts are sites where sea lions rest on land, but where few or no pups are born (Calkins and Pitcher 1982, Loughlin et al. 1984). Consequently, most adult females (4+ years old) and reproductively-active males (9+ years old) are counted at rookeries during the breeding season, while most juveniles (1-3 years old of both sexes) and young males (4-8 years old) are counted at haulouts (Thorsteinson and Lensink 1962, Winship et al. 2001). Trends in sea lion population abundance have been determined by analyzing time series of pup and non-pup counts at 'trend' sites that have been consistently surveyed over time since the 1970s, 1990s, and 2000s (Table 1; see NMFS 2008). Trend sites include all rookeries and major haulouts, and have included a larger number of sites as surveys became more comprehensive

after the species was listed in 1990. Johnson and Fritz (in review) developed another method for trend estimation that does not rely on 'trend' sites and uses data from all sites with more than two non-zero counts since 1990.

The revised Steller sea lion recovery plan (NMFS 2008) contains demographic recovery criteria that will guide NMFS in reclassifying the western DPS from endangered to threatened (down-listing) and removing ESA protection from both DPS (de-listing). For the western DPS, there are two demographic down-listing criteria:

1) "the population for the U.S. region [in Alaska] has increased (statistically significant) for 15 years on average, based on counts of non-pups",
2) "the trends in non-pups in at least five of the seven subregions are consistent with the trend observed under criterion #1. The population trend in any two adjacent subregions cannot be declining significantly. The seven subregions are as follows:
    a. Eastern Gulf of Alaska (US)
    b. Central Gulf of Alaska (US)
    c. Western Gulf of Alaska (US)
    d. Eastern Aleutian Islands (including the eastern Bering Sea) (US)
    e. Central Aleutian Islands (US)
    f. Western Aleutian Islands (US)
    g. Russia/Asia."

The lowest recent total non-pup count in the western DPS in Alaska occurred in 2000 (Sease et al. 2001, Sease and Gudmundson 2002), and is a reasonable year to choose as the first in the 15-year time period to estimate trends relative to the demographic down-listing criteria. Counts

through 2012 are reported here, and thus will provide an indication of whether the western DPS is on track to satisfy one or both demographic down-listing criteria by 2015. By contrast, the eastern DPS has increased at an annual rate of approximately 3% since at least the late 1970s (Pitcher et al. 2007, NMFS 2013) and is proposed to be removed from the list of ESA threatened and endangered species in 2013.

METHODS

Regions Within the Western DPS in Alaska

Geographical regions used for analyzing survey results were the same as those used in previous survey reports (Loughlin et al. 1987, 1990; Merrick et al. 1991, 1992, Sease et al. 1993, 1999, 2001; Strick et al. 1997; Sease and Loughlin 1999; Sease and Gudmundson 2002; Fritz and Stinchcomb 2005; Fritz et al. 2008) and generally follow the meta-population structure proposed by York et al. (1996). With the exception of the eastern Bering Sea region, they are identical to those adopted in the revised Steller Sea Lion Recovery Plan (NMFS 2008), and include three regions in the Gulf of Alaska, three regions in the Aleutian Islands, and one in the eastern Bering Sea (Fig. 1):

a. Eastern Gulf of Alaska (E GULF: ~144°- 150°W);
b. Central Gulf of Alaska (C GULF: ~150°- 157°W);
c. Western Gulf of Alaska (W GULF: ~157°- 163°W, south of the Alaska Peninsula);
d. Eastern Aleutian Islands (E ALEU: ~163°- 169°W, north of the Alaska Peninsula and south of 51°N);
e. Central Aleutian Islands (C ALEU: ~169°W– 177°E);

f. Western Aleutian Islands (W ALEU: ~172°- 177°E); and

g. Eastern Bering Sea (BERING: 157°W – 180°, north of 51°N).

Other regions used in this study include (Fig. 1):

- Kenai-to-Kiska (K-K: Kenai Peninsula 150°W to Kiska Island 177°E). This index area includes all of the C GULF, W GULF, E ALEU and C ALEU, and encompasses what historically was the core of the Steller sea lion range (Merrick et al. 1987, NMFS 2008). Counts of non-pups in the K-K region comprised between 74% and 88% of the total western DPS count in Alaska in past surveys (Fritz et al. 2008).
- Combinations of the seven primary regions that reflect population trend similarities and sea lion movement during the breeding season:
  - four regions east of Samalga Pass (~169°W; ESAM): E GULF, C GULF, W GULF, and E ALEU;
  - two regions west of Samalga Pass (WSAM): C ALEU and W ALEU;
  - E GULF and C GULF (ECGULF); and
  - E ALEU and W GULF (EAWG).

Rookery Cluster Areas

In addition to the regions described above, we identified 11 rookery cluster areas (RCA) initially as part of an analysis of Steller sea lion population and groundfish bottom trawl survey data for an ESA Biological Opinion on the effects of groundfish fishing on the recovery of the western and eastern DPS (NMFS 2010). The RCA boundaries reflected bottom trawl survey strata as well as reasonable clusters of sea lion terrestrial sites to structure an analysis of the relationships between fish abundance, fishery distribution, and sea lion abundance (Table 1; Fig.

2). Each RCA contains at least two rookeries, and from west to east across the range of Steller sea lions in Alaska, they are defined as follows:

1. RCA 1 is identical to the W ALEU;
2. RCAs 2-5 in aggregate are similar to the C ALEU, with the exception that the three sites east of 170°W in the C ALEU (Uliaga, Kagamil, and Chuginadak) are in RCA 6:
    a. RCA 2 encompasses the area from Kiska Island to Amchitka Pass (177°E – 180°);
    b. RCA 3 includes the Delarof Islands and Tanaga Island (180°- 177.5°W);
    c. RCA 4 includes all sites from Kanaga through Atka Islands (174-177.5°W);
    d. RCA 5 encompasses the area from Amlia Island through most of the Islands of Four Mountains and excludes the three sites noted above (170-174°W);
3. RCA 6 includes all sites in the E ALEU plus the three C ALEU sites noted above;
4. RCA 7 includes all sites in the W GULF except for seven between 157°W and 159°W (Lighthouse Rocks, Atkulik, Kak, Chankliut, Seal Cape, Mitrofania and Spitz), which are in RCA 8;
5. RCA 8 includes all sites in the western C GULF (154°- 159°W) plus the seven W GULF sites noted above;

6. RCA 9 includes all sites in the eastern C GULF (152°- 154°W) in the Kodiak and Barren Islands archipelagos, but none of the nine C GULF sites on the Kenai Peninsula (Outer Island, Nuka Point, Gore Point, East Chugach Island, Perl Island, Perl Rocks, Nagahut Rocks, Cape Elizabeth, and Flat), which are included in RCA 10;
7. RCA 10 includes all sites in the E GULF plus the nine Kenai Peninsula sites noted above; and
8. RCA 11 is identical to southeast Alaska (part of the eastern DPS), and includes all sites east of 144°W and north of Dixon Entrance (54° 30'N).

Aerial Surveys

Aerial surveys for non-pups are conducted in early to 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 during the year. Pup surveys are conducted 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 and Calkins 1981, Pitcher et al. 2001). For non-pup surveys, daily effort was restricted to the hours between approximately 1000 and 1900 local time when sea lions were most likely hauled out (Chumbley et al. 1997, Sease and Gudmundson 2002). For pup surveys, daily effort was only restricted by adequate light for photography because pups ~1 month of age do not forage on their own and remain on land (Pitcher and Calkins 1981).

All aerial surveys were conducted using twin Otter aircraft (DeHavilland DHC-6) operated by NOAA Aircraft Operations Center, Tampa, FL, using one or three Canon EOS-1Ds Mark III cameras (21 megapixel, full-frame sensor) mounted in the plane's belly port (open to

the air) in a computer-controlled mount that compensated for the speed and altitude of the plane to reduce image blur (FMC; Aerial Imaging Systems). The survey crew consisted of two pilots, two forward science observers using bubble windows located on either side of the crew cabin, and a scientist operating the mount controller and maintaining the cameras from a station near the belly port; a third observer often was seated aft on the port side when one camera was used (2008), which was mounted to take vertical photographs (perpendicular to the ground) with a 50 mm lens. For three camera surveys (2009-2012), the center camera was mounted vertically and the port and starboard cameras were mounted at 21° off vertical pointing inward allowing for their lines of sight to cross; each had an 85 mm lens. The desired survey altitude was 750 ft (230 m), which yielded swath widths on the ground of ~550 ft (170 m) using one camera or ~900 ft (275 m) using three cameras. Due to low ceilings, wind, and topography, some sites were photographed at altitudes ranging from 500 to 1,500 ft. The optimal ground speed was 100 kts, but ranged from 85 to 110 kts depending on wind speed and direction. Straight and level survey passes were used at all sites except for those where topography and local winds were prohibitive. Multiple passes were required at some large sites and care was taken to make parallel passes in the same direction to ease site reconstruction during photo analysis. Cameras were set to aperture priority (f /5.6) and ISO to 800. Camera shutter speed fluctuated depending on local light conditions, which was permissible because of the FMC. The mount controller (computer) automatically fired the cameras to provide 60% overlap using ground speed and altitude inputs. Lenses were focused manually and set (taped) to near infinity. It was the responsibility of the two forward science observers to locate sea lions, line up survey passes with the pilots, ensure all animals were photographed, and manually count those (if < 10) that were not.

2008 Survey --A survey to count non-pups in Alaska was conducted from 7 June to 6 July 2008, which was the first complete survey of the western DPS in Alaska since 2004 (Fritz and Stinchcomb 2005) and the first complete survey of the eastern DPS in southeast Alaska since 2002 (Pitcher et al. 2007). Of the 356 sites in the region, 339 (95%) were successfully surveyed in 2008 (Table 1). Of the 339 sites surveyed, 169 were photographed, 30 had < 10 sea lions and were visually assessed by observers on the plane, and 140 had no sea lions. Of the 17 'missed' sites, 15 could not be surveyed because of poor weather conditions, whereas 2 (rookeries on Chowiet and Chirikof Islands) were incompletely surveyed (see Appendix A).

In 2008, the survey started in southeast Alaska, which was surveyed on 7-8 June. In the past, southeast Alaska was surveyed in late June or early July after the western DPS. The most recent survey of southeast Alaska prior to 2008 was conducted on 4-5 July 2002 or approximately 1 month later in the year than in 2008. All other surveys conducted in southeast Alaska since 1996 were done on or after 20 June, or about 2 weeks later than the 2008 survey. Prior to 2008, the next earliest-in-the-year southeast Alaska survey was conducted on 12-13 June 1994. The western DPS survey commenced in the E GULF on the same day (9 June) in both 2007 and 2008.

2009 Survey -- A survey to count pups in Alaska was conducted from 24 June to 15 July 2009. The primary objective in 2009 was to survey all rookery and major haulout sites in Alaska (Table 2). A secondary objective was to survey all sites (for non-pups) in southeast Alaska, E GULF and C GULF approximately 2.5 weeks later than the 2008 survey to investigate movement of sea lions during the breeding season in the DPS boundary area. A total of 172 of 178 targeted sites were surveyed from Forrester Island in southeast Alaska to Kiska Island in the C ALEU. We were unable to survey sites in the W ALEU because of runway maintenance at the

Eareckson Air Station (U.S. Air Force) on Shemya Island. Therefore, we counted pups on photographs taken between 24 June and 2 July 2008 at the four W ALEU rookeries for the 2009 report.

2010 Survey -- The primary objective in 2010 was to count non-pups at all sites in Alaska during an initial survey conducted from 7 June to 3 July; 259 of 356 sites were surveyed (Table 1), including almost all sites in RCAs 3-5 and RCAs 9-11. RCAs 10 and 11 were surveyed on 7-9 June, the same dates as in 2008. RCAs 6 and 8 were incompletely surveyed, and RCAs 1, 2, and 7 were not surveyed because of runway maintenance at Eareckson Air Station or low ceilings/fog.

A secondary objective was to conduct a replicate non-pup survey in RCAs 10 and 11 in early July to further assess movement between the two DPSs during the summer breeding season. We surveyed 69 of 106 sites overall (65%) during the replicate survey on 10-13 July (Table 1), approximately 1 month after the initial 2010 survey and 2.5 weeks later (in the year) than in 2009 (24-27 June). Because of time constraints, we chose not to re-survey 29 sites in RCA 11 that had no animals during the initial survey; these sites also had very low numbers during all breeding season surveys conducted since 2000. However, due to weather (fog) on the last survey day available, we were unable to survey an additional six sites (including two rookeries at White Sisters and Graves Rock) that had a total of 4,592 non-pups during the initial survey.

A third objective was to count pups at sites surveyed at least 10 days after the mean sea lion birth date. From east to west in Alaska, mean birth dates are 4 June in southeast Alaska,

14 June in the E GULF, and 11 June in the C GULF, W GULF and Aleutian Islands (Pitcher et al. 2001). A total of 33 sites with pup counts > 0 were surveyed at least 10 days after the regional mean sea lion birth date.

2011 Survey -- The primary objective of the 2011 survey was to count western DPS pups in Alaska. The secondary objective was to count non-pups at sites missed during the 2010 survey, particularly in the C ALEU and W ALEU. The survey was conducted from 27 June to 16 July 2011, during which 135 of the 179 targeted sites were surveyed. All 73 sites in the E GULF, C GULF, and W GULF and in the E ALEU between 144° and 170°W were surveyed, as were all 52 sites in the eastern half of the C ALEU between 170° and 178°W and 10 of 13 sites in the W ALEU. However, we were unable to survey any of the 40 sites (including seven rookeries) in the western half of the C ALEU between 177°E and 178°W, Buldir in the W ALEU, and Walrus Island (Pribilof Islands) in the BERING because of persistent fog and bad weather. In addition, we could not survey Alaid and Nizki in the W ALEU due to airspace restrictions near Shemya Island.

2012 Survey -- The primary objective of the 2012 survey was to count both pups and non-pups in the E ALEU, C ALEU and W ALEU. The survey was conducted from 17 June to 9 July 2012, during which only 14 of the 175 targeted sites were surveyed; 13 of the 14 sites were in the W ALEU and one was in the C ALEU. Persistent fog and bad weather precluded any survey effort east of 177°E.

Other Counts

Non-Pups -- Counts from land-based observers at Ugamak Island were used to estimate non-pup abundance at both the North and Ugamak Bay rookeries in mid-June 2008 (see Appendix A). Non-pups were counted from cliff-side observation points overlooking seven W

ALEU sites on 22-24 June 2010, and three C ALEU and two W ALEU sites on 23-27 June 2012, and from a skiff or vessel at one W ALEU and six C ALEU sites on 23-30 June 2012.

Pups -- Ground counts of pups were conducted at rookeries where it was not possible to obtain vertical imagery from the aircraft because of steep cliffs surrounding the site (Akun/Billings Head on 26 June 2009 and 30 June 2011), or because the sites were inaccessible due to closure of nearby airfields (four rookeries in the W ALEU on 22-24 June 2010 and two rookeries in the W ALEU on 26-27 June 2012). Pups were counted by at least two researchers slowly moving through the rookery, carefully moving adults and juveniles out of the way. It is largely to avoid this disturbance that aerial survey protocols to count pups were developed and tested (Snyder et al. 2001).

Counting Methodology

Sea lions on all photographs taken during the 2008-2012 aerial surveys were counted by two researchers working independently. If sea lions were disturbed into the water by the survey aircraft, researchers counted those visible in the water. However, sea lions observed offshore near undisturbed sites were not counted. Initial total non-pup and pup counts by each researcher for each site were compared. If the difference in counts at a site was greater than 5% or more than 20 (more than 10 for pups), then photographs (with counted animals) were compared to reconcile discrepancies. After reconciliation of counts from each of the 2008-2012 surveys, total counts of non-pups by the independent counters differed by < 1%, whereas total counts of pups differed by a range of 0.7-2.4%. All pup and non-pup counts reported here are means of replicate counts by each researcher (either from photographs or on-site), the visual count recorded by the airborne observer for those sites with < 10 sea lions, or the estimated non-pup population for the five sites either incompletely or not surveyed in 2008 (see Appendix A).

Sea lions were counted from digital photographs using high resolution monitors and Adobe Photoshop (versions CS2 and CS5) software. Assignment to the following age-sex classes was based on color, size, shape, and behavior (as inferred from the site function as either rookery or haulout, and the position of the animal with respect to breeding adults (Chumbley et al. 1997):

Pups -- Sea lions born during the survey year. These are the smallest and darkest-colored animals on land—almost exclusively present on rookeries—usually associated with an adult female, and located within or near territories held by adult males.

Juveniles -- Sea lions 1-4 years old of both sexes that were identified primarily by their size (smaller than adult females), but also by their behavior and location (primarily at haulouts). If observed at rookeries, independent (weaned) juveniles were most often found on the periphery and not in or near territories of adult males with or without females. Dependent juveniles at rookeries were observed near adult females and often within territories of adult males.

Adult Females -- Mature females approximately 4 years and older primarily observed on rookeries within territories maintained by adult males. Adult females not within territories were identified based on their size (larger than juveniles and smaller neck, head, flippers, and shoulders than either subadult or adult males), pelage color (light tan), and often aided by the nearby presence of a dependent pup or juvenile.

Subadult Males -- The head, neck, and shoulders of subadult males are smaller than those of adult males, but larger than those of adult females. Subadult males are most often found at haulouts near rookeries and on the periphery (not within actively held territories) of rookeries.

Adult Males -- Adult males are the largest animals on the rookeries, with robust neck and shoulders. Territorial adult males may or may not have one or more females within their

territory: adult males with females generally occupied central locations within the rookery, whereas those without females were regularly spaced on the periphery of the territories of males with adult females and pups.

A script within the software tallied the number of pups, juveniles, adult females, subadult males, and adult males that were counted (Fig. 3).

Population Trend Estimates

Two methods were used to estimate trends (annual rates of change over defined periods) in non-pup and pup counts. The first was based on regional and total sums of counts at 'trend' sites only. Trend sites are rookeries and haulouts that have been surveyed consistently over periods of time, thus allowing analyses of population trends on decadal (or longer) scales, but at a subset of all sites surveyed. Some sites or entire regions were not surveyed in some years (Table 1), which limits an analysis based on trend site counts to certain region-period combinations which differ across the range. The second method (agTrend; Johnson and Fritz in review) was developed to use data at a larger group of sites (all those with at least two counts > 0 between 1990 and 2012) and to estimate counts for years and sites that were missing.

Trend Site Method

The following groups of trend sites were defined as follows:

70s Trend Sites -- Includes 32 rookeries and 55 haulouts consistently surveyed from the 1970s to the present (87 sites). Between 70% and 80% of the total number of non-pups counted on all sites during surveys conducted in the 1990s and 2000s were counted on 70s trend sites.

90s Trend Sites -- Includes all the 70s trend sites, plus 74 other rookeries and haulouts routinely surveyed since 1991 (161 sites). Non-pup counts at 90s trend sites have totaled between 90% and 98% of the total counted on all sites during surveys conducted since 1991.

00s Trend Sites -- Includes all the 90s trend sites, plus 71 other haulouts routinely surveyed since 2000 (232 sites). The 00s trend sites have had ~99% of the total number of non-pups counted on all sites during surveys conducted since 2000.

Trend Rookeries -- Sites at which pups have been regularly counted since the late 1970s (31 sites). This includes all sites identified as rookeries in Table 1 with the exception of Chiswell Islands, Ushagat, Jude, Sea Lion Rock (Amak), Ogchul, Kanaga (Ship Rock), and Walrus.

To estimate non-pup trends, counts at trend sites were summed for those years when all trend sites were surveyed in the following regions:

- western DPS in Alaska;
- eastern DPS in Alaska (southeast Alaska);
- each of the six western DPS regions (W ALEU, C ALEU, E, ALEU, W, GULF, C, GULF, and E GULF);
- each of the five region combinations (K-K, ECGULF, EAWG, ESAM, and WSAM); and
- each RCA.

Fritz and Stinchcomb (2005) reported that non-pup counts from vertical high resolution images were significantly greater (by 3.64%) than those from 35 mm photographs taken obliquely out the side windows of aircraft. Oblique photographs were used in non-pup surveys conducted in the western DPS through 2002 and in eastern DPS through 2000; high-resolution vertical surveys were used in the western DPS beginning in 2004 and in the eastern DPS beginning in 2002. To accurately estimate regional or DPS-wide non-pup trends in periods that span the change in method, vertical counts have been adjusted downward (Fritz and Stinchcomb 2005, Fritz et al. 2008), but the oblique counts could also have been adjusted upward to yield the

same result. Unadjusted non-pup counts are used to estimate minimum population size as reported in Allen and Angliss (2013). No adjustment is necessary for counts of pups from vertical, high resolution photographs compared to those from ground-based counts since they were not significantly different from one another (Snyder et al. 2001).

Estimates of population growth rate (λ) for various time periods were derived from the following basic model (Eberhardt 2002):

$$N_t = N_0 \lambda^t ,$$

where N_t is the population size at time t and N_0 is the initial population size. A log-linear regression of the natural logarithm of the non-pup or pup counts on the survey years,

$$\ln N_t = \ln N_0 + t \ln \lambda$$

was used to calculate λ, which was then expressed as a percentage annual growth rate (AR),

$$AR = (e^{\lambda}-1) \times 100. \qquad \text{Eq. 1}$$

Tests to determine the significance of λ were done at an α-level of 0.05.

Definition of Terrestrial Sites

In addition to the functional definition of a rookery (where adult male sea lions actively defend territories, most pups are born, and most 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 specifying a minimum number of pups, as well as a time period, and was necessary to track non-pup counts separately at currently functional rookeries and haulouts. Using this rookery definition, some sites listed as rookeries in the designation of critical habitat (U.S. Federal Register 1993) are not included as rookeries in this analysis, whereas 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/Pochnoi, Semisopochnoi/Petrel, and Amchitka/East Cape in the C ALEU.

The following sites were reclassified from haulout to rookery:

- Chiswell Islands in the E GULF;
- Ushagat in the C GULF;
- Jude and South Rock in the W GULF;
- Kanaga/Ship Rock in the C ALEU.

Analyses presented here do not alter the designation of critical habitat because 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 haulouts were aggregated separately within each region to determine relative abundance at each type of site. Rookeries have a greater proportion of mature, reproductively-active animals, whereas 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.

Steller Sea Lion Movement

In addition to multiple aerial surveys in 2010, we summarized the distribution of sightings of sea lions branded as pups in the western DPS during the breeding season to determine the effect that inter-regional movement could have on estimates of regional non-pup trends. Valid sightings included only those during the breeding season (May-July) when the animals were 1+ years old (see (Fritz et al. in review). We used sightings made between 2001 and 2011 of the following cohorts of pups branded at their natal rookeries in three regions (see

Merrick et al. 1996 and Fritz et al. in review for details regarding the branding process, sighting effort, and survival estimates):

- E GULF
  - Seal Rocks: 2001, 2003, and 2005 cohorts (255 pups); 1,064 sightings.
  - Wooded (Fish): 2001 (32 pups); 220 sightings.
- C GULF
  - Sugarloaf: 2000, 2002, 2004, 2008, and 2010 (559 pups); 3,098 sightings.
  - Marmot: 2000, 2002, 2004, 2008, and 2010 (434 pups); 8,610 sightings.
- E ALEU
  - Ugamak Island: 2001, 2003, 2005, and 2009 (714 pups); 7,958 sightings.

For each region, the average annual number of branded animals (unique individuals) observed in each region was calculated and standardized as a percent. This provided a crude estimate because it did not take into account differences in rates of survival or sighting probability by region, cohort, sex, age, and time (Fritz et al. in review) of the distribution of sea lions born in each of the three regions during the breeding season (i.e., when the surveys are conducted).

We estimated the number of Steller sea lions by sex and age (through age 11 years) that moved between the E GULF, C GULF, and southeast Alaska during the 2009 breeding season using the following data and assumptions:

- Survival by age and sex of eastern DPS sea lions born at each of four rookeries in southeast Alaska: two southern rookeries (Forrester and Hazy) and two northern rookeries (White Sisters and Graves Rock; Hasting et al. 2011; Appendix Table B1). Survival for pups born at Biali was assumed to be the average of Hazy and White Sisters given the longitudinal survival gradient

(Hastings et al. 2011). The survival rate at the oldest age available in Hastings et al. (2011) for each sex and rookery was assumed for each subsequent age to 11 year;

- Survival by age and sex of western DPS sea lions born at four rookeries in the C GULF and E GULF (Fritz et al. in review; Appendix Table B2). Survival for pups born at Chiswell was set to E GULF rates, whereas survival for pups born at Outer, Chowiet, and Chirikof was set to C GULF rates;
- Transition probabilities of branded sea lions (by age and sex) from southeast Alaska to the western DPS (Jemison et al. in review); Appendix Table B3). Separate transition probabilities were used for the southern and northern (including Biali) rookeries. Jemison et al. (in review) provided transition probabilities from the C GULF and E GULF to southeast Alaska (Appendix Table B3). Transition probabilities at the oldest age available for each sex and region were assumed for each subsequent age to 11 years;
- Pup counts in 2009 by rookery in the C GULF, E GULF, and southeast Alaska (Table 2). Pups counted at haulouts surveyed in 2009 (Table 2) were added to the largest rookery in each region and a 50:50 sex ratio at birth was assumed (Calkins and Pitcher 1982).

Beginning with the number of female and male pups born in 2009 (Table 2), numbers at age by sex in southeast Alaska, E GULF, and C GULF were estimated using the appropriate survival rates (Appendix Tables B1 and B2). The number of sea lions of each sex and age that moved from either the E GULF or C GULF (their natal region) to southeast Alaska during the breeding season was estimated using transition probabilities (Appendix Table B3) and the 2009 numbers-

at-age-by-sex matrices. Jemison et al. (in review) did not estimate transition probabilities from southeast Alaska to each of the C GULF and E GULF regions (only from southeast Alaska to the western DPS), nor did they estimate transition probabilities between the C GULF and E GULF. For the latter, we used the average annual regional distribution of branded western DPS sea lions, and for the former, we assumed the same transition probability as in the opposite direction: of all the sea lions moving from southeast Alaska to the western DPS, 58% went to the E GULF and 42% went to the C GULF.

RESULTS

Because many sites were missed during aerial surveys conducted in 2010-2012, the most recent years for which complete counts of non-pups and pups in Alaska are available are 2008 and 2009, respectively (Tables 1-8). Western DPS non-pup counts in Alaska declined rapidly from the late 1970s through 1989, and then more slowly between 1990 and 2000 when the decline stopped. Between 2000 and 2008, non-pup counts increased slightly faster in the western DPS overall than in the K-K region and at the 2000s than the 1990s trend sites (Fig. 4). By contrast, non-pup counts in southeast Alaska increased throughout the 1990s and 2000s (Fig. 5).

There is considerable regional variability in western DPS non-pup trends in Alaska in (Tables 3-6; Figs. 5-7). In the W ALEU (RCA 1) and western half of the C ALEU (RCAs 2-3), non-pup counts continued to decline through 2012, with the rate of decline greater in the W ALEU (Figs. 5A, 6A, and 7A). In the eastern half of the C ALEU (RCAs 4-5), non-pup counts increased between 1996 and 2004, but were greater and more variable in RCA 4 and continued to increase in RCA 5 between 2004 and 2011 (Fig. 7B). Non-pup trends were very similar in the E ALEU (RCA 6) and W GULF (RCA 7) between 1991 and 2011: stable through the 1990s, a

low count in 2000, followed by steady increase through 2008 and 2011, respectively (Figs. 6B and 7C). Trends in the C GULF (RCAs 8-9), however, were stable or increasing slowly, and were different from the increasing trends in the other ESAM regions, including the E GULF (RCA 10; Figs. 5B, 6C, and 7D).

Movement of sea lions was likely responsible for the large difference in E GULF non-pup counts (Δ = 1,498, or +37%; Table 1; Figs. 5B and 6C) between the initial (8-9 June) and replicate (11 July) 2010 surveys. The increase was largely due to an increase in juvenile sea lions (Δ = 1,064, +77%) and subadult males (Δ=356, +56%); counts of adult females (Δ = 174, +11%) also increased while those of adult males dropped (Δ = 100, -23%; Fig. 8A). These changes in E GULF age/sex composition between early June and mid-July indicate the potential magnitude of animal movement during the breeding season in this area. While the timing of the rookery break-up is likely similar each year (mid-late July; Pitcher and Calkins 1981, Calkins and Pitcher 1982, Pitcher et al. 2001), the movement of non-reproductive, young animals between regions could add considerable variability to regional non-pup counts. This variability is also evident in the difference between the 6-11 June 2008 (early) and 25-26 June 2009 (optimal) E GULF non-pup counts, but in this case, the 'early' count was greater than the 'optimal' count (Δ = 807, +20%; Table 1), though the age/sex composition was similar (Fig. 8B).

The distribution of sightings of branded animals during the breeding season supports the aerial survey results that showed the potential for movement of large numbers of sea lions into the E GULF. The majority of branded western DPS sea lions (≥ 64%) were observed at age 1+ year within their natal region during the breeding season (Table 9; Fig. 9). There were regional differences, however, in natal region fidelity ranging from a low of 64% in the C GULF to a high of 79% in the E ALEU. Of those animals observed outside their natal region, there were also

differences in the direction of movement between regions: C GULF and E GULF animals were more likely to be observed in regions to the east (E GULF and southeast Alaska, respectively) than west (W GULF and C GULF, respectively), while E ALEU animals were more likely to be observed to the north (BERING) and to a lesser extent, to the south (W GULF; Table 9; Fig.9). Only one E ALEU branded animal was seen east of the W GULF and only one E GULF animal was seen west of the W GULF. A major consideration, however, is that sighting effort was not equally distributed between regions. Effort was relatively high in Russia, E ALEU, C GULF, E GULF, southeast Alaska and Washington (WASH), but lower in the W ALEU, C ALEU, W GULF, and in British Columbia Canada (BC). Consequently, we may be underestimating movement of E ALEU animals to the west (C ALEU and W ALEU) and south (W GULF), C GULF animals to the west (W GULF, C ALEU and W ALEU), and western DPS animals (particularly those from the C GULF and E GULF) to BC in the eastern DPS.

Using the survival and movement rates in Appendix Tables B1-3 and the 2009 pup counts (Table 2), we estimated that the average annual breeding season movement of Steller sea lions was 917 from the western DPS to southeast Alaska, and 1,093 from southeast Alaska to the western DPS. This results in a net average annual movement of 176 sea lions from the eastern DPS (southeast Alaska only) to the western DPS during the breeding season (Table 10; Fig. 10). Based on the assumptions used in the analysis, most of the net movement from southeast Alaska was to the E GULF (102 of 176) and the remainder (74) to the C GULF, but these assumptions did not affect the estimate of the number of sea lions that moved between DPSs. There was a much larger net breeding season movement, however, between the C GULF and E GULF (1,600). The effect of these estimated regional movements is a net increase of 1,702 sea lions in the E GULF and a net decrease of 1,526 in the C GULF. These estimates are similar to the

difference in E GULF non-pup counts between the early and late surveys conducted in 2010 (Δ = 1,498).

Regional and overall trends in pup counts in Alaska (Table 2; Figs. 11 and 12) are similar to those of non-pups. Pup production declined from 1997 through 2012 in the W ALEU and from 1990 through 2009 and 2010 in RCAs 2 and 3, respectively. In the eastern half of the C ALEU, trends in pup production differed by RCA. In RCA 4, pup counts increased from 1990 through 2009 and dropped slightly in 2010 and 2011, while in RCA 5, pup production declined from 1990 through 2001, increased through 2009 and also dropped slightly in 2010 and 2011. Overall, pup production in the C ALEU dropped sharply in the late 1980s, and declined more slowly since 1991. Decadal trends in pup production have had the same pattern in both the E ALEU and W GULF since the mid-1980s: sharp decline in the late 1980s, slow decline through the 1990s, and steady increases in the 2000s. In the C GULF, the western (RCA 8) and eastern (RCA 9) portions both declined sharply in the 1980s, both declined more slowly through 1998 (RCA 8) or 2001 (RCA 9), and in the 2000s, were stable (RCA 8) or increased slowly (RCA 9). Overall pup production in the C GULF increased slowly from 2003-04 through 2011. Pup production in the E GULF (RCA 10) was variable and low through 2001-02, and increased through 2011. Overall, pup production in the western DPS in Alaska reached its lowest value in 2001-02, and increased slowly through 2011. By comparison, pup production in the eastern DPS in Alaska (southeast Alaska) increased significantly and steadily between the late 1970s and 2009.

An estimate of the pup production in the western DPS in Alaska for 2011 (11,600 pup) can be made by summing the total number of pups counted in 2011 (10,604; 91%) with the most recent estimates available for 12 sites missed in 2011: Gramp Rock (299), Tag (135),

Ulak/Hasgox Point (264), Buldir (1), Alaid (10), and Walrus (14) surveyed in 2010; and Semisopochnoi/Pochnoi (5), Amchitka/East Cape (13), Amchitka/Column Rock (40), Ayugadak (44), Kiska/Cape St Stephen (91), and Kiska/Lief Cove (80) surveyed in 2009 (Table 2). The estimate for 2009 obtained in a similar manner is 11,120 pups [10,792 (97%) counted in 2009, plus 252 counted at four sites in the W ALEU in 2008 (Table 2), and 76 counted in 2005 at Attu/Cape Wrangell and Walrus; Fritz et al. 2008].

Relative trends in counts of non-pups at rookeries and haulout sites can indicate demographic changes in the population (Fig. 13). In regions where non-pup counts declined continuously through the 2008-2012 period (W ALEU and the western half of the C ALEU; Figs. 13A-B), non-pup counts at both rookeries and haulouts also declined. In the 2000s, inclusion of counts at an expanded group of trend haulouts (the 00s haulouts; Table 1) did not improve the trend in either area. To the east, counts at rookeries increased steadily from 1998 to 2004 and from 2006 to 2011 in the eastern half of the C ALEU (Fig. 13C), and from 2000 through 2008 and 2010 in the E ALEU and W GULF, respectively (Figs. 13D-E). In each of these regions, counts at haulouts were either stable or increased at a slower rate than at rookeries, but trends generally improved with the inclusion of counts at 00s haulouts, particularly in the W GULF (Figs. 13C-E). By contrast, rookery and haulout non-pup counts in the C GULF increased slowly in the 2000s (Fig. 13F). In the E GULF, rookery non-pup counts reached their lowest values in the mid-1990s and have increased (with the exception of the 2007 count) through 2011, while haulout non-pup counts declined in the 1990s and have increased through 2011, but with considerable inter-annual variability (Fig. 13G). Overall, rookery non-pup counts in the western DPS in Alaska and in the K-K region reached their lowest value in 2000 and increased slowly through 2008 (Figs. 13H-I). Counts at the 90s haulouts were generally stable in the 1990s, but

declined slightly in the 2000s in the Kenai-Kiska region. Inclusion of counts at the 2000s trend site haulouts improved the recent haulout trends, but in the K-K region the rookery trend is greater than at haulouts whereas trends at rookeries and haulouts were similar for the western DPS in Alaska overall. The difference in trends at haulouts between the K-K region and the western DPS in Alaska is due entirely to the increase in E GULF haulouts where counts have also had the greatest inter-annual variability. In southeast Alaska, both rookery and haulout non-pup counts increased through the 1990s, but rookery counts may have stabilized in the 2000s while counts at haulouts continued to increase (Fig. 13J).

The factor to adjust oblique to vertical photo counts is independently estimated in agTrend; the same data that Fritz and Stinchcomb (2005) used is the prior. The agTrend posterior estimate of the adjustment factor is 3.98% (e.g., counts of non-pups from vertical photographs are 3.98% greater, on average, than counts from oblique photos). This is slightly greater than the adjustment factor estimated by Fritz and Stinchcomb (2005; 3.64%).

Average annual rates of change in counts of western non-pups and pups by RCA and region in the 2000s (2000-2012) are listed in Table 11 and displayed in Figures 14 and 15. Rates of change estimated by the trend site and agTrend methods reveal the same longitudinal cline, and are similar to each other. Each method estimated a significantly positive trend in non-pup counts in the western DPS in Alaska overall, ranging from 1.7% per year to 2.3% per year. West of Samalga Pass (RCAs 1-5; W ALEU and C ALEU), non-pup and pup trends decreased to the west, while east of Samalga Pass, trends were generally all significantly positive. Movement of non-pups from the C GULF and E GULF during the breeding season, particularly juveniles, likely affected trend estimates in each individual region and RCA (8-10) estimated by all methods. Similar movement could have affected trend estimates in the E ALEU and W GULF,

but there are fewer data to support this hypothesis given the lack of branded pups and low sighting effort in the W GULF. Therefore, trends using each method for the combined eastern and central Gulf of Alaska (ECGULF), eastern Aleutians and western Gulf of Alaska (EAWG), and all regions east of Samalga Pass (ESAM) regions were also estimated (Table 11). While less informative given the strong longitudinal cline in trends west of Samalga Pass, trends for the combined WSAM region were also estimated (Table 11).

Use of the expanded group of 2000s trend sites improved overall western DPS and Kenai-Kiska non-pup trends and also decreased the variance relative to the 1990s trend site rates. The 2000s trend sites also yielded higher (though not statistically different) non-pup trend estimates in two of three increasing regions (E ALEU and W GULF, but not E GULF). This was because the 2000s trend sites included haulouts that had been inconsistently monitored in the 1990s, yet had large and increasing counts in the 2000s, such as Unimak/Oksenof Point in the E ALEU, and Olga Rocks, Sushilnoi Rocks, and Caton in the W GULF (Table 1). For regions with stable or declining non-pup counts, there were no significant differences in the estimates of annual rates of change between the 1990s and 2000s trend sites. agTrend yielded slightly lower rates for the steeply declining W ALEU than the trend site methods, as well as for some increasing regions (e.g., E ALEU, W GULF). For the increasing regions, this is likely due to a relatively low trend site count in 2000, which would increase the estimated trend with this as the starting year. By contrast, agTrend utilized all data collected from 1990 to 2012 to inform the estimates for missing sites and years, and as such, was less influenced by the count in a single year. Variances of agTrend rates were generally lower than trend site rates, which was primarily due to the relatively small number of complete survey years available for many regions to estimate trend site rates (some as few as 4).

DISCUSSION

There is strong evidence that Steller sea lion pup and non-pup counts in the western DPS in Alaska increased between 2000 and 2012 despite the continued declines west of 177°W. As first noted by Braham et al. (1980), however, there is considerable variation in abundance trends across Alaska. In the western DPS in the 1990s, abundance declined sharply at the ends of the Alaskan range (W ALEU and E GULF), but was stable in the middle (E ALEU and W GULF; Fritz and Stinchcomb 2005; Fritz et al. 2008). In the 2000s, a new pattern emerged with negative and positive abundance trends west and east of Samalga Pass, respectively. In southeast Alaska, as in most of the rest of the eastern DPS, abundance has steadily increased since the mid-1970s (Pitcher et al. 2007, NMFS 2013).

Movement of branded age 1+ year western sea lions between the C GULF and E GULF, and the virtual lack of sightings of E ALEU branded animals east of the W GULF during the breeding season suggests that it may not be appropriate to estimate trends in non-pups for each of these four regions separately. Consequently, in addition to separate regional estimates, we present non-pup trend estimates for the pooled EAWG, ECGULF, and ESAM regions, for which there is strong evidence that each increased at > 2.4% per year. Estimates of juvenile and young adult survival in the 2000s in both the eastern and western DPS east of Samalga Pass are consistent with increasing populations, and in the western DPS, are greater than in the 1980s when abundance was declining steeply (Holmes et al. 2007, Hastings et al. 2011, Fritz et al. in review). Greater survivorship of juveniles may be reflected by increasing non-pup counts at haulouts in the early 1990s followed by increases at rookeries in the late 1990s and early 2000s in these regions. By contrast, declining non-pup counts at both rookeries and haulouts in the W

ALEU and western C ALEU (RCAs 1-3) suggest a different pattern of vital rate changes, with potentially declining rates of both survival and reproduction.

While inter-region movement during the breeding season within the western DPS likely affected non-pup trend estimates in the E GULF and C GULF, net average annual movements between the western and eastern DPSs were small, as were the likely effects on overall DPS trends. Movements of sea lions were based on sightings throughout many breeding seasons and as such, represent an average annual pattern based on the last decade (2001-2011; Jemison et al. in review). By contrast, each aerial survey captures a snapshot of the distribution and abundance of animals in each region, which may or may not conform to the average annual pattern. Consequently, while the current estimated net movement during the breeding season is small, more research is necessary, including additional replicate surveys and continued analysis of sightings of marked animals, to determine how movement affects DPS and regional trend estimation.

An estimate of the abundance of non-pups in a region can be made by multiplying regional pup production by 3.5, a value derived from the stable, equilibrium life table for a 1970s C GULF Steller sea lion population by Calkins and Pitcher (1982). Applying this value to average (2009 and 2011) regional pup counts yields non-pup abundance estimates of 3,724 in the E GULF and 7,371 in the C GULF. Adding the estimated net movement into the E GULF (Δ = 1,702) increases the non-pup abundance to 5,426, while subtracting the net movement out of the C GULF (Δ = -1,526) decreases the non-pup abundance to 5,845. Thus, movement of non-pups from the C GULF to the E GULF gives the appearance of similar regional non-pup abundances (note the similarity in the 2008-2011 counts in both regions; 4,747-5,487 in the C GULF and 4,098-5,545 in the E GULF) despite much greater pup production in the C GULF.

Only 43-66% of the juvenile and adult female Steller sea lions occupying a region are hauled-out during the day when survey flights are conducted, with the range reflecting differences in haul-out behavior by age, sex and reproductive status (see review by Holmes et al. 2007). If an overall 60% haul-out probability for non-pups is assumed, then average annual movement between regions could have increased the E GULF non-pup count by ~1,020, decreased the C GULF count by ~920, decreased the southeast Alaska count by ~110, and increased the overall western DPS count by ~110. Relative to the 2008-2010 non-pup counts in each region and DPS, movement of sea lions during the breeding season could have had considerable effect on regional counts in the E GULF and C GULF (increase of 18-25% and decrease of 16%, respectively), but a much smaller impact on counts in the entire western DPS (increase of < 0.5%) and in southeast Alaska (decrease of < 1%).

While movement may have depressed the C GULF 2000-2012 non-pup trend, movement cannot explain the relatively low C GULF 2000-2012 pup trend. Slower growth in pup counts in the C GULF than in the other regions east of Samalga Pass could be due to some level of permanent emigration of adult females out of the region (primarily to the E GULF) or poor local conditions (which could have depressed reproductive rates), both of which suggest that sea lions responded to meso-scale (on the order of 100s of kilometers) variability in their environment. Given the strong similarity in survivorship of western DPS sea lions east of Samalga Pass, the depressed pup trends in the C GULF suggest that reproductive rates may be lower for those that remained there to breed (see also (Pitcher et al. 1998, Holmes et al. 2007).

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 abundance of Steller sea lions (pups and non-pups). For a stable population at equilibrium,

the multiplier was 4.5 (recall that 3.5 was the factor used to estimate non-pup abundance from pup production). Applying this factor to the most recent estimates of western DPS pup production in Alaska (11,120 in 2009 and 11,600 in 2011 at 37 rookeries and dozens of major haulouts; Table 1) yields total population estimates of 50,040 in 2009 and 52,200 in 2011. For southeast Alaska, the most recent estimate of pup production is 7,462 in 2009 (at only five rookeries and seven major haulouts), which yields a total population estimate of ~33,600.

Samalga Pass has been identified as a major boundary in the Alaskan coastal ecosystem for a wide variety of physical and bio-geographic factors, separating an oceanic, pelagic ecosystem to the west (in the Aleutian Islands) from a coastal, shelf ecosystem to the east (in the eastern Bering Sea and Gulf of Alaska). The strong seasonal low salinity signal of the Alaska Coastal Current, which reflects freshwater discharge onto the continental shelf from rivers throughout the Gulf of Alaska, disappears west of Samalga Pass (Ladd et al. 2005). Aleutian Island passes west of Samalga Pass are more strongly influenced by deeper ocean currents, such as the nutrient-rich Alaskan Stream and the Aleutian North Slope Current (Stabeno et al. 2005). Distinct changes in species occurrence, diversity, and diet of demersal fishes occur at Samalga Pass, which represents the western edge of the eastern Bering Sea shelf fish community (Logerwell et al. 2005). For Steller sea lions, there are clear differences in abundance trends (this study, York 1994, Winship and Trites 2006), diet (Sinclair and Zeppelin 2002), terrestrial and marine habitat use (Call and Loughlin 2005, Fadely et al. 2005), and genetics (O'Corry-Crowe et al. 2006) east and west of Samalga Pass that indicate that it has a major influence on the species' metapopulation structure. Data presented here support the hypothesis proposed by O'Corry-Crowe et al. (2006) that the strong differences in physical and biological oceanography east and

west of Samalga Pass have led to these differences, and ultimately to population sub-division within the western DPS.

If the overall western non-pup count in Alaska continues to increase through 2015, the western DPS appears to be on a trajectory to satisfy the first demographic criterion for down-listing it from 'endangered' to 'threatened' status under the ESA (NMFS 2008). The second demographic criterion, however, involves regional population performance, which has varied across the range. The western DPS may satisfy the first part of criterion #2 if non-pup counts in the E GULF, C GULF, W GULF, E ALEU and Russia (overall) continue to increase through 2015. However, persistent declines in the W ALEU and the western half of the C ALEU may preclude it from satisfying the second part of criterion #2, and indicate that the western DPS is responding to mesoscale variability in factors affecting recovery.

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Table 1. -- Aerial survey counts of adult and juvenile (non-pup) Steller sea lions at rookery (Rook=1) and haul-out sites in Alaska in June and July 2008-2012. Early and late surveys conducted in 2010 are referred to as 2010E (early) and 2010L (late). Trend sites are those that have been consistently surveyed since the 1970s (70), 1991 (90), or 2000 (00). Sites where counts are indicated for 2008 (*) and 2010 (**) surveys were conducted on-site. For 'boxed' sites under rookery or trend site columns, see notes at end. RCA = rookery cluster area. DPS=distinct population segment.

				2008		2009		2010E		2010L		2011	
Site Name	**RCA**	**Rook**	**Trend**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**
Southeast Alaska Region													
WHITE SISTERS	11	1	70	7-Jun	1,132	25-Jun	1,435	8-Jun	1,557				
BIALI ROCK	11	1	70	7-Jun	408	24-Jun	616	7-Jun	488	12-Jul	509		
HAZY	11	1	70	8-Jun	1,686	24-Jun	2,457	7-Jun	1,642	12-Jul	1,570		
FORRESTER/SEA LION RK	11	1	70	8-Jun	509	24-Jun	796	7-Jun	542	12-Jul	526		
FORRESTER/NORTH	11			8-Jun	844	24-Jun	1,238	7-Jun	1,057	12-Jul	525		
FORRESTER/C HORN RK	11			8-Jun	311	24-Jun	502	7-Jun	414	12-Jul	197		
FORRESTER/LOWRIE	11			8-Jun	1,228	24-Jun	2,114	7-Jun	1,312	12-Jul	1,886		
FORRESTER/FORRESTER I.	11			8-Jun	2	24-Jun	91	7-Jun	60	12-Jul	18		
BENJAMIN	11			8-Jun	0	24-Jun	0	7-Jun	0				
BLACK ROCK	11							8-Jun	0				
CAPE ADDINGTON	11		90	8-Jun	718	24-Jun	9	7-Jun	542	12-Jul	616		
CAPE BARTOLOME	11			8-Jun	0	24-Jun	0	7-Jun	59	12-Jul	13		
CAPE BINGHAM	11			7-Jun	0	25-Jun	0	8-Jun	0				
CAPE CROSS	11			7-Jun	1	25-Jun	0	8-Jun	7	13-Jul	0		
CAPE FAIRWEATHER	11			9-Jun	0	25-Jun	0	8-Jun	0	13-Jul	0		
CAPE OMMANEY	11		90	7-Jun	218	24-Jun	273	7-Jun	317	12-Jul	224		
CASE (TLINGIT) POINT	11			7-Jun	0	25-Jun	0	8-Jun	0				
CIRCLE POINT	11			8-Jun	0	24-Jun	0	7-Jun	0				
CORONATION	11		70	8-Jun	279	24-Jun	5	7-Jun	254	12-Jul	178		
DOROTHY	11			8-Jun	0	24-Jun	0	7-Jun	0				
EASTERLY	11			8-Jun	255	24-Jun	188	7-Jun	216	12-Jul	124		
ELDRED ROCK	11			8-Jun	0	24-Jun	0	7-Jun	0				
EMMONS	11			8-Jun	1	24-Jun	1	8-Jun	0				
ETOLIN	11			8-Jun	0	24-Jun	0	7-Jun	0				

Table 1. -- Continued.

Site Name	RCA	Rook	Trend	2008		2009		2010E		2010L		2011	
				Date	Count	Date	Count	Date	Count	Date	Count	Date	Count
FALSE POINT PYBUS	11			8-Jun	0	24-Jun	0	7-Jun	0				
GAFF ROCK	11							8-Jun	0				
GRAN (LEDGE) POINT	11		90	8-Jun	582	24-Jun	638	7-Jun	516	12-Jul	166		
GRAVES ROCK	11	1	70	9-Jun	1,305	25-Jun	1,442	8-Jun	1,057				
GRINDALL	11			8-Jun	374	24-Jun	6	7-Jun	132	12-Jul	90		
HARBOR POINT	11			9-Jun	178	25-Jun	264	8-Jun	206	13-Jul	0		
HORN CLIFF	11		90	8-Jun	0	24-Jun	0	7-Jun	0				
INIAN	11		70 90	7-Jun	116	25-Jun	2	8-Jun	175				
JACOB ROCK	11		70	7-Jun	101	24-Jun	300	7-Jun	220	12-Jul	138		
KAIUCHALI (BIORKA)	11		90	7-Jun	30	24-Jun	5	7-Jun	18	12-Jul	26		
LARCH BAY	11			7-Jun	28	24-Jun	0	7-Jun	0	12-Jul	0		
LITTLE ISLAND	11			8-Jun	0	24-Jun	0	7-Jun	0				
MET POINT	11			8-Jun	0	24-Jun	0	7-Jun	0				
MIDDLE PASS ROCK	11							8-Jun	74				
MIST	11			8-Jun	0	24-Jun	0	7-Jun	0				
PATTERSON POINT	11			7-Jun	0			7-Jun	0				
PINTA ROCKS	11			8-Jun	0	24-Jun	0	7-Jun	0				
POINT CAROLUS	11			7-Jun	0	25-Jun	0	8-Jun	0				
POINT ISLET (POINT ROCK)	11							7-Jun	0				
POINT LEAGUE (STEVENS P.)	11			8-Jun	1	24-Jun	0	7-Jun	0	12-Jul	0		
POINT LULL	11			7-Jun	153	24-Jun	162	7-Jun	0	12-Jul	0		
POINT MARSDEN	11			7-Jun	0	24-Jun	0	7-Jun	0				
POINT MARSH	11			8-Jun	4	24-Jun	0	7-Jun	2	12-Jul	61		
ROUND ROCK	11			8-Jun	0	24-Jun	0	7-Jun	0				
SAIL	11		90	8-Jun	3	24-Jun	496	7-Jun	0	12-Jul	980		
SAKIE POINT	11			8-Jun	0	24-Jun	0	7-Jun	0				
SEA LION ISLANDS	11		70	7-Jun	137	25-Jun	298	8-Jun	271				
SEA LION ROCK (PUFFIN B.)	11		90	7-Jun	0	24-Jun	124	7-Jun	113	12-Jul	16		
SOUTH MARBLE	11		90	7-Jun	786	25-Jun	1,010	8-Jun	1,458				
ST. LAZARIA	11			7-Jun	0	24-Jun	0	7-Jun	0				
SUNSET	11		90	8-Jun	384	24-Jun	322	7-Jun	400	12-Jul	0		
TARR INLET	11							8-Jun	0				
TENAKEE CANNERY POINT	11			7-Jun	0	24-Jun	0	7-Jun	0				

Table 1. -- Continued.				2008		2009		2010E		2010L		2011	
Site Name	**RCA**	**Rook**	**Trend**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**
THE BROTHERS/SW	11		70	8-Jun	764	24-Jun	537	7-Jun	828	12-Jul	608		
THE BROTHERS/W+E	11			8-Jun	0	24-Jun	0	7-Jun	0	12-Jul	0		
THE SISTERS	11			7-Jun	0	24-Jun	0	7-Jun	0				
TIMBERED	11		90	8-Jun	288	24-Jun	4	7-Jun	444	12-Jul	438		
TURNABOUT	11			8-Jun	0	24-Jun	0	7-Jun	0	12-Jul	0		
VENISA	11			9-Jun	0	25-Jun	0	8-Jun	0				
WEST ROCK	11		90	8-Jun	841	24-Jun	869	7-Jun	713	12-Jul	375		
WOLF ROCK	11		90	8-Jun	300	24-Jun	170	7-Jun	245	12-Jul	3		
YASHA	11		90	7-Jun	378	24-Jun	612	7-Jun	450	12-Jul	1,516		
Southeast Alaska Total		**5**			**14,345**		**16,986**		**15,789**		**10,803**		
Eastern Gulf of Alaska Region													
ALSEK	11			9-Jun	0	25-Jun	0	8-Jun	0				
AKWE	11			9-Jun	0	25-Jun	0	8-Jun	0				
CAPE ST. ELIAS	10		70	9-Jun	1,400	25-Jun	714	9-Jun	558	11-Jul	1,490	27-Jun	1,480
HOOK POINT	10		00	9-Jun	261	26-Jun	0	9-Jun	384	11-Jul	0	27-Jun	60
CAPE HINCHINBROOK	10		90	9-Jun	228	26-Jun	102	9-Jun	161	11-Jul	0	27-Jun	76
SEAL ROCKS	10	1	70	9-Jun	1,024	26-Jun	1,006	9-Jun	1,042	11-Jul	1,036	27-Jun	1,310
WOODED (FISH)	10	1	70	9-Jun	603	26-Jun	662	9-Jun	634	11-Jul	886	28-Jun	564
SITKAGI BLUFFS	10			9-Jun	0	25-Jun	0	9-Jun	0				
MIDDLETON	10					26-Jun	0	9-Jun	0				
GLACIER	10		70	11-Jun	508	26-Jun	724	9-Jun	564	11-Jul	1,127	27-Jun	862
THE NEEDLE	10		70	11-Jun	88	26-Jun	112	9-Jun	111	11-Jul	66	28-Jun	102
POINT ELEANOR	10			11-Jun	0	26-Jun	0	9-Jun	0	11-Jul	0		
PERRY	10		00	11-Jun	226	26-Jun	0	9-Jun	0	11-Jul	0	27-Jun	0
PLEIADES	10			11-Jun	0	26-Jun	0	9-Jun	0	11-Jul	0		
POINT LaTOUCHE	10			11-Jun	0	26-Jun	0	9-Jun	0	11-Jul	0		
DANGER	10			11-Jun	2	26-Jun	1	9-Jun	0	11-Jul	160		
POINT ELRINGTON	10		70	6-Jul	168	26-Jun	162	9-Jun	81	11-Jul	38	28-Jun	42
PROCESSION ROCKS	10		00	6-Jul	102	26-Jun	113	9-Jun	185	11-Jul	72	28-Jun	108
CAPE PUGET	10		90	6-Jul	0	26-Jun	10	9-Jun	1	11-Jul	0		
CAPE JUNKEN	10		00	6-Jul	0	26-Jun	1	9-Jun	0	11-Jul	0		
CAPE FAIRFIELD	10		90	6-Jul	46	26-Jun	32	9-Jun	27	11-Jul	11		
CAPE RESURRECTION	10					26-Jun	169	9-Jun	0	11-Jul	158	28-Jun	120

Table 1. -- Continued.				2008		2009		2010E		2010L		2011	
Site Name	**RCA**	**Rook**	**Trend**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**
RUGGED	10		70	11-Jun	8	26-Jun	2	9-Jun	0	11-Jul	7		
AIALIK CAPE	10		90	11-Jun	77	26-Jun	88	9-Jun	74	11-Jul	100		
NATOA (GROTTO)	10		00					9-Jun	46	11-Jul	63	28-Jun	51
CHISWELL ISLANDS	10	1	70	11-Jun	68	26-Jun	94	9-Jun	68	11-Jul	186	28-Jun	126
GRANITE CAPE	10		00	11-Jun	4	26-Jun	5	9-Jun	0	11-Jul	1		
SEAL ROCKS (KENAI)	10		70	11-Jun	0	26-Jun	13	9-Jun	4	11-Jul	58		
STEEP POINT	10		00	11-Jun	92	26-Jun	88	9-Jun	107	11-Jul	86		
RABBIT	10		00	11-Jun	0	26-Jun	0	9-Jun	0	11-Jul	0		
Eastern Gulf of Alaska Total		**3**			**4,905**		**4,098**		**4,047**		**5,545**		**4,901**
Central Gulf of Alaska Region													
OUTER (PYE)	10	1	90	11-Jun	248	26-Jun	231	9-Jun	269	11-Jul	435	28-Jun	308
NUKA POINT	10		00	11-Jun	0			9-Jun	0	10-Jul	0		
GORE POINT	10		90	11-Jun	0	26-Jun	0	9-Jun	0	10-Jul	0		
EAST CHUGACH	10		90	11-Jun	0	26-Jun	0	9-Jun	0	10-Jul	0		
PERL	10		90	11-Jun	144	26-Jun	150	9-Jun	217	10-Jul	74	28-Jun	140
PERL ROCKS	10		00	11-Jun	0			9-Jun	0	10-Jul	0		
NAGAHUT ROCKS	10		90	11-Jun	21	26-Jun	0	9-Jun	0	10-Jul	0		
ELIZABETH/C. ELIZABETH	10		90	11-Jun	0	26-Jun	0	9-Jun	0	10-Jul	0		
FLAT	10		00	11-Jun	0			9-Jun	0	10-Jul	0		
WEST AMATULI	9			12-Jun	0			10-Jun	0				
SUGARLOAF	9	1	70	12-Jun	848	27-Jun	844	10-Jun	788			28-Jun	1,018
USHAGAT/NW	9		70	12-Jun	0	27-Jun	0	10-Jun	0				
USHAGAT/SW	9	1	70	12-Jun	96	27-Jun	88	10-Jun	86			28-Jun	166
USHAGAT/ROCKS SOUTH	9		70	12-Jun	45	27-Jun	28	10-Jun	28				
SUD	9			12-Jun	0			10-Jun	0				
LATAX ROCKS	9		70	12-Jun	108	27-Jun	334	10-Jun	128			28-Jun	228
SEA OTTER	9		90	12-Jun	1	27-Jun	7	12-Jun	6				
RK NEAR SEA OTTER	9		90	12-Jun	47	27-Jun	20	12-Jun	0				
AFOGNAK/TONKI CAPE	9		90	12-Jun	16	27-Jun	2	12-Jun	0				
SEA LION ROCKS (MARMOT)	9		70	12-Jun	13	27-Jun	2	12-Jun	0				
MARMOT	9	1	70	12-Jun	644	27-Jun	748	12-Jun	576			28-Jun	829
LONG ISLAND	9		70	12-Jun	59	27-Jun	39	12-Jun	0				
KODIAK/CAPE CHINIAK	9		70	12-Jun	130	27-Jun	116	12-Jun	110			28-Jun	234

Table 1. -- Continued.				2008		2009		2010E		2010L		2011	
Site Name	**RCA**	**Rook**	**Trend**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**
UGAK	9		90	12-Jun	0	27-Jun	0	12-Jun	0				
KODIAK/GULL POINT	9		90	12-Jun	108	27-Jun	89	12-Jun	72				
KODIAK/CAPE BARNABAS	9		70	12-Jun	84	27-Jun	130	12-Jun	194				
TWOHEADED	9		70	12-Jun	204	27-Jun	251	12-Jun	244			28-Jun	353
SITKINAK/CAPE SITKINAK	9		70	12-Jun	114	27-Jun	62	12-Jun	76				
NOISY	9		00	12-Jun	0			10-Jun	0				
KODIAK/MALINA POINT	9		00	12-Jun	0			10-Jun	0				
KODIAK/STEEP CAPE	9		90	12-Jun	38			10-Jun	24				
KODIAK/CAPE PARAMANOF	9		00	12-Jun	0			10-Jun	0				
SHAW	9		00	12-Jun	0			10-Jun	0				
CAPE DOUGLAS	9		00	12-Jun	0			10-Jun	0				
SHAKUN ROCKS	9		90	13-Jun	80			10-Jun	117			30-Jun	125
CAPE NUKSHAK	9		00	13-Jun	0			10-Jun	0				
KODIAK/CAPE KULIUK	9		00	12-Jun	0			10-Jun	0				
KODIAK/CAPE UGAT	9		90	12-Jun	285	27-Jun	270	10-Jun	140			30-Jun	212
KODIAK/BIRD ROCK	9							10-Jun	108				
KODIAK/SUNDSTROM	8		00	12-Jun	0			12-Jun	0				
KODIAK/CAPE ALITAK	8		00	12-Jun	0			12-Jun	0				
KODIAK/CAPE IKOLIK	8		00	12-Jun	56			10-Jun	86				
KODIAK/TOMBSTONE RKS	8		00	12-Jun	0			10-Jun	0				
KODIAK/CAPE UYAK	8			12-Jun	0			10-Jun	0				
KODIAK/STURGEON HEAD	8			12-Jun	0			10-Jun	0				
CAPE UGYAK	8		00	13-Jun	0			10-Jun	0				
CAPE GULL	8		00	13-Jun	0			10-Jun	0				
CAPE KULIAK	8			13-Jun	0			10-Jun	0				
TAKLI	8		90	13-Jun	67			10-Jun	74				
PUALE BAY	8		90	13-Jun	2			10-Jun	84			30-Jun	0
KILOKAK ROCKS	8		00	13-Jun	101			10-Jun	142			30-Jun	187
AIUGNAK COLUMNS	8		00	13-Jun	3								
UGAIUSHAK	8		70	13-Jun	0								
SUTWIK	8		70	13-Jun	92	28-Jun	106	13-Jun	148			30-Jun	286
AGHIYUK	8			13-Jun	0			12-Jun	0				
CHOWIET	8	1	70	13-Jun	559	28-Jun	644	12-Jun	653			30-Jun	686
CHIRIKOF	8	1	70	13-Jun	300	28-Jun	430	12-Jun	262			30-Jun	461

Table 1. -- Continued.				2008		2009		2010E		2010L		2011	
Site Name	**RCA**	**Rook**	**Trend**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**
NAGAI ROCKS	8		90	13-Jun	234	28-Jun	218	12-Jun	201			30-Jun	254
Central Gulf of Alaska Total		**6**			**4,747**		**4,061**		**4,833**		**509**		**5,487**
Western Gulf of Alaska Region													
LIGHTHOUSE ROCKS	8		90	13-Jun	164	28-Jun	123					30-Jun	182
ATKULIK	8		00	13-Jun	0			13-Jun	0				
KAK	8		90	13-Jun	1			13-Jun	27				
CHANKLIUT	8		00	14-Jun	0			13-Jun	0				
SEAL CAPE	8		00	14-Jun	0								
MITROFANIA	8		90	14-Jun	129							30-Jun	183
SPITZ	8		70	14-Jun	1								
KUPREANOF POINT	7		90	14-Jun	72							30-Jun	175
CASTLE ROCK	7		70	14-Jun	28								
BIG KONIUJI	7		00	14-Jun	0								
ATKINS	7	1	70	14-Jun	558	28-Jun	630					30-Jun	892
CHERNABURA	7	1	70	14-Jun	1,281	28-Jun	1,162					30-Jun	1,494
TWINS	7		00	14-Jun	0								
THE HAYSTACKS	7		90	14-Jun	9								
THE WHALEBACK	7		90	14-Jun	102	28-Jun	103					30-Jun	122
NAGAI/MOUNTAIN POINT	7		70	14-Jun	60							30-Jun	10
NAGAI/RK W CAPE WEDGE	7		00	14-Jun	0								
EGG (SAND POINT)	7		00	14-Jun	0								
SEA LION ROCKS (SHUMS)	7		70	14-Jun	54							30-Jun	168
UNGA/CAPE UNGA	7		00	14-Jun	0								
UNGA/ACHEREDIN POINT	7		90	14-Jun	202							30-Jun	103
JUDE	7	1	90	14-Jun	464	28-Jun	512					30-Jun	698
OMEGA	7		00	14-Jun	0								
WOSNESENSKI	7		00	14-Jun	98							1-Jul	32
OLGA ROCKS NE	7		00	14-Jun	48							1-Jul	48
OLGA ROCKS SW	7		00	14-Jun	128							1-Jul	192
SUSHILNOI ROCKS	7		00	14-Jun	286	28-Jun	398					1-Jul	444
PINNACLE ROCK	7	1	70	14-Jun	1,094	28-Jun	1,132					1-Jul	1,126
HUNT	7			5-Jul	0								
SOZAVARIKA	7			5-Jul	0								

Table 1. -- Continued.				2008		2009		2010E		2010L		2011	
Site Name	**RCA**	**Rook**	**Trend**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**
UMGA	7			5-Jul	0								
CLUBBING ROCKS	7	1	70	5-Jul	951	28-Jun	1,023					30-Jun	1,068
CHERNI	7		90	5-Jul	0								
HAGUE ROCK	7		00	5-Jul	1								
CATON	7		00	5-Jul	542							1-Jul	606
SOUTH ROCKS	7	1	90	5-Jul	450	28-Jun	434					1-Jul	484
SANAK	7			5-Jul	0								
BIRD	7		70	5-Jul	155							1-Jul	234
ROCK	7		90	5-Jul	0								
Western Gulf of Alaska Total		**6**			**6,878**		**5,517**		**27**				**8,261**
Eastern Aleutian Islands Region													
UNIMAK/CAPE LAZAREF	6			5-Jul	0								
UNIMAK/OKSENOF POINT	6		00	16-Jun	762	10-Jul	332					5-Jul	188
UNIMAK/CAPE LUTKE	6		00	5-Jul	0								
UNIMAK/SCOTCH CAP	6		00	5-Jul	0								
UNIMAK/CAVE POINT	6			16-Jun	0								
UNIMAK/SENNETT POINT	6		00	16-Jun	0								
UNIMAK/CAPE SARICHEF	6		90	16-Jun	167	28-Jun	1					5-Jul	0
AMAK+ROCKS	6		70	16-Jun	265	28-Jun	324	14-Jun	366			5-Jul	358
SEA LION ROCK (AMAK)	6	1	70	16-Jun	360	28-Jun	314	14-Jun	436			5-Jul	552
UGAMAK/NORTH*	6	1	70	14-Jun	708	9-Jul	992					4-Jul	622[1]
UGAMAK/UGAMAK BAY*	6			14-Jun	768	9-Jul	658					5-Jul	398[1]
UGAMAK/ROUND	6			17-Jun	143	9-Jul	212					4-Jul	192
UGAMAK/SW	6											4-Jul	7
AIKTAK	6		90	17-Jun	42	10-Jul	61					4-Jul	78
KALIGAGAN	6		00	17-Jun	1								
TIGALDA/ROCKS NE	6		90	17-Jun	358	9-Jul	228					4-Jul	135
TIGALDA/SOUTH SIDE	6		90	17-Jun	90							1-Jul	61
BASALT ROCK	6		00	17-Jun	0								
ROOTOK/EAST	6		90	17-Jun	4								
ROOTOK/NORTH	6			17-Jun	56								
TANGINAK	6		90	17-Jun	1								
AKUN/JACKASS POINT	6		00	17-Jun	0								

Table 1. -- Continued.				2008		2009		2010E		2010L		2011	
Site Name	**RCA**	**Rook**	**Trend**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**
AKUN/AKUN BAY	6		00	16-Jun	8								
AKUN/BILLINGS HEAD**	6	1	70	17-Jun	386								
AKUN/AKUN HEAD	6		00	16-Jun	0			15-Jun	0				
AKUTAN/NORTH HEAD	6			16-Jun	0			15-Jun	1				
AKUTAN/REEF-LAVA	6		70	14-Jun	128	8-Jul	166	15-Jun	98			4-Jul	352
AKUTAN/CAPE MORGAN	6	1	70	19-Jun	1,134	8-Jul	904	3-Jul	1,298			4-Jul	1,358
AKUTAN/BATTERY POINT	6			17-Jun	0			3-Jul	0				
BABY	6			17-Jun	0			15-Jun	0				
OLD MAN ROCKS	6		90	17-Jun	89			19-Jun	196			1-Jul	126
EGG	6		90	17-Jun	0			3-Jul	84				
OUTER SIGNAL	6		90	17-Jun	10			3-Jul	52				
INNER SIGNAL	6		00	17-Jun	54			3-Jul	28				
UNALASKA/CAPE SEDANKA	6		90	17-Jun	0			3-Jul	0				
UNALASKA/PRIEST ROCK	6		00	16-Jun	2			15-Jun	4				
UNALASKA/CAPE WISLOW	6			16-Jun	0			15-Jun	0				
UNALASKA/BISHOP POINT	6		00 90	16-Jun	204	1-Jul	195	19-Jun	240			3-Jul	214
UNALASKA/KOVRIZHKA	6		00	16-Jun	0			19-Jun	0				
UNALASKA/MAKUSHIN BAY	6		90	16-Jun	115			19-Jun	56				
UNALASKA/CAPE STARICHKOF	6		00	16-Jun	0			19-Jun	0				
UNALASKA/SPRAY CAPE	6		90	16-Jun	0			19-Jun	0				
UNALASKA/WHALEBONE C.	6		00	17-Jun	0			3-Jul	0				
UNALASKA/CAPE IZIGAN	6		90	17-Jun	188	8-Jul	456	3-Jul	435			4-Jul	460
BOGOSLOF/FIRE ISLAND	6	1	70	19-Jun	390	8-Jul	398	19-Jun	434			3-Jul	314[1]
UMNAK/CAPE IDAK	6			17-Jun	0			19-Jun	0				
UMNAK/REINDEER POINT	6			17-Jun	0								
UMNAK/CAPE CHAGAK	6			19-Jun	0								
UMNAK/AGULIUK POINT	6			19-Jun	0			19-Jun	0				
UMNAK/CAPE ASLIK	6		70	19-Jun	62			19-Jun	78			3-Jul	20
EMERALD	6		00	17-Jun	0			3-Jul	0				
POLIVNOI ROCK	6		90	17-Jun	93			3-Jul	136			3-Jul	28
THE PILLARS	6		90	17-Jun	0			3-Jul	15			3-Jul	90
OGCHUL	6	1	70	17-Jun	200	8-Jul	224	3-Jul	268			3-Jul	210
VSEVIDOF	6		70	17-Jun	50			3-Jul	75			3-Jul	82
SAMALGA	6			3-Jul	0			3-Jul	0				

Table 1. -- Continued.				2008		2009		2010E		2010L		2011	
Site Name	**RCA**	**Rook**	**Trend**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**
ADUGAK	6	1	70	3-Jul	636	8-Jul	620	19-Jun	564			3-Jul	492
Eastern Aleutian Islands Total		**7**			**7,474**		**6,085**		**4,864**				**6,337**
Central Aleutian Islands Region													
ULIAGA	6		90	19-Jun	66			19-Jun	216			3-Jul	182
KAGAMIL	6		70	19-Jun	0			19-Jun	51			3-Jul	41
CHUGINADAK	6		70	3-Jul	52			3-Jul	173			3-Jul	68
CARLISLE	5		70	19-Jun	26			19-Jun	10			3-Jul	42
HERBERT	5		70	3-Jul	104			3-Jul	67			9-Jul	92
YUNASKA	5	1	70	19-Jun	282	13-Jul	298	3-Jul	403			9-Jul	526
CHAGULAK	5		70	3-Jul	59			3-Jul	54			9-Jul	49
AMUKTA+ROCKS	5		70	3-Jul	34			3-Jul	72			9-Jul	54
SEGUAM/FINCH POINT	5		70	19-Jun	0			3-Jul	0			9-Jul	2
SEGUAM/SW RIP	5		70	19-Jun	39			3-Jul	30			9-Jul	0
SEGUAM/SADDLERIDGE	5	1	70	19-Jun	835	1-Jul	856	3-Jul	756			9-Jul	944
SEGUAM/TURF POINT	5		70	19-Jun	3	7-Jul	13	3-Jul	7			9-Jul	25
SEGUAM/LAVA COVE	5		70	19-Jun	0			3-Jul	0			9-Jul	0
SEGUAM/LAVA POINT	5		70	19-Jun	0			3-Jul	0			9-Jul	0
SEGUAM/WHARF POINT	5		70	19-Jun	48			3-Jul	69			9-Jul	71
AGLIGADAK	5		70	21-Jun	14	7-Jul	11	25-Jun	38			9-Jul	12
AMLIA/EAST CAPE	5		70	21-Jun	117			25-Jun	63			9-Jul	26
AMLIA/CAPE MISTY	5							25-Jun	0			9-Jul	24
AMLIA/SVIECH. HARBOR	5		90	21-Jun	100	7-Jul	192	25-Jun	120			9-Jul	191
TANADAK (AMLIA)	5		70	21-Jun	30			25-Jun	12			9-Jul	34
SAGIGIK	5		70	21-Jun	14			25-Jun	40			9-Jul	14
ATKA/NORTH CAPE	4		70	21-Jun	32			23-Jun	206			11-Jul	94
ATKA/CAPE KOROVIN	4		70	21-Jun	39			23-Jun	6			11-Jul	0
SALT	4		70	21-Jun	4			23-Jun	7			11-Jul	1
AMTAGIS	4			3-Jul	0			25-Jun	0			11-Jul	0
SAGCHUDAK	4			3-Jul	0			25-Jun	0			11-Jul	6
KONIUJI/NORTH POINT	4		00	21-Jun	0			23-Jun	0			11-Jul	0
KASATOCHI/NORTH POINT	4	1	70	21-Jun	550	4-Jul	609	24-Jun	732			11-Jul	716
OGLODAK	4		90	3-Jul	98	4-Jul	86	23-Jun	86			11-Jul	44
IKIGINAK	4		70	3-Jul	0			23-Jun	0			11-Jul	4

Table 1. -- Continued.

Site Name	RCA	Rook	Trend	2008		2009		2010E		2010L		2011	
				Date	Count	Date	Count	Date	Count	Date	Count	Date	Count
FENIMORE	4		90	21-Jun	4			23-Jun	29			11-Jul	96
TAGALAK	4		00	21-Jun	86			24-Jun	53			11-Jul	44
CHUGUL	4		00	21-Jun	12			24-Jun	33			11-Jul	22
ANAGAKSIK	4		70	21-Jun	20			23-Jun	30			11-Jul	21
IGITKIN/SW POINT	4			21-Jun	0			23-Jun	0			11-Jul	0
GREAT SITKIN	4		90	21-Jun	0			23-Jun	0			11-Jul	76
LITTLE TANAGA STRAIT	4		70	21-Jun	36			24-Jun	26			11-Jul	60
SILAK	4			21-Jun	32			25-Jun	90			11-Jul	64
KAGALASKA	4		90	21-Jun	42			25-Jun	52			11-Jul	0
ADAK/CAPE MOFFET	4			21-Jun	0			24-Jun	0			11-Jul	0
ADAK/ARGONNE POINT	4		70					24-Jun	84			11-Jul	0
ADAK/LAKE POINT	4	1		2-Jul	538	4-Jul	558	24-Jun	672			11-Jul	656
ADAK/CAPE YAKAK	4			2-Jul	84	4-Jul	37	24-Jun	43			11-Jul	108
ADAK/CRONE ISLAND	4		00	21-Jun	60			25-Jun	15			11-Jul	13
ADAK/HEAD ROCK	4			20-Jun	0			24-Jun	0			11-Jul	0
KANAGA/N CAPE	4		90	21-Jun	14			24-Jun	0			11-Jul	0
KANAGA/CAPE MIGA	4			21-Jun	0			24-Jun	27			11-Jul	2
KANAGA/SHIP ROCK	4	1	90	20-Jun	322	4-Jul	420	24-Jun	372			11-Jul	358
KANAGA/CAPE CHUNU	4		00	20-Jun	69	4-Jul	18	24-Jun	21			11-Jul	0
BOBROF	4							24-Jun	19			11-Jul	20
TANAGA/BUMPY POINT	3		90	20-Jun	22			24-Jun	0			11-Jul	0
TANAGA/CAPE SUDAK	3		90					24-Jun	46			11-Jul	22
TANAGA/CAPE SASMIK	3		90	20-Jun	95			24-Jun	96			11-Jul	19
ILAK	3		00	20-Jun	18			24-Jun	32				
GRAMP ROCK	3	1	70	20-Jun	593	4-Jul	442	24-Jun	504				
UGIDAK	3		70	20-Jun	16			24-Jun	4				
TAG	3	1	70	20-Jun	255	4-Jul	234	24-Jun	212				
OGLIUGA	3		00	20-Jun	0			24-Jun	2				
SKAGUL/S. POINT	3			20-Jun	1								
KAVALGA	3		70	2-Jul	62			24-Jun	4				
GARELOI	3			20-Jun	0			24-Jun	0				
UNALGA+DINKUM ROCKS	3		70	20-Jun	0			24-Jun	0				
ULAK/HASGOX POINT	3	1	70	2-Jul	537	7-Jul	514	24-Jun	470				
AMATIGNAK/KNOB POINT	3		90	20-Jun	3			24-Jun	0				

Table 1. -- Continued.				2008		2009		2010E		2010L		2011	
Site Name	**RCA**	**Rook**	**Trend**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**
AMATIGNAK/NITROF POINT	3		70	2-Jul	49			24-Jun	46				
SEMISOPOCHNOI/POCHNOI	2		90	20-Jun	32	4-Jul	36						
SEMISOPOCHNOI/PETREL	2			20-Jun	0								
SEMISOPOCHNOI/TUMAN PT	2												
SEMISOPOCHNOI/SW KNOB	2		00										
AMCHITKA/CAPE IVAKIN	2		70	20-Jun	0								
AMCHITKA/EAST CAPE	2		70			7-Jul	71						
AMCHITKA/OMEGA POINT	2												
AMCHITKA/ST. MAKARIUS	2		90	2-Jul	0								
AMCHITKA/COLUMN ROCK	2	1	90	2-Jul	71	7-Jul	69						
AMCHITKA/BIRD	2												
AMCHITKA/CHITKA POINT	2												
AYUGADAK	2	1	70	1-Jul	152	4-Jul	112						
LITTLE SITKIN	2			1-Jul	0								
RAT	2		90	1-Jul	0								
SEGULA/GULA POINT	2			1-Jul	0								
SEGULA/CHUGUL POINT	2			1-Jul	0								
SEA LION ROCK (KISKA)	2		90	1-Jul	0								
TANADAK (KISKA)	2		90	21-Jun	1								
TWIN ROCKS (KISKA)	2		00	21-Jun	1								
KISKA/SOUTH HEAD	2		00	21-Jun	0								
KISKA/GERTRUDE-BUKHTI	2		00	21-Jun	0								
KISKA/SOBAKA-VEGA	2		90	23-Jun	52								
KISKA/CAPE ST STEPHEN	2	1	70	23-Jun	229	7-Jul	204						
KISKA/LIEF COVE	2	1	70	2-Jul	162	7-Jul	152						
KISKA/WITCHCRAFT POINT	2		00	1-Jul	7								
KISKA/PILLAR ROCK	2		90	1-Jul	0								
KISKA/SIRIUS POINT	2			1-Jul	0								
KISKA/WOLF POINT	2			1-Jul	0								
Central Aleutian Islands Total		**12**			**6,223**		**4,932**		**6,200**				**4,843**

Table 1. -- Continued.				2008		2009		2010E		2010L		2011	
Site Name	**RCA**	**Rook**	**Trend**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**
Western Aleutian Islands Region													
BULDIR/EAST CAPE	1			1-Jul	0			22-Jun	0				
BULDIR/ROOKERY	1	1	70	2-Jul	38			22-Jun	25				
BULDIR/NW ROCKS	1			1-Jul	5			22-Jun	0				
INGENSTREM ROCKS	1			1-Jul	0							16-Jul	0
SHEMYA	1		90	30-Jun	4							16-Jul	3
NIZKI	1			24-Jun	0								
ALAID	1		70	24-Jun	86			23-Jun	95				
AGATTU/CAPE SABAK	1	1	70	30-Jun	202			24-Jun	178			16-Jul	302
AGATTU/GILLON POINT	1	1	70	30-Jun	280			24-Jun	237			16-Jul	174
DAN'S ROCKS	1			30-Jun	0							16-Jul	0
ATTU/MASSACRE BAY	1		90	30-Jun	0							16-Jul	0
ATTU/CHIRIKOF POINT	1		90	24-Jun	42							16-Jul	22
ATTU/CHICHAGOF POINT	1		90	24-Jun	25							16-Jul	16
ATTU/KRESTA POINT	1		90	24-Jun	0							16-Jul	0
ATTU/CAPE WRANGELL	1	1	90	30-Jun	246			23-Jun	190			16-Jul	244
Western Aleutian Islands Total		**3**			**928**				**725**				**761**
Western DPS in Alaska Total		**37**			**31,155**		**24,693**		**20,696**		**6,054**		**30,590**

Table 1. -- Continued. **2012**

Site Name	RCA	Rook	Trend	Date	Count	Comments
Central Aleutian Islands Region						
LITTLE TANAGA STRAIT	4		70	30-Jun	17	Count from skiff
SILAK	4			30-Jun	47	Count from skiff
KAGALASKA	4		90	30-Jun	52	Count from skiff
SEMISOPOCHNOI/POCHNOI	2		90	28-Jun	13	Count from skiff
SEMISOPOCHNOI/PETREL	2		00	28-Jun	22	Count from skiff
AMCHITKA/EAST CAPE	2		70	23-Jun	70	Count from overlook
AMCHITKA/COLUMN ROCK	2	1	90	23-Jun	41	Count from skiff
AYUGADAK	2	1	70	23-Jun	122	Count from overlook
KISKA/CAPE ST STEPHEN	2	1	70	23-Jun	109	Count from overlook
KISKA/PILLAR ROCK	2		90	25-Jun	2	
Western Aleutian Islands Region						
BULDIR/EAST CAPE	1					
BULDIR/ROOKERY	1	1	70	27-Jun	1	Count from vessel
BULDIR/NW ROCKS	1					
INGENSTREM ROCKS	1			25-Jun	0	
SHEMYA	1		90	25-Jun	18	
NIZKI	1			25-Jun	0	
ALAID	1		70	25-Jun	103	
AGATTU/CAPE SABAK	1	1	70	26-Jun	172	Includes count of 140 from overlook and 32 from aerial survey
AGATTU/GILLON POINT	1	1	70	25-Jun	196	
DAN'S ROCKS	1			25-Jun	0	
ATTU/MASSACRE BAY	1		90	25-Jun	0	
ATTU/CHIRIKOF POINT	1		90	25-Jun	16	
ATTU/CHICHAGOF POINT	1		90	25-Jun	53	
ATTU/KRESTA POINT	1		90	25-Jun	0	
ATTU/CAPE WRANGELL	1	1	90	25-Jun	186	
Western Aleutian Islands Total		**4**			**745**	

Table 1. -- Continued.

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

1) In southeast Alaska, Forrester/Sea Lion Rk, Forrester/East Rk, Forrester/North, Forrester/C Horn Rk, and Forrester/Lowrie have been combined into a single Forrester Complex site; The Brothers/SW and The Brothers/W+E have been combined into a single The Brothers site.
2) In the W Gulf of Alaska, Clubbing Rocks North and South have been combined into a single Clubbing Rocks site.
3) In the E Aleutians, Ugamak/Ugamak Bay, Ugamak/North and Ugamak/Round have been combined into a single Ugamak Complex site.
4) In the E Aleutians, Rootok/North and Rootok/East have been combined into a single Rootok site.
5) In the C Aleutians, Adak/Lake Point, Adak/Cape Yakak, Adak/Cape Moffet and Adak/Argonne Point have been combined into a single Adak site.
6) In the W Aleutians, Buldir/East Cape, Buldir/Rookery, and Buldir/NW Rocks have been combined into a single Buldir site.

[1] Non-pup counts in 2011 at Bogoslof (3 July), Ugamak/North (4 July), and Ugamak/Ugamak Bay (5 July) may have been negatively affected by disturbances related to pup weighing at Bogoslof on 29 June (4 days before survey), and pup branding at Ugamak/Ugamak Bay on 1 July (4 days before survey) and at Ugamak/North on 2 July (2 days before survey).

Table 2. -- Counts of Steller sea lion pups at rookery and selected major haul-out sites (see Table 1) in Alaska in June and July 2008-2012. Trend rookeries are in bold italics. RCA=rookery cluster area; DPS=distinct population segment.

		2008		2009		2010		2011	
Site Name	**RCA**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**
Southeast Alaska Region									
WHITE SISTERS	11			25-Jun	847				
BIALI ROCK	11			24-Jun	144				
HAZY	11			24-Jun	1,976				
FORRESTER/SEA LION RK	11			24-Jun	638				
FORRESTER/NORTH	11			24-Jun	1,223				
FORRESTER/C HORN RK	11			24-Jun	441				
FORRESTER/LOWRIE	11			24-Jun	1,734				
GRAVES ROCK	11			25-Jun	440				
CAPE OMMANEY	11			24-Jun	1				
EASTERLY	11			24-Jun	1				
JACOB ROCK	11			24-Jun	2				
SUNSET	11			24-Jun	1				
THE BROTHERS/SW	11			24-Jun	2				
WEST ROCK	11			24-Jun	2				
YASHA	11			24-Jun	10				
Southeast Alaska Total					**7,462**				
Eastern Gulf of Alaska Region									
CAPE ST. ELIAS	10			25-Jun	18	11-Jul	15	27-Jun	26
HOOK POINT	10			26-Jun	0			27-Jun	0
CAPE HINCHINBROOK	10			26-Jun	0			27-Jun	0
SEAL ROCKS	10			26-Jun	740	11-Jul	634	27-Jun	728
WOODED (FISH)	10			26-Jun	178	11-Jul	224	28-Jun	225
MIDDLETON	10			26-Jun	0				
GLACIER	10			26-Jun	4			27-Jun	5
THE NEEDLE	10			26-Jun	20	11-Jul	22	28-Jun	30
POINT ELEANOR	10			26-Jun	0				
PERRY	10			26-Jun	0			27-Jun	0
PLEIADES	10			26-Jun	0				
POINT LaTOUCHE	10			26-Jun	0				
DANGER	10			26-Jun	0				
POINT ELRINGTON	10			26-Jun	1	11-Jul	4	28-Jun	2
PROCESSION ROCKS	10			26-Jun	0			28-Jun	0
CAPE PUGET	10			26-Jun	0				
CAPE JUNKEN	10			26-Jun	0				
CAPE FAIRFIELD	10			26-Jun	0				
CAPE RESURRECTION	10			26-Jun	1			28-Jun	1
RUGGED	10			26-Jun	0				
AIALIK CAPE	10			26-Jun	1				
CHISWELL	10			26-Jun	64	11-Jul	64	28-Jun	84
GRANITE CAPE	10			26-Jun	0				
SEAL ROCKS (KENAI)	10			26-Jun	0				
STEEP POINT	10			26-Jun	0				

Table 2. -- Continued.		2008		2009		2010		2011	
Site Name	**RCA**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**
RABBIT	10			26-Jun	0				
Eastern Gulf of Alaska Total					**1,027**		**963**		**1,101**
Central Gulf of Alaska Region									
OUTER (PYE)	10			26-Jun	122	11-Jul	122	28-Jun	145
GORE POINT	10			26-Jun	0				
EAST CHUGACH	10			26-Jun	0				
PERL	10			26-Jun	0			28-Jun	0
NAGAHUT ROCKS	10			26-Jun	0				
ELIZABETH/CAPE ELIZABETH	10			26-Jun	0				
SUGARLOAF	9			27-Jun	613			28-Jun	767
USHAGAT/NW	9			27-Jun	0				
USHAGAT/SW	9			27-Jun	70			28-Jun	84
USHAGAT/ROCKS SOUTH	9			27-Jun	1				
LATAX ROCKS	9			27-Jun	12			28-Jun	18
SHAKUN ROCKS	9							30-Jun	1
SEA OTTER	9			27-Jun	0				
RK NEAR SEA OTTER	9			27-Jun	0				
AFOGNAK/TONKI CAPE	9			27-Jun	0				
SEA LION ROCKS (MARMOT)	9			27-Jun	0				
MARMOT	9			15-Jul	509			28-Jun	524
LONG ISLAND	9			27-Jun	0				
KODIAK/CAPE CHINIAK	9			27-Jun	0			28-Jun	0
UGAK	9			27-Jun	0				
KODIAK/GULL POINT	9			27-Jun	0				
KODIAK/CAPE BARNABAS	9			27-Jun	0				
TWOHEADED	9			27-Jun	14			28-Jun	52
SITKINAK/CAPE SITKINAK	9			27-Jun	0				
KODIAK/CAPE UGAT	9			27-Jun	1			30-Jun	0
SUTWIK	8			28-Jun	12			30-Jun	24
KILOKAK ROCKS	8							30-Jun	2
CHOWIET	8			28-Jun	360			30-Jun	453
CHIRIKOF	8			14-Jul	216			30-Jun	186
NAGAI ROCKS	8			28-Jun	18			30-Jun	8
Central Gulf of Alaska Total					**1,948**		**122**		**2,264**
Western Gulf of Alaska Region									
LIGHTHOUSE ROCKS	8			14-Jul	16			30-Jun	9
MITROFANIA	7							30-Jun	2
ATKINS	7			28-Jun	338			30-Jun	380
CHERNABURA	7			14-Jul	244			30-Jun	250
THE WHALEBACK	7			28-Jun	40			30-Jun	52
JUDE	7			14-Jul	270			30-Jun	300
OLGA ROCKS SW	7							1-Jul	1
SUSHILNOI ROCKS	7			28-Jun	34			1-Jul	27
PINNACLE ROCK	7			14-Jul	702			1-Jul	748
CLUBBING ROCKS	7			14-Jul	778			30-Jun	828
BIRD	7							1-Jul	2

Table 2. -- Continued.		2008		2009		2010		2011	
Site Name	**RCA**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**
SOUTH ROCKS	7			28-Jun	60			1-Jul	70
Western Gulf of Alaska Total					**2,482**				**2,669**
Eastern Aleutian Islands Region									
UNIMAK/OKSENOF POINT	6			10-Jul	6			5-Jul	0
UNIMAK/CAPE SARICHEF	6			28-Jun	0			5-Jul	0
AMAK+ROCKS	6			28-Jun	1			5-Jul	1
SEA LION ROCK (AMAK)	6			14-Jul	185			5-Jul	200
UGAMAK/NORTH	6			9-Jul	512			4-Jul	484
UGAMAK/UGAMAK BAY	6			9-Jul	326			5-Jul	331
UGAMAK/ROUND	6			9-Jul	71			4-Jul	154
AIKTAK	6			10-Jul	2			4-Jul	2
TIGALDA/ROCKS NE	6			9-Jul	0			4-Jul	0
AKUN/BILLINGS HEAD	6			26-Jun	144			30-Jun	136
AKUTAN/REEF-LAVA	6			8-Jul	22			4-Jul	21
AKUTAN/CAPE MORGAN	6			8-Jul	688	3-Jul	730	4-Jul	734
UNALASKA/BISHOP POINT	6			1-Jul	0			3-Jul	1
UNALASKA/CAPE IZIGAN	6			8-Jul	29	3-Jul	41	4-Jul	34
BOGOSLOF/FIRE ISLAND	6			8-Jul	282			3-Jul	323
OGCHUL	6			8-Jul	90	3-Jul	116	3-Jul	109
THE PILLARS	6					3-Jul	1	3-Jul	1
ADUGAK	6			8-Jul	276			3-Jul	250
Eastern Aleutian Islands Total					**2,634**		**888**		**2,781**
Central Aleutian Islands Region									
HERBERT	5							9-Jul	3
YUNASKA	5			13-Jul	170	3-Jul	185	9-Jul	166
SEGUAM/SADDLERIDGE	5			1-Jul	540	3-Jul	518	9-Jul	504
SEGUAM/TURF POINT	5			7-Jul	0	3-Jul	0	9-Jul	0
AGLIGADAK	5			7-Jul	0	25-Jun	1	9-Jul	0
AMLIA/EAST CAPE	5					25-Jun	2	9-Jul	0
AMLIA/SVIECH. HARBOR	5			7-Jul	34	25-Jun	30	9-Jul	35
KASATOCHI/NORTH POINT	4			4-Jul	394	24-Jun	354	11-Jul	373
OGLODAK	4			4-Jul	4	23-Jun	3	11-Jul	0
TAGALAK	4					24-Jun	1	11-Jul	2
SILAK	4					25-Jun	1	11-Jul	0
ADAK/LAKE POINT	4			4-Jul	338	24-Jun	318	11-Jul	310
ADAK/CAPE YAKAK	4			4-Jul	0	24-Jun	2	11-Jul	0
KANAGA/SHIP ROCK	4			4-Jul	214	24-Jun	214	11-Jul	208
KANAGA/CAPE CHUNU	4			4-Jul	0	24-Jun	3	11-Jul	0
TANAGA/CAPE SASMIK	3					24-Jun	3	11-Jul	2
GRAMP ROCK	3			4-Jul	332	24-Jun	299		
TAG	3			4-Jul	130	24-Jun	135		
ULAK/HASGOX POINT	3			7-Jul	272	24-Jun	264		
SEMISOPOCHNOI/POCHNOI	2			4-Jul	5				
AMCHITKA/EAST CAPE	2			7-Jul	13				
AMCHITKA/COLUMN ROCK	2			7-Jul	40				
AYUGADAK	2			4-Jul	44				

Table 2. -- Continued.		2008		2009		2010		2011	
Site Name	**RCA**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**	**Date**	**Count**
KISKA/CAPE ST STEPHEN	2			7-Jul	91				
KISKA/LIEF COVE	2			7-Jul	80				
Central Aleutian Islands Total					**2,701**		**2,333**		**1,603**
Western Aleutian Islands Region									
BULDIR/ROOKERY	1	2-Jul	7			22-Jun	1		
ALAID	1	24-Jun	20			23-Jun	10		
AGATTU/CAPE SABAK	1	30-Jun	83			24-Jun	84	16-Jul	76
AGATTU/GILLON POINT	1	30-Jun	142			24-Jun	106	16-Jul	83
ATTU/CAPE WRANGELL	1					23-Jun	33	16-Jul	27
Western Aleutian Islands Total			**252**				**234**		**186**
Eastern Bering Sea Region									
WALRUS						15-Jul	14		
Western DPS in Alaska Total			**252**		**10,792**		**4,554**		**10,604**

		2012	
Site Name	**RCA**	**Date**	**Count**
Western Aleutian Islands Region			
BULDIR/ROOKERY	1	27-Jun	0
ALAID	1	25-Jun	9
AGATTU/CAPE SABAK	1	26-Jun	69
AGATTU/GILLON POINT	1	25-Jun	90
ATTU/CAPE WRANGELL	1	25-Jun	32
Western Aleutian Islands Total			**200**

Table 3. --Aerial survey counts of adult and juvenile (non-pup) Steller sea lions observed at 1970s trend sites (Table 1) by region in Alaska in June and July from 1976 to 2012. Counts in 2004-2012 were adjusted to account for differences in photograph orientation and resolution relative to those taken in previous years. Respectively, 2010E and 2010L refer to 'early' and 'late' surveys conducted in 2010. Western and Eastern refer to distinct population segments in Alaska. SEAK = southeast Alaska.

	Gulf of Alaska			Aleutian Islands					Eastern
Year	Eastern	Central	Western	Eastern	Central	Western	Kenai-Kiska	Western	SEAK
1976-1979	7,053	24,678	8,311	19,743	36,632	14,658	89,364	111,075	
1985		19,002	6,275	7,505	21,956	4,526[1]	54,738		
1989									8,127
1990	5,444	7,050	3,915	3,801	7,988		22,754		7,492
1991	4,596	6,270	3,732	4,228	7,496	3,083	21,726	29,405	7,567
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	8,873
1996	2,132	3,913	3,739	4,715	5,524	2,187	17,891	22,210	8,163
1998	2,110[2]	3,467	3,360	3,841	5,749	1,911	16,417	20,438	8,872
2000	1,975	3,180	2,840	3,840	5,419	1,071	15,279	18,325	9,862
2002	2,500	3,366	3,221	3,956	5,480	817	16,023	19,340	9,948
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						
2008	3,726	3,176	4,153	5,040	4,932[3]	589	17,301	21,616	8,561
2009	3,362	3,683							11,655
2010E	2,951	3,173				516			9,547
2010L	4,716								
2011	4,385[4]		5,014[5]						
2012						455			

[1] Includes 1988 count at Buldir
[2] Includes 1999 counts for those sites not surveyed in 1998
[3] Includes 2006 count at Amchitka/East Cape of 99 animals (adjusted).
[4] Includes 2010L counts at Rugged and Seal Rocks (Kenai) (total of 63 animals adjusted).
[5] Includes 2008 count at Castle Rock of 27 animals (adjusted).

Table 4. --Aerial survey counts of adult and juvenile (non-pup) Steller sea lions observed at 1990s trend sites (Table 1) in seven regions of Alaska in June-July from 1991 to 2012. Kenai-Kiska consists of the combined counts in the central and western Gulf of Alaska and eastern and central Aleutian Islands. Counts in 2004-2011 were adjusted to account for differences in photograph orientation and resolution relative to those taken in previous years. Respectively, 2010E and 2010L refer to early and late surveys conducted in 2010. Western and Eastern refer to distinct population segments in Alaska. SEAK = southeast Alaska.

	Gulf of Alaska			Aleutian Islands					Eastern
Year	**Eastern**	**Central**	**Western**	**Eastern**	**Central**	**Western**	**Kenai-Kiska**	**Western**	**SEAK**
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	11,524
1996	2,450	5,400	5,356	5,967	6,368	3,334	23,091	28,875	10,778
1998	2,158[6]	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	15,138
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								
2008	4,064	4,420	5,565	6,405	5,820[7]	894	22,210	27,168	13,396
2009	3,586								16,029
2010E	3,204	4,333							14,869
2010L	4,823								
2011			6,762[8]						
2012						718			

[6] Includes 1999 counts for those sites not surveyed in 1998
[7] Includes 2006 count at Amchitka/East Cape of 99 animals (adjusted).
[8] Includes 2008 counts at Kak, Spitz, Castle Rock, The Haystacks, Cherni and Rock totaling 38 animals (adjusted).

Table 5. --Aerial survey counts of adult and juvenile (non-pup) Steller sea lions observed at 2000s trend sites (Table 1) in seven regions of Alaska in June-July from 1991 to 2011. Kenai-Kiska consists of the combined counts in the central and western Gulf of Alaska and eastern and central Aleutian Islands. Counts in 2004-2012 were adjusted to account for differences in photograph orientation and resolution relative to those taken in previous years. Respectively, 2010E and 2010L refer to early and late surveys conducted in 2010. Western refers to distinct population segment in Alaska.

	Gulf of Alaska			Aleutian Islands				
Year	**Eastern**	**Central**	**Western**	**Eastern**	**Central**	**Western**	**Kenai-Kiska**	**Western**
2000	2,353	4,814	4,568	4,995	6,871	1,650	21,248	25,251
2002	3,116	4,786	5,011	5,272	6,831	1,199	21,900	26,215
2004	3,172	4,297	5,901	6,029	7,240	1,286	23,468	27,926
2006	3,609							
2007	3,570							
2008	4,771	4,581	6,625	7,206	6,070[9]	895	24,481	30,147
2009	3,638							
2010E	3,900	4,553						
2010L	5,037							
2011			7,993[10]					
2012						718		

[9] Includes 2006 count at Amchitka/East Cape of 99 animals (adjusted).

[10] Includes 2008 counts at Atkulik, Big Koniuji, Chankliut, Egg(Sand Point), Hague Rock, Nagai/Rk W of Cape Wedge, Omega, Seal Cape, Twins, Kak, Spitz, Castle Rock, The Haystacks, Cherni and Rock totaling 33 animals (adjusted).

Table 6. --Counts of adult and juvenile Steller sea lions (non-pups) observed at 1990s trend sites grouped by Rookery Cluster Areas (RCA) 1-10 and at 1970s trend sites in RCA 11 from 1991-2011. Counts in 2004-2012 were adjusted to account for differences in photograph orientation and resolution relative to those taken in previous years. Respectively, 2010E and 2010L refer to early and late surveys conducted in 2010.

	Rookery Cluster Area										
Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1991	4,601	2,149	2,604	1,833	1,839	5,514	4,762	3,021	4,757	5,482	8,034
1992	4,199	1,807	2,557	1,467	1,620	5,890	4,770	2,656	4,429	4,597	8,014
1994	3,114	1,494	2,092	1,512	1,716	5,760	5,217	2,301	4,092	4,225	9,001
1996	3,334	1,525	2,037	1,553	1,143	6,077	4,743	2,088	3,280	3,095	8,230
1998	2,786	1,381	2,162	1,815	1,531	5,902	4,726	2,101	2,900	2,605[11]	8,693
2000	1,633	1,053	1,918	2,021	1,431	5,127	3,730	1,507	2,916	2,500	9,855
2002	1,196	949	1,661	2,197	1,546	5,456	4,275	1,764	2,670	3,117	9,949
2004	1,286	993	1,719	2,422	1,627	6,116	4,934	1,767	2,271	3,304	
2006						6,203					
2007				1,936			5,363			3,252	
2008	894	772	1,573	1,715	1,644	6,519	5,274	1,491	2,814	4,463	8,561
2009										3,953	
2010E			1,332	2,205	1,678				2,495	3,672	9,547
2010L										5,313	
2011				2,155	2,006		6,365[12]				
2012	718										

[11] Includes 1999 counts for those sites not surveyed in 1998

[12] Includes 2008 counts at Castle Rock, The Haystacks, Cherni and Rock totaling 30 animals (adjusted).

Table 7. --Counts of Steller sea lion pups at trend rookeries (Table 2) in seven regions of the western stock in Alaska and southeast (SE) Alaska from 1978-1979 to 2011. The maximum count during each period at the selected rookeries was used. Western and Eastern refer to distinct population segments in Alaska. SEAK = southeast Alaska.

	Gulf of Alaska			Aleutian Islands					Eastern
Year	**Eastern**	**Central**	**Western**	**Eastern**	**Central**	**Western**	**Kenai-Kiska**	**Western**	**SEAK**
1978-1979	574	18,893	9,351						2,219
1984-1989		10,254	5,879	4,778	9,563[13]		30,474		
1990-1992		4,949	1,923	2,115	3,568		12,671		4,164
1994	903	2,831	1,662	1,756	3,109		9,358		3,770
1996	584								3,714
1997	611					979			4,160
1998	689	1,876	1,493	1,474	2,834	803	7,677	9,169	4,235
2001-2002	586	1,721	1,671	1,561	2,612	488	7,565	8,639	4,877
2003-2004	716	1,609	1,577	1,731					
2005	715	1,651	1,707	1,921	2,551[14]	343	7,830	8,888	5,510
2009	918	1,821	2,062	2,300	2,431	279[15]	8,614	9,811	7,444
2010	858				2,328[16]	224			
2011	953	2,075	2,206	2,412	2,306[17]	187	8,999	10,139	
2012						191			

[13] Includes 1979 count at Amchitka/Column Rocks
[14] Includes 2004 count at Akun/BillingsHead and Yunaska.
[15] Includes 2008 counts at Buldir, Agattu/Cape Sabak and Agattu/Gillon Point, and 2005 count at Attu/Cape Wrangell
[16] Includes 2009 counts at Amchitka/Column Rocks, Ayugadak, Kiska/Lief Cove, and Kiska/Cape St Stephens.
[17] Includes 2010 counts at Gramp, Tag, and Ulak/Hasgox Point, and 2009 counts at Amchitka/Column Rocks, Ayugadak, Kiska/Lief Cove, and Kiska/Cape St Stephens.

Table 8. -- Counts of Steller sea lion pups at trend rookeries (Table 2; also includes Ogchul in RCA 6) by Rookery Cluster Areas (RCAs) 1-11 from 1990-2012. 'Boxed' cells (**bold**) indicate pup counts within the RCA were pooled from multiple years.

	Rookery Cluster Area										
Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1990		744	1,595	315	914				**3,294**		3,600
1991							**1,923**	**1,292**			4,164
1992									**1,986**		
1993										1,261	
1994		609	1,297	542	661	1,850	1,662	950	1,762	1,022	3,770
1996											3,714
1997	979				655				1,435	715	4,160
1998	803	392	1,215	587	640	1,516	1,493	418	1,345	802	4,235
2000									1,159	767	
2001			917	653	**613**	**1,618**	1,301	**612**	885		4,741
2002	488	371	928	672			**1,724**		959	653	4,866
2003						**1,800**		**557**			
2004		287	846		**675**				962	755	
2005	343	324	869	683		**1,779**	1,707	555	992	819	5,510
2007											
2009	279[18]	255	734	732	710	2,389	2,062	576	1,122	1,040	7,444
2010	224		698	674	703					980	
2011	186			683	670	2,521	2,206	639	1,291	1,098	
2012	191										
Total Rookeries	4	4	3	2	2	6	4	2	2	3	5

[18] Includes 2008 counts at Buldir, Agattu/Cape Sabak and Agattu/Gillon Point, and 2005 count at Attu/Cape Wrangell

Table 9. --Number (#) of individually branded western Steller sea lions observed by region during May-July, 2001-2011, and the average annual distribution. All sea lions were branded as pups on natal rookeries in each of three regions. Branding began in 2000 in the C GULF and in 2001 in the E GULF and E ALEU. Region definitions are in the text, except SEAK = southeast Alaska, BC = British Columbia (Canada), and WASH = Washington state.

	Natal Region					
	Number of Individuals			Average Annual Distribution		
Region Seen	E ALEU	C GULF	E GULF	E ALEU	C GULF	E GULF
RUSSIA	1	1		0.002	0.001	0.000
W ALEU				0.000	0.000	0.000
C ALEU				0.000	0.000	0.000
BERING	76	9		0.169	0.012	0.000
E ALEU	355	9	1	0.787	0.012	0.006
W GULF	18	7	1	0.040	0.010	0.006
C GULF	1	464	6	0.002	0.643	0.036
E GULF		183	124	0.000	0.253	0.734
SEAK		49	36	0.000	0.068	0.213
BC				0.000	0.000	0.000
WASH			1	0.000	0.000	0.006
# BRANDED	714	993	287			
# YEARS	10	11	10			

Table 10. -- Estimate of number of Steller sea lions (1-11 years old) that moved per year between southeast Alaska (SEAK), E GULF and C GULF. Non-pup abundance in each region is estimated by multiplying the 2009 pup count by 3.5 (Calkins and Pitcher 1982). Regional movements based on regional distribution of sightings of western DPS (distinct population segment; wDPS) branded animals (Table 9) and movement probabilities estimated by Jemison et al (in review; Appendix Table B3). Region definitions are in the text.

			TO Region FROM:				FROM Region TO:				Net
Region	Non-Pups	Method	C GULF	E GULF	SEAK	Total	C GULF	E GULF	SEAK	Total	Change
SEAK	26,128	Jemison et al.	386	531	-	917	-460	-633	-	-1093	-176
E GULF	3,595	wDPS Brand	1728	-	-	2361	-128	-	-	-659	1702
		Jemison et al.	-	-	633		-	-	-531		
C GULF	6,818	wDPS Brand	-	128	-	588	-	-1728		-2114	-1526
		Jemison et al.	-	-	460		-	-	-386		

Table 11. -- Average annual rates of change (AR: % per year) in non-pup (A) and pup (B) counts in the 2000s estimated using 1990s and 2000s trend sites (non-pups), rookery trend sites (pups), and agTrend by rookery cluster area (RCA), region, and the entire western distinct population segment in Alaska (wDPS). Period refers to trend site analyses only; all agTrend rates are for the period 2000-2012. 95% CI=95% confidence interval for non-pup and pup trend site ARs, and 95% credible interval for agTrend non-pup and pup ARs. Region and RCA definitions are in the text.

A.			1990s Trend Sites		2000s Trend Sites		agTrend	
		Period	AR	95% CI	AR	95% CI	AR	95% CI
RCA	1	2000-2012	-6.3	-9.1, -3.3			-7.23	-9.04, -5.56
	2	2000-2008	-3.6	-8.0, 1.1			-4.48	-6.67, -2.30
	3	2000-2010	-2.9	-5.2, -0.6			-3.24	-4.81, -1.80
	4	2000-2011	-0.4	-3.4, 2.7			0.51	-1.23, 2.39
	5	2000-2011	2.2	0.4, 4.0			2.25	0.44, 4.11
	6	2000-2008	3.1	1.7, 4.5			2.44	0.94, 3.92
	7	2000-2011	4.6	3.2, 6.0			4.28	2.78, 5.80
	8	2000-2008	-0.6	-8.4, 7.9			1.34	-0.34, 3.06
	9	2000-2010	-0.7	-4.8, 3.6			0.54	-1.18, 2.39
	10	2000-2010	4.2	1.0, 7.5			4.00	1.23, 6.63
Region	W ALEU	2000-2012	-6.3	-9.1, -3.3	-6.3	-9.1, -3.3	-7.23	-9.04, -5.56
	C ALEU	2000-2008	-1.5	-5.8, 3.1	-1.5	-6.1, 3.4	-0.56	-1.45, 0.43
	WSAM	2000-2008	-2.3	-5.2, 0.7	-2.3	-5.3, 0.8	-1.53	-2.35, -0.66
	E ALEU	2000-2008	3.2	1.6, 4.8	4.9	3.1, 6.6	2.39	0.92, 3.94
	W GULF	2000-2011	4.4	2.5, 6.4	5.0	3.7, 6.4	4.01	2.49, 5.42
	EAWG	2000-2008	3.7	1.4, 6.0	4.9	3.4, 6.3	3.22	2.19, 4.25
	C GULF	2000-2010	-0.4	-2.6, 1.8	-0.5	-2.3, 1.3	0.87	-0.34, 2.18
	E GULF	2000-2010	5.9	2.3, 9.6	5.7	2.7, 8.8	4.51	1.63, 7.58
	ECGULF	2000-2010	2.3	0.6, 4.1	2.4	0.8, 4.0	2.40	0.92, 3.86
	ESAM	2000-2008	3.4	2.6, 4.1	4.1	3.6, 4.6	2.89	2.07, 3.80
	K-K	2000-2008	1.2	-0.7, 3.2	1.9	0.5, 3.2	1.68	1.04, 2.35
	wDPS	2000-2008	1.7	0.0, 3.3	2.3	1.6, 3.0	1.67	1.01, 2.38

Table 11. -- Continued.

B.			Rookery Trend Sites		agTrend	
		Period	AR	95% CI	AR	95% CI
RCA	1	2002-2012	-9.2	-11.1, -7.2	-9.36	-10.93, -7.78
	2	2002-2009	-4.7	-12.1, 3.3	-4.83	-7.32, -2.04
	3	2002-2010	-3.1	-4.1, -2.1	-1.74	-3.37, -0.13
	4	2001-2011	0.5	-0.5, 1.5	2.56	-0.15, 5.39
	5	2001-2011	1.1	-0.6, 2.8	0.45	-1.48, 2.48
	6	2001-2011	4.9	2.0, 7.9	3.30	1.76, 4.83
	7	2001-2011	4.6	1.2, 8.1	3.00	1.01, 5.18
	8	2001-2011	0.6	-2.1, 3.3	-0.54	-5.19, 3.90
	9	2000-2011	2.0	-0.9, 5.0	2.46	0.50, 4.11
	10	2000-2011	4.2	1.9, 6.5	3.80	1.43, 6.23
Region	W ALEU	2002-2012	-9.2	-11.1, -7.2	-9.36	-10.93, -7.78
	C ALEU	2001-2011	-1.3	-2.0, -0.7	-0.46	-1.50, 0.72
	E ALEU	2001-2011	4.8	3.7, 5.9	3.30	1.76, 4.83
	W GULF	2001-2011	3.5	1.2, 6.0	3.03	1.06, 5.20
	C GULF	2001-2011	2.2	-0.5, 4.9	1.48	-0.56, 3.30
	E GULF	2001-2011	4.7	2.9, 6.6	3.97	1.31, 6.50
	BERING	2001-2010	-10.9	-31.2, 15.4	-7.39	-11.55, -2.85
	K-K	2001-2011	1.9	0.9, 2.9	1.70	0.89, 2.55
	wDPS	2001-2011	1.8	0.7, 2.9	1.45	0.69, 2.22

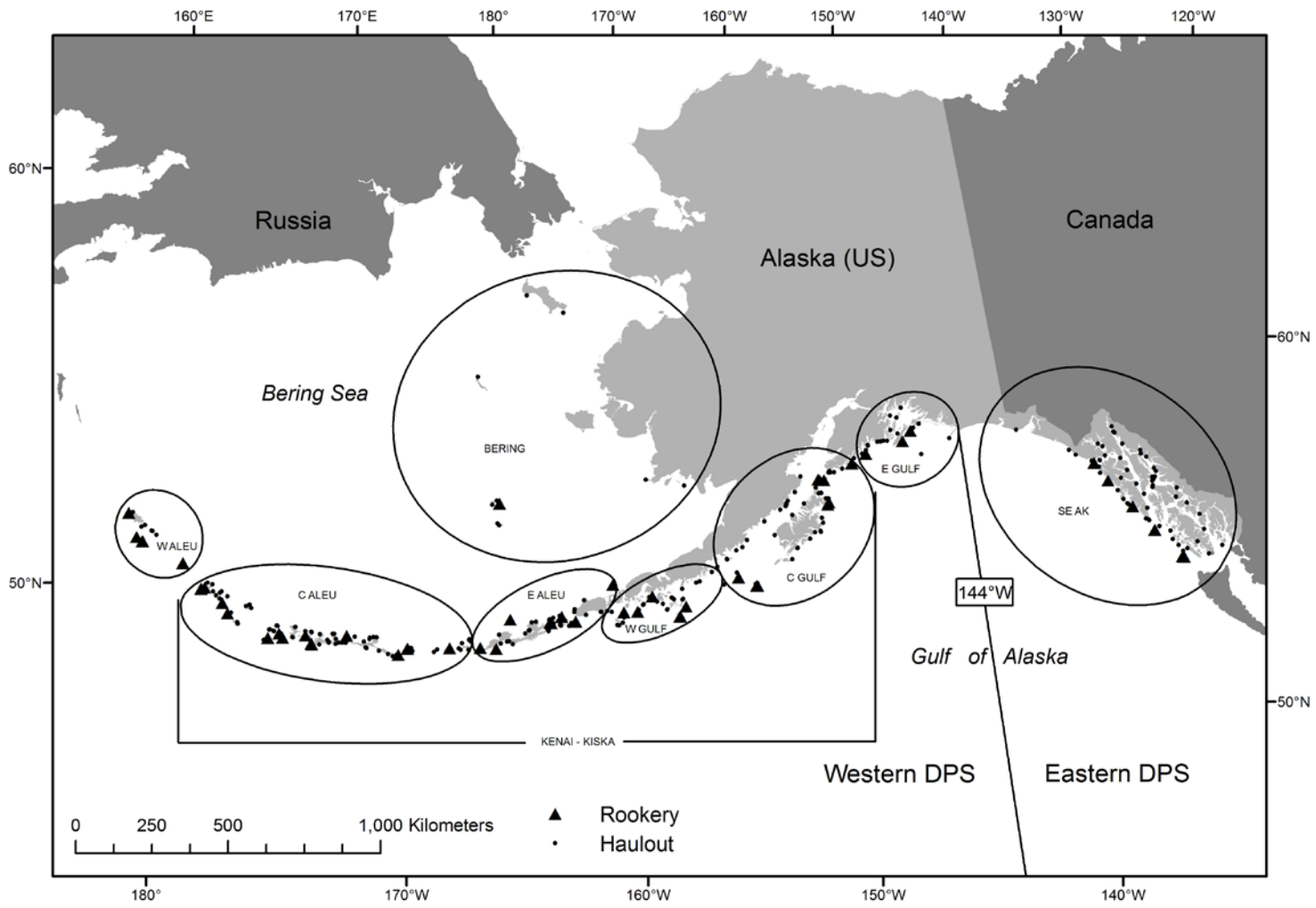

Figure 1. -- Terrestrial rookery and haulout sites in the range of the eastern and western distinct population segments (DPSs) of Steller sea lion in Alaska, and the regions used for trend analysis [western (W), central (C), and eastern (E) regions in the Gulf of Alaska (GULF) and Aleutian Islands (ALEU), eastern Bering Sea (BERING), and southeast Alaska (SE AK)].

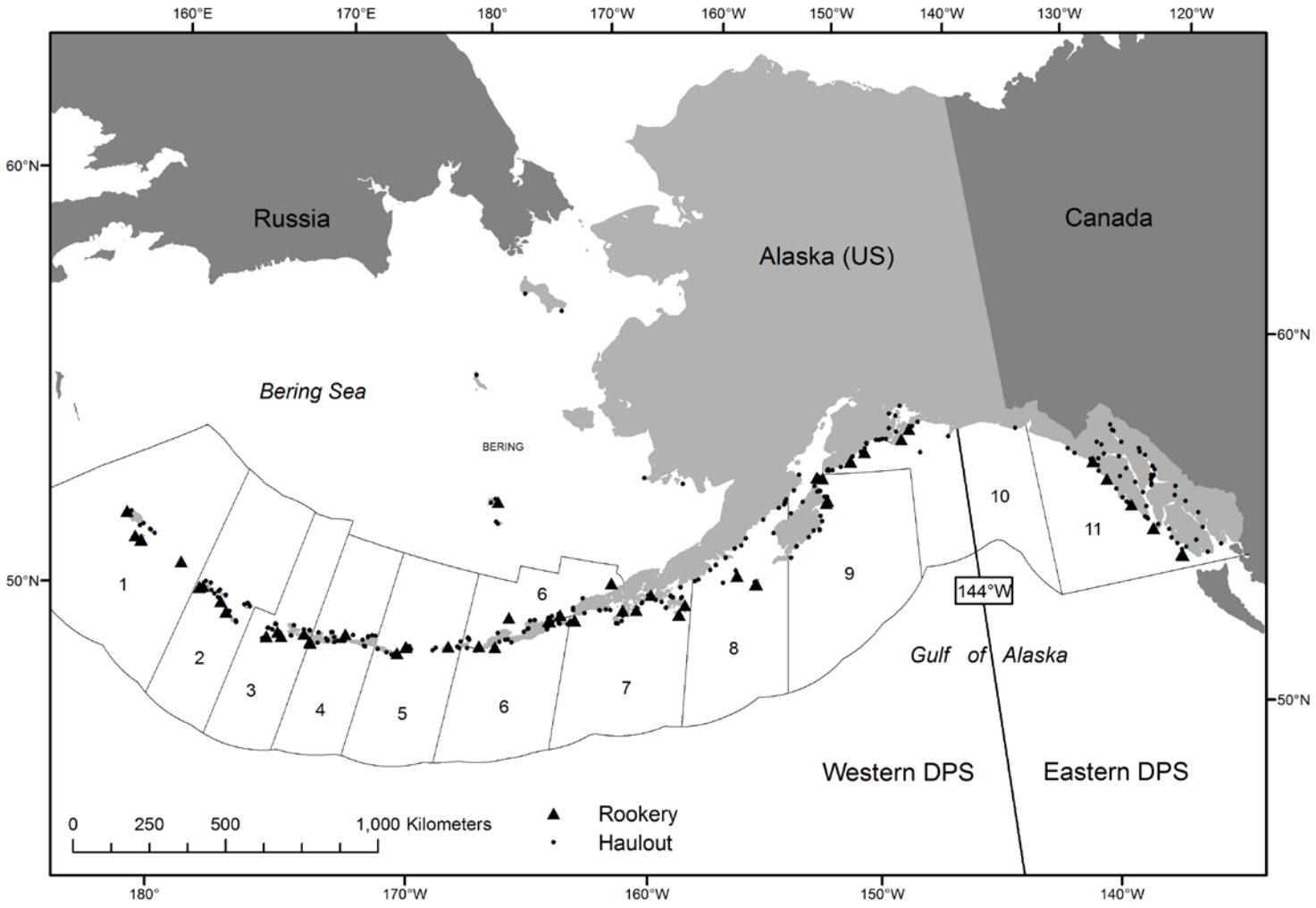

Figure 2. -- Terrestrial rookery and haulout sites in the range of the eastern and western distinct population segments (DPSs) of Steller sea lion in Alaska, and the Rookery Cluster Areas (RCAs) used in the analysis of population trends (1-11).

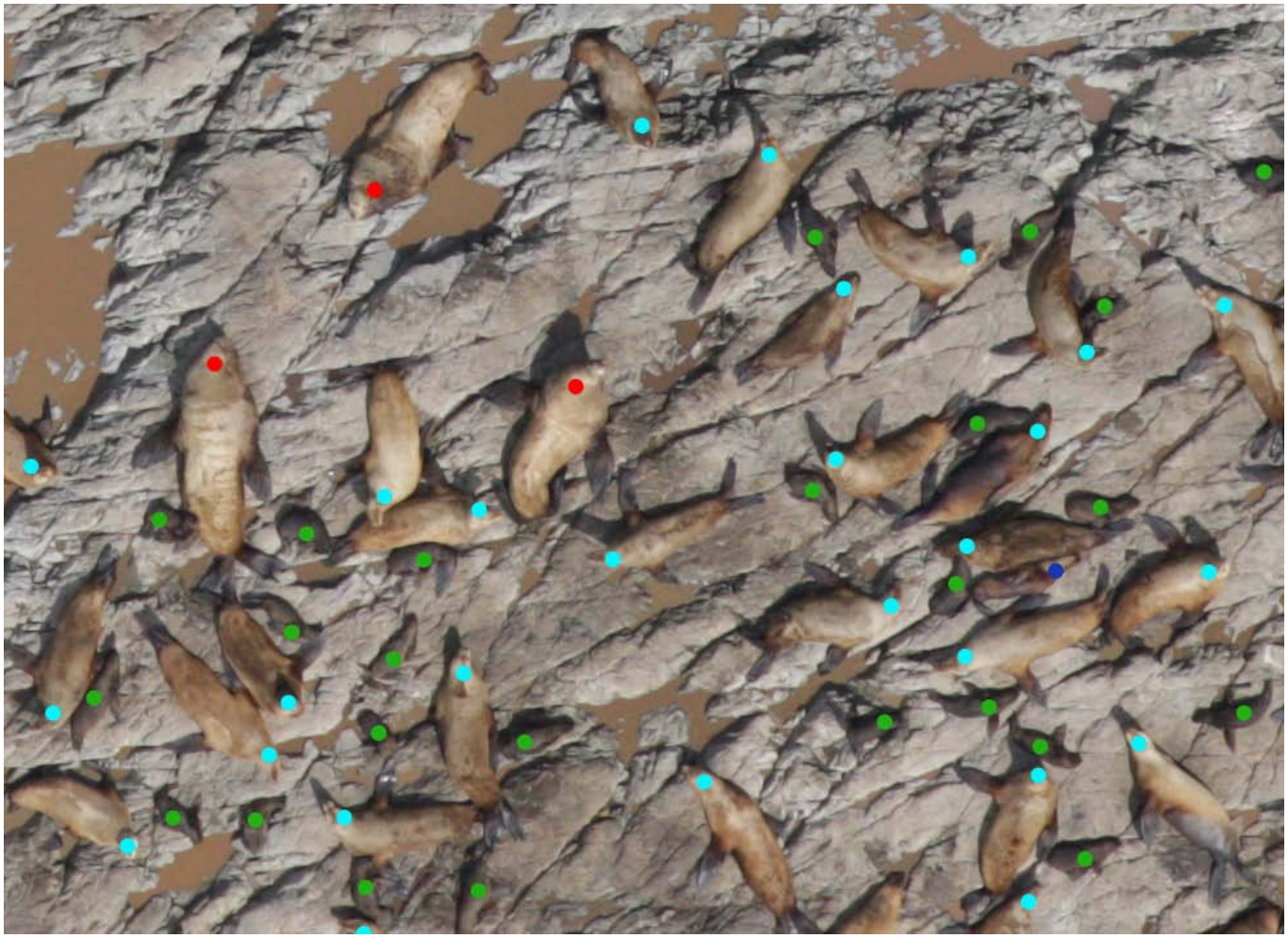

Figure 3. -- Steller sea lions hauled out at Lake Point rookery on Adak Island, 11 July 2011. Detail of a photograph taken at an altitude of 232 m (761 ft) with an 85 mm lens. Individual sea lions were counted and assigned to five age-sex categories: adult males (red), adult females (turquoise), subadult males (pink; none in photo), juveniles (blue; one in photo), and pups (green). Photographed area on the rookery is 12.8 m × 17.7 m (42 ft × 58 ft).

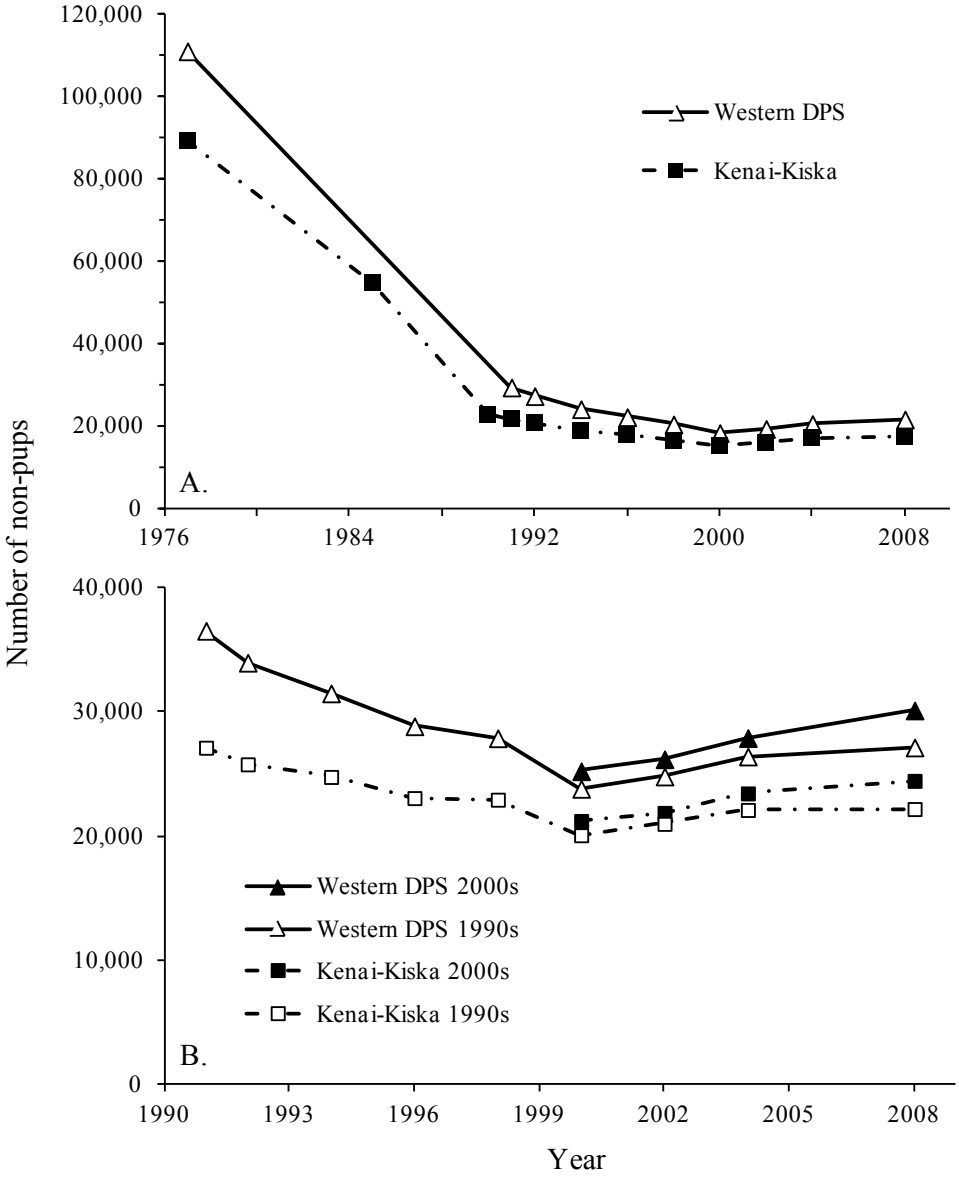

Figure 4. -- Number of adult and juvenile Steller sea lion (non-pups) counted at 1970s (A) and 1990s and 2000s (B) trend sites in the western DPS and in the Kenai-Kiska area in Alaska (Table 1). Counts in 2004-2008 were adjusted for photograph orientation and resolution differences with those taken previously.

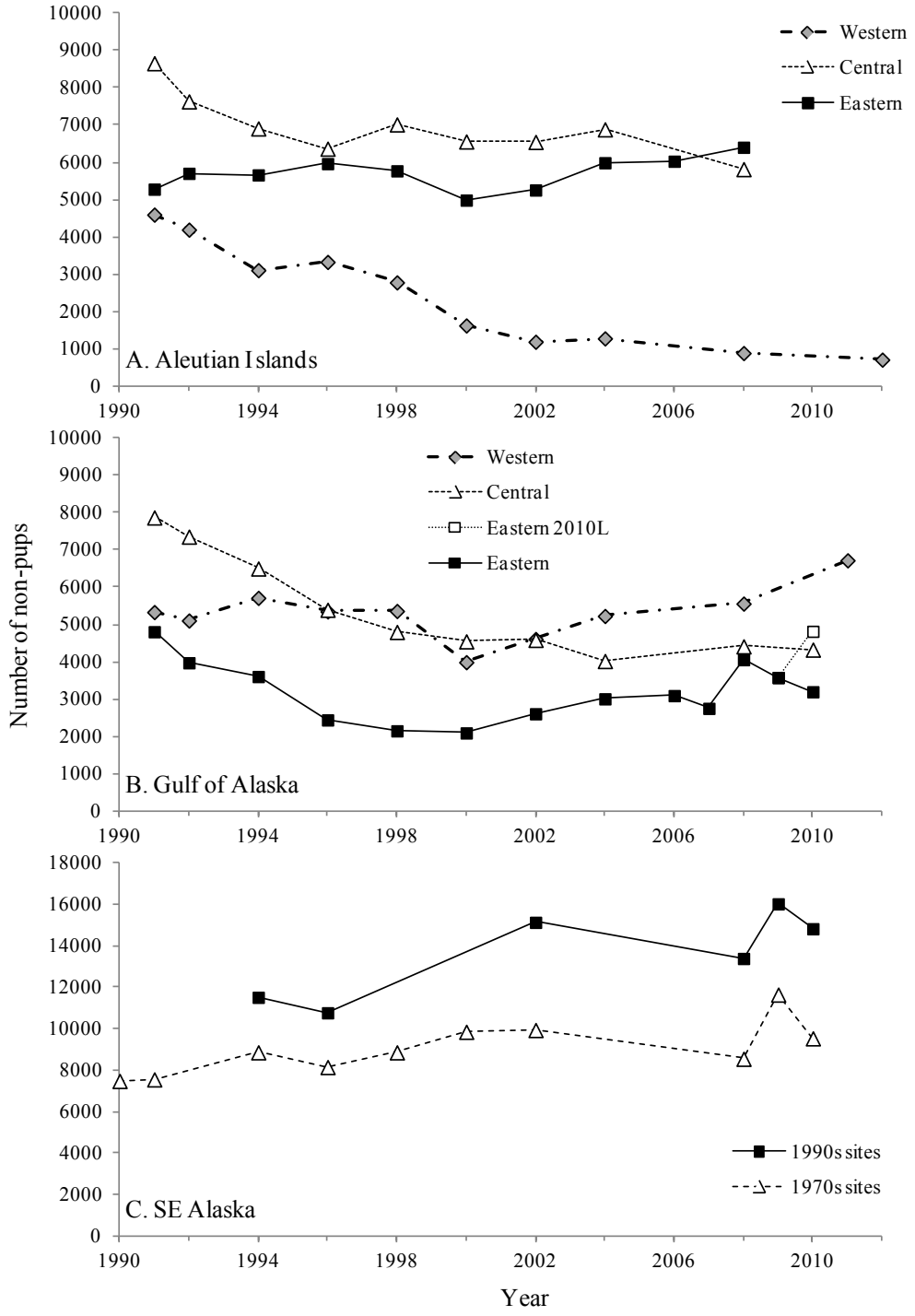

Figure 5. -- Number of adult and juvenile Steller sea lion (non-pups) counted at trend sites in Alaska (Table 1), 1991-2012. A. Aleutian Island regions, 1990s trend sites; B. Gulf of Alaska regions (including 'late' 2010 survey data for the eastern Gulf of Alaska; 1990s trend sites); C. eastern DPS (southeast (SE) Alaska; 1970s and 1990s trend sites). Counts in 2004-2012 were adjusted for differences in photograph orientation and resolution with those taken previously.

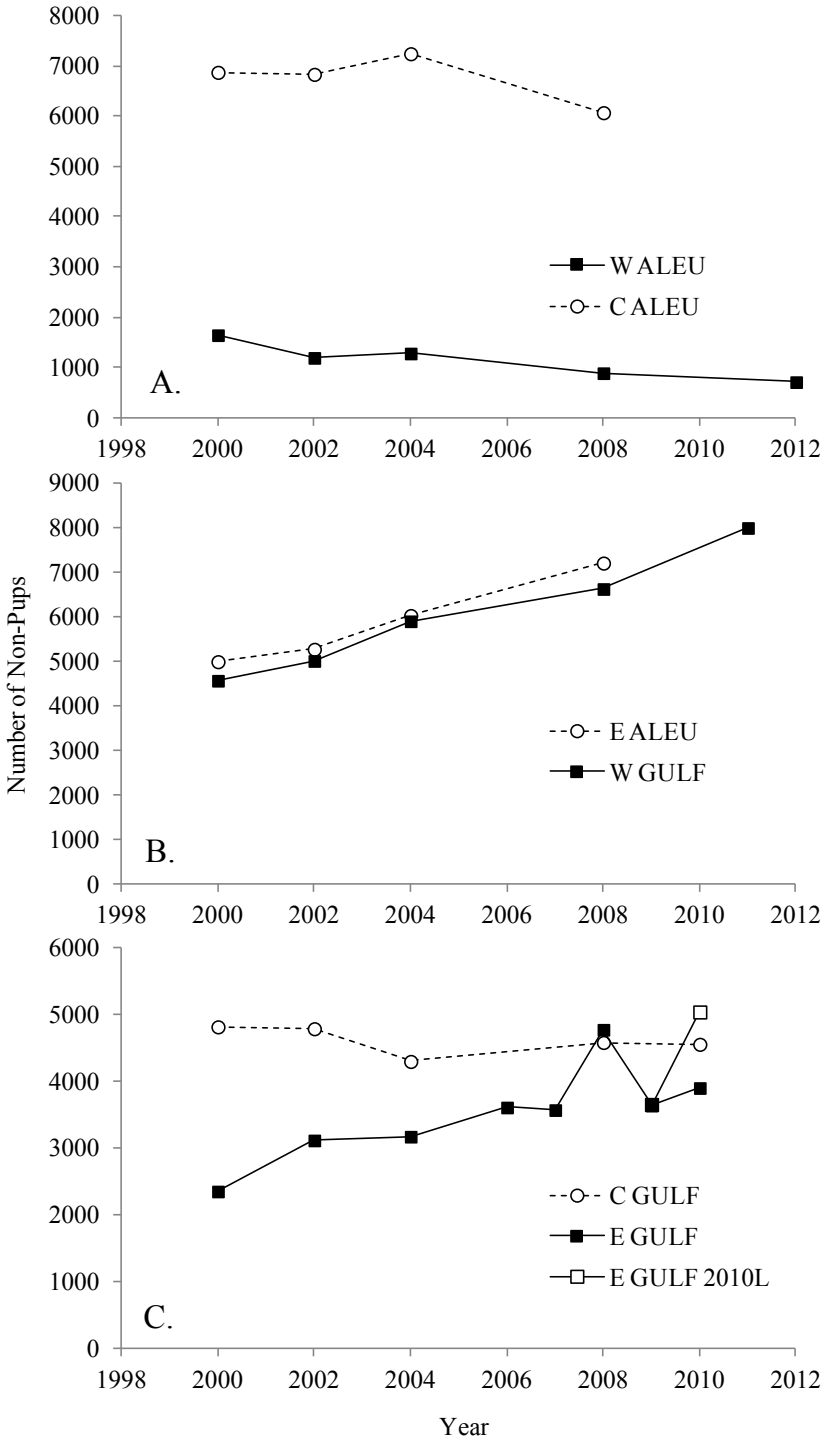

Figure 6. -- Number of adult and juvenile Steller sea lion (non-pups) counted at 2000s trend sites in the western DPS in Alaska (Table 1), 2000-2012. A. western and central Aleutian Island regions; B. eastern Aleutian Islands and western Gulf of Alaska regions; C. central and eastern Gulf of Alaska regions (including 'late' 2010 survey data for the eastern Gulf of Alaska. Counts in 2004-2012 were adjusted for differences in photograph orientation and resolution with those taken previously.

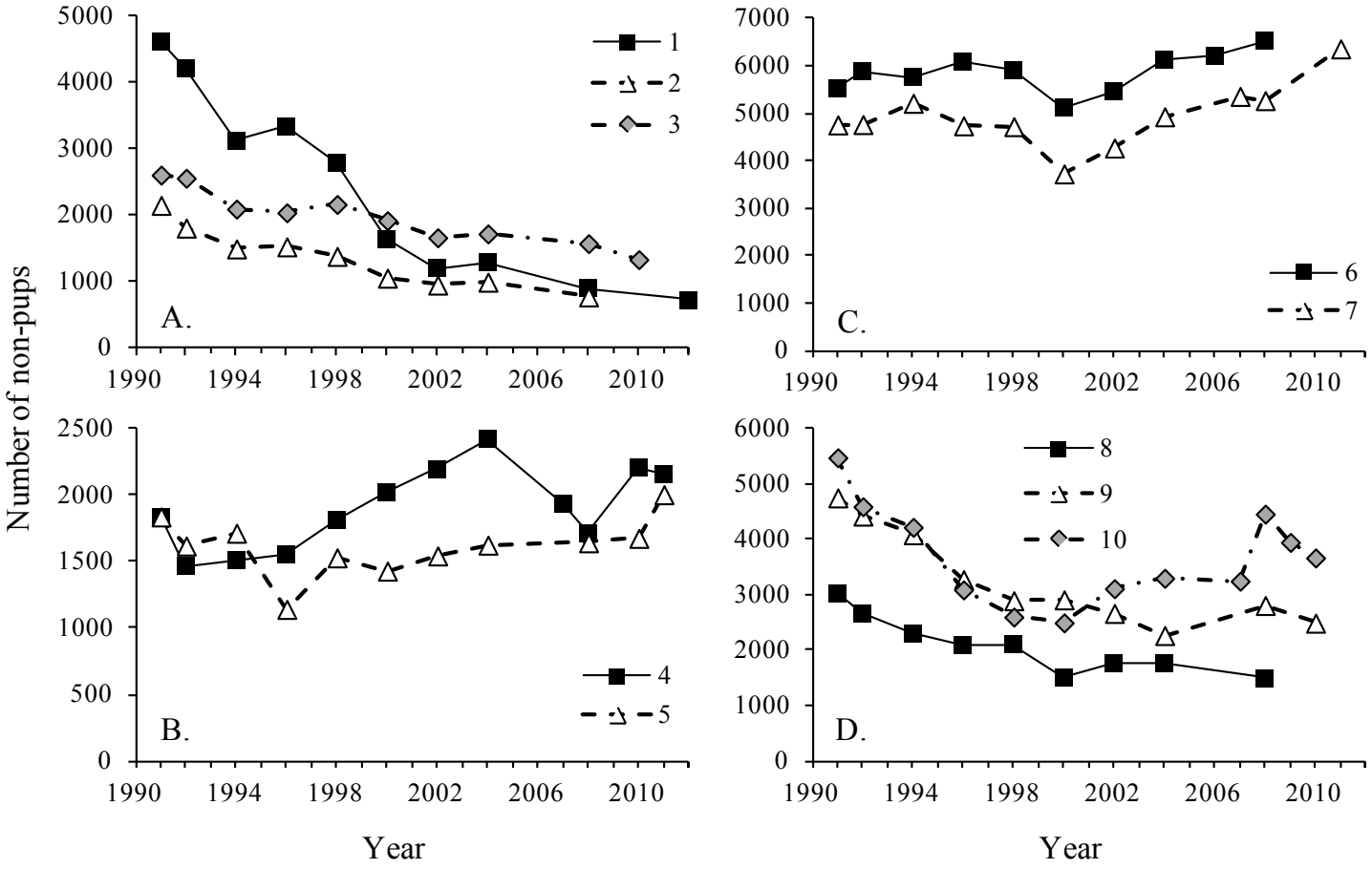

Figure 7. -- Number of adult and juvenile Steller sea lion (non-pups) counted at 1990s trend sites in Rookery Cluster Areas (RCAs) 1 10 in the western DPS in Alaska (Table 1), 1991-2012. A. RCAs 1-3; B. RCAs 4-5; C. RCAs 6-7; D. RCAs 8-10. Counts in 2004-2012 were adjusted for photograph orientation and resolution differences with those taken previously.

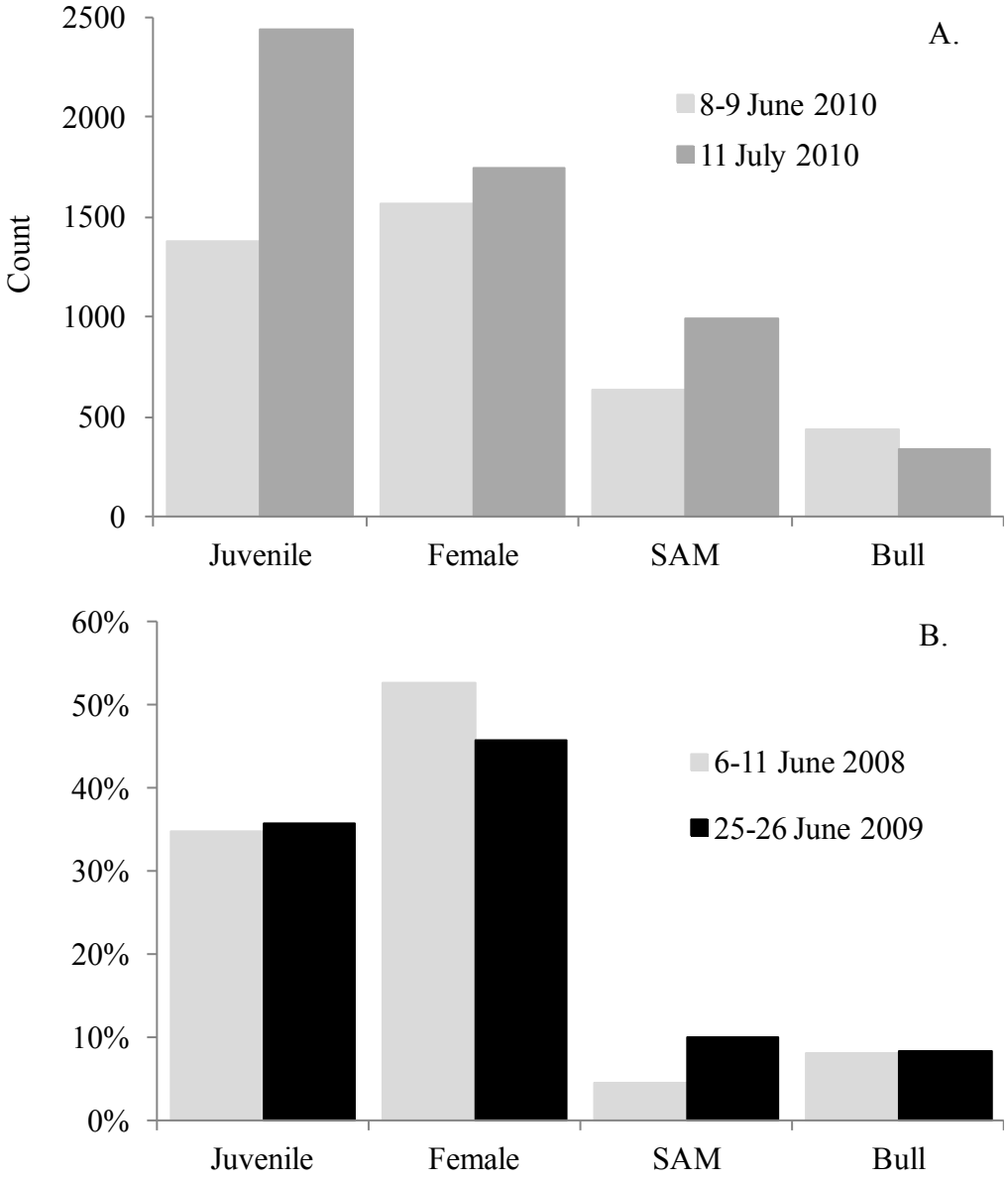

Figure 8. -- Age/sex composition of the Steller sea lion non-pup counts in the eastern Gulf of Alaska during 'early' (light gray), optimal (black), and 'late' (dark gray) surveys in 2008-2010. A. Counts by age/sex class in the 'early' and 'late' surveys in 2010. B. Age/sex composition of the non-pup counts in the 'early' 2008 and optimal 2009 surveys. SAM = subadult male.

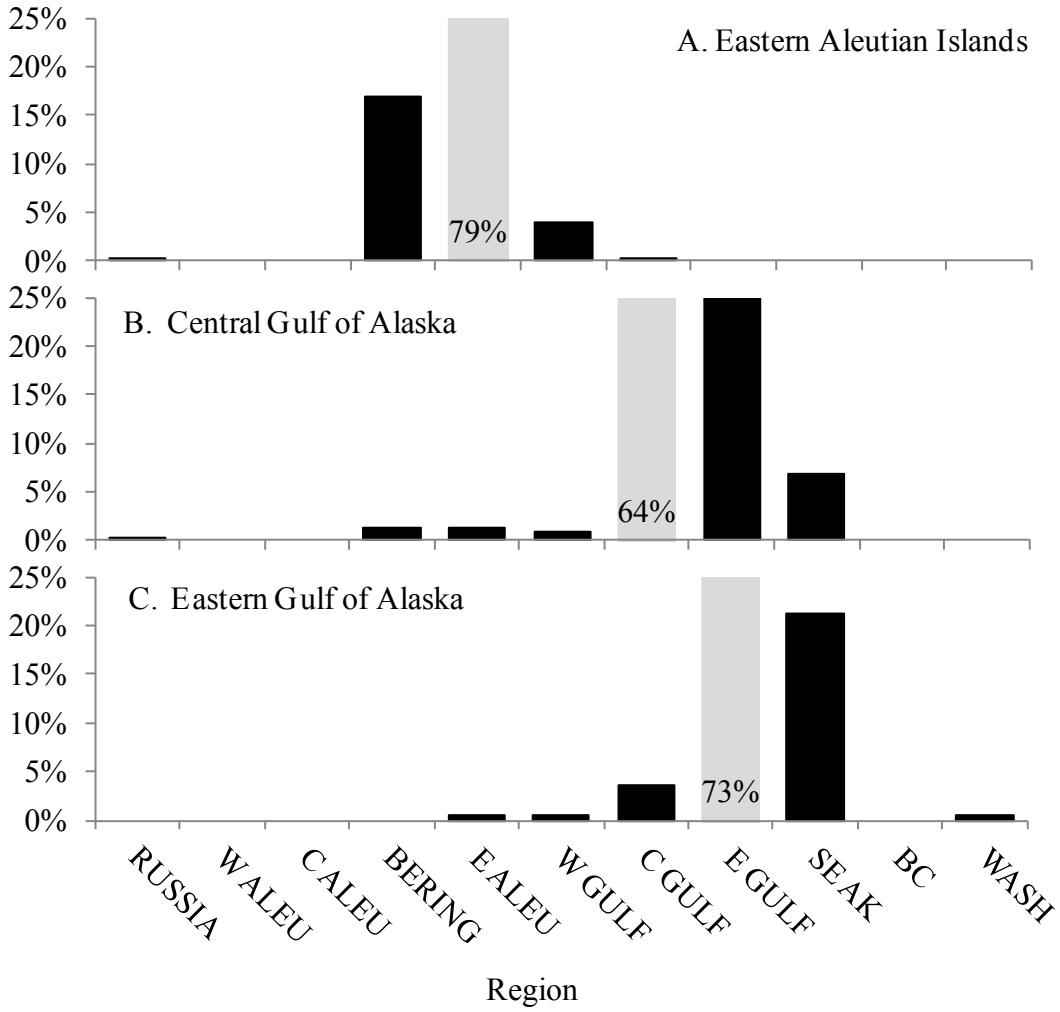

Figure 9. -- Distribution of sightings of individual branded western DPS Steller sea lions by natal rookery region in May-July, 2001-2011. Steller sea lions were branded as pups in 2000-2010 on rookeries in the eastern Aleutian Islands (A; Ugamak; 714 non-pups), central Gulf of Alaska (B; Marmot and Sugarloaf.; 993), and eastern Gulf of Alaska (C; Wooded (Fish) and Seal Rocks; 287). The data are the average number of individually branded sea lions observed in each region per year, standardized to a total of 100 per natal region, and displayed as a percent. The percent observed within each natal region is shown at the bottom of the gray bar which extends vertically off each chart.

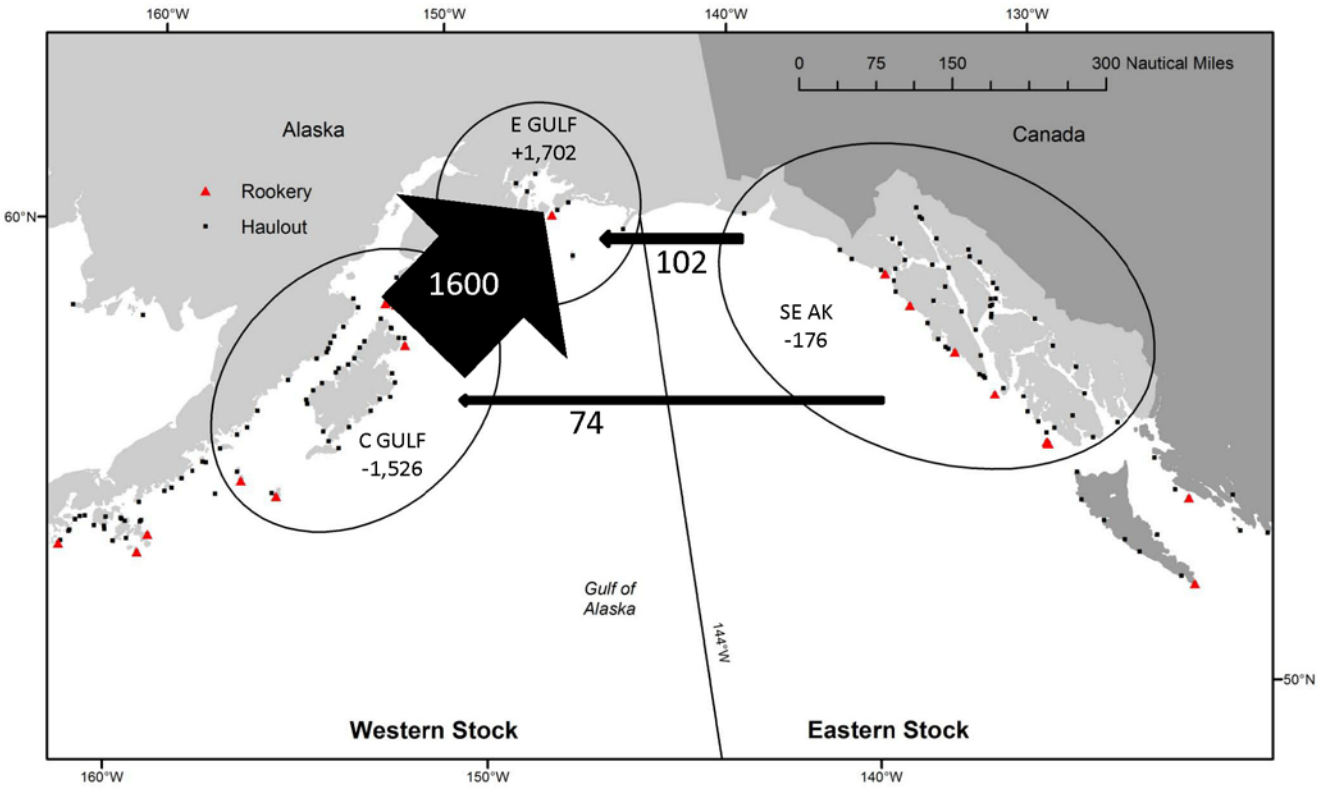

Figure 10. -- Net movement (proportional width arrows and associated numbers) of Steller sea lions between southeast Alaska (SE AK), the eastern Gulf of Alaska (E GULF), and the central Gulf of Alaska (C GULF) during the breeding season based on sightings of branded animals (Jemison et al. in review, Fritz et al. in review), pup production in 2009 (this study), and age-specific survival (Hastings et al. 2011, Fritz et al. in review). The net change in abundance of Steller sea lions in each region is listed under the region name.

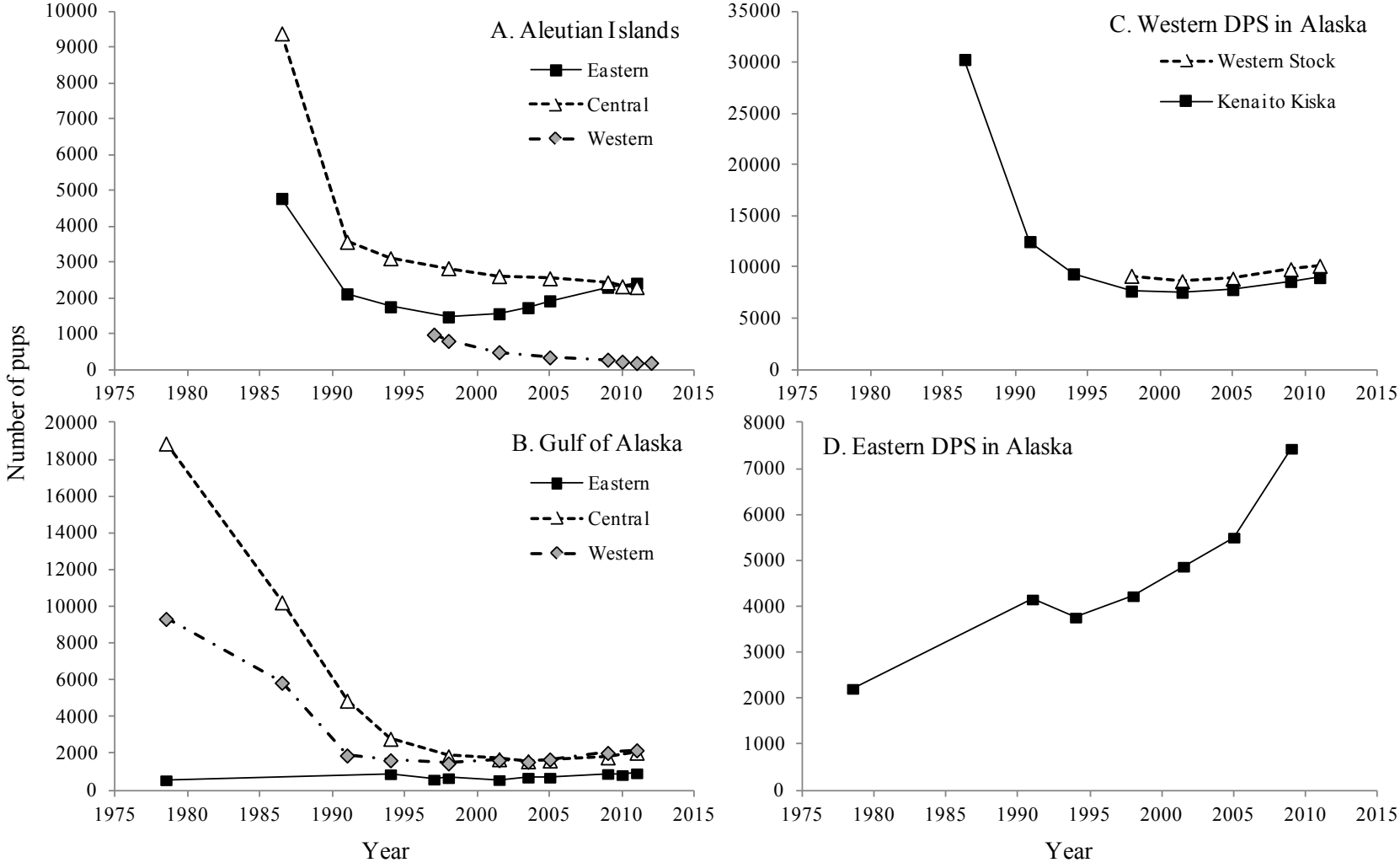

Figure 11. -- Number of Steller sea lion pups counted at trend rookeries in Alaska (Table 6), 1978-2012. A. Aleutian Island regions; B. Gulf of Alaska regions; C. Kenai-Kiska area and western distinct population segment (DPS) in Alaska; D. eastern DPS in Alaska (southeast Alaska).

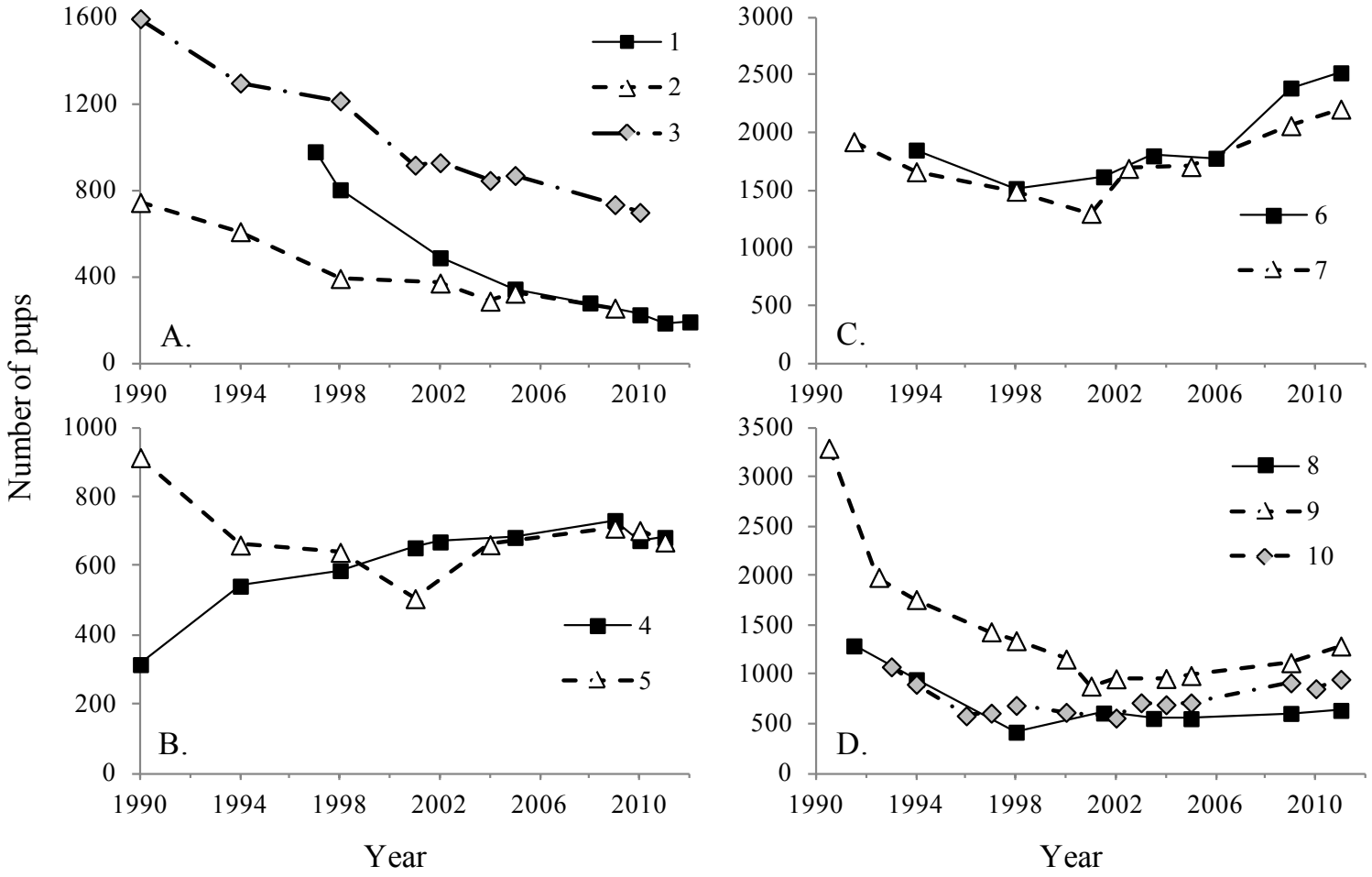

Figure 12. -- Number of Steller sea lion pups counted at trend rookeries (Table 2) in Rookery Cluster Areas (RCAs) 1-10 in the western stock in Alaska, 1990-2011. A. RCAs 1-3; B. RCAs 4-5; C. RCAs 6-7; D. RCAs 8-10.

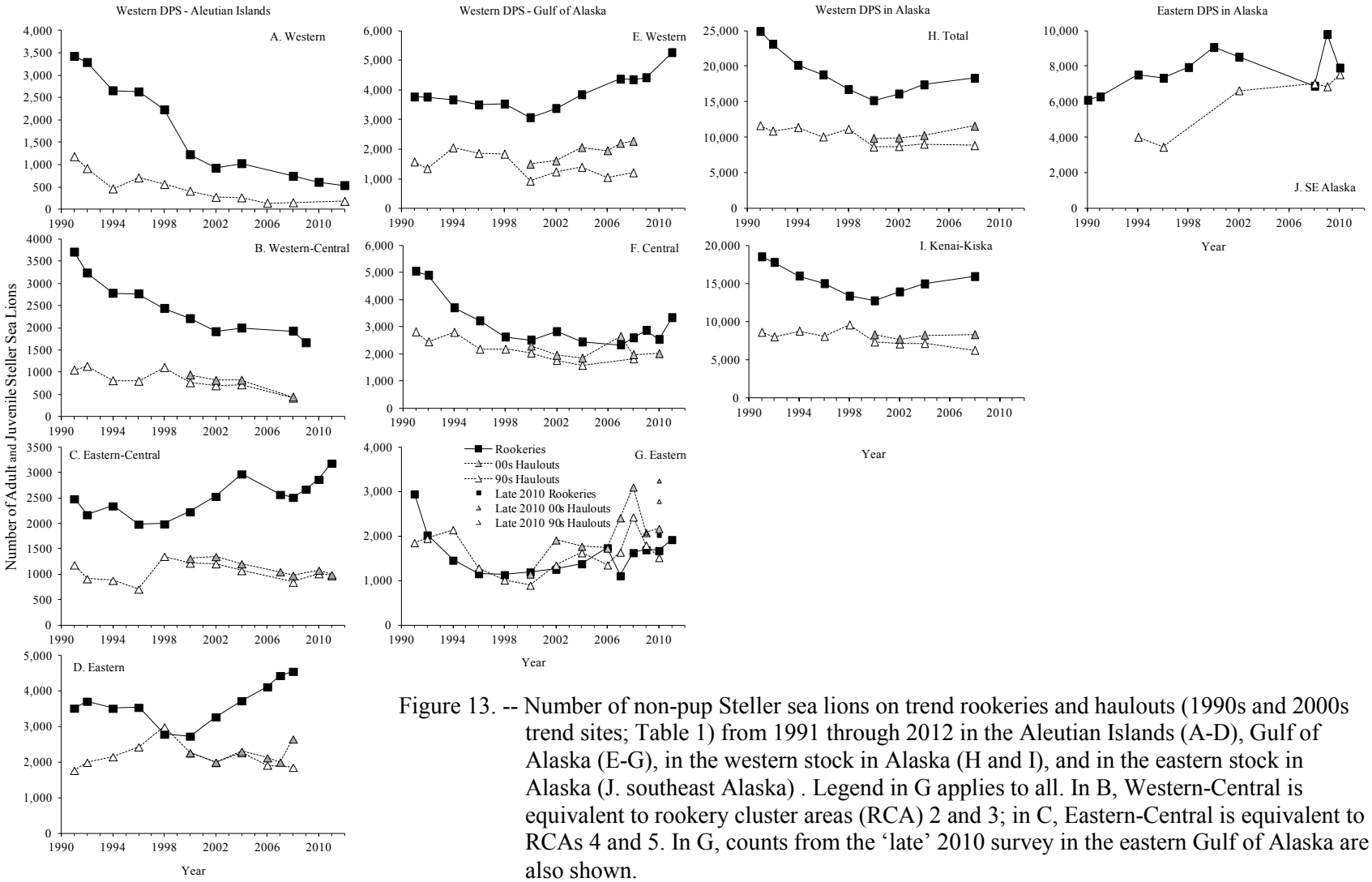

Figure 13. -- Number of non-pup Steller sea lions on trend rookeries and haulouts (1990s and 2000s trend sites; Table 1) from 1991 through 2012 in the Aleutian Islands (A-D), Gulf of Alaska (E-G), in the western stock in Alaska (H and I), and in the eastern stock in Alaska (J. southeast Alaska) . Legend in G applies to all. In B, Western-Central is equivalent to rookery cluster areas (RCA) 2 and 3; in C, Eastern-Central is equivalent to RCAs 4 and 5. In G, counts from the 'late' 2010 survey in the eastern Gulf of Alaska are also shown.

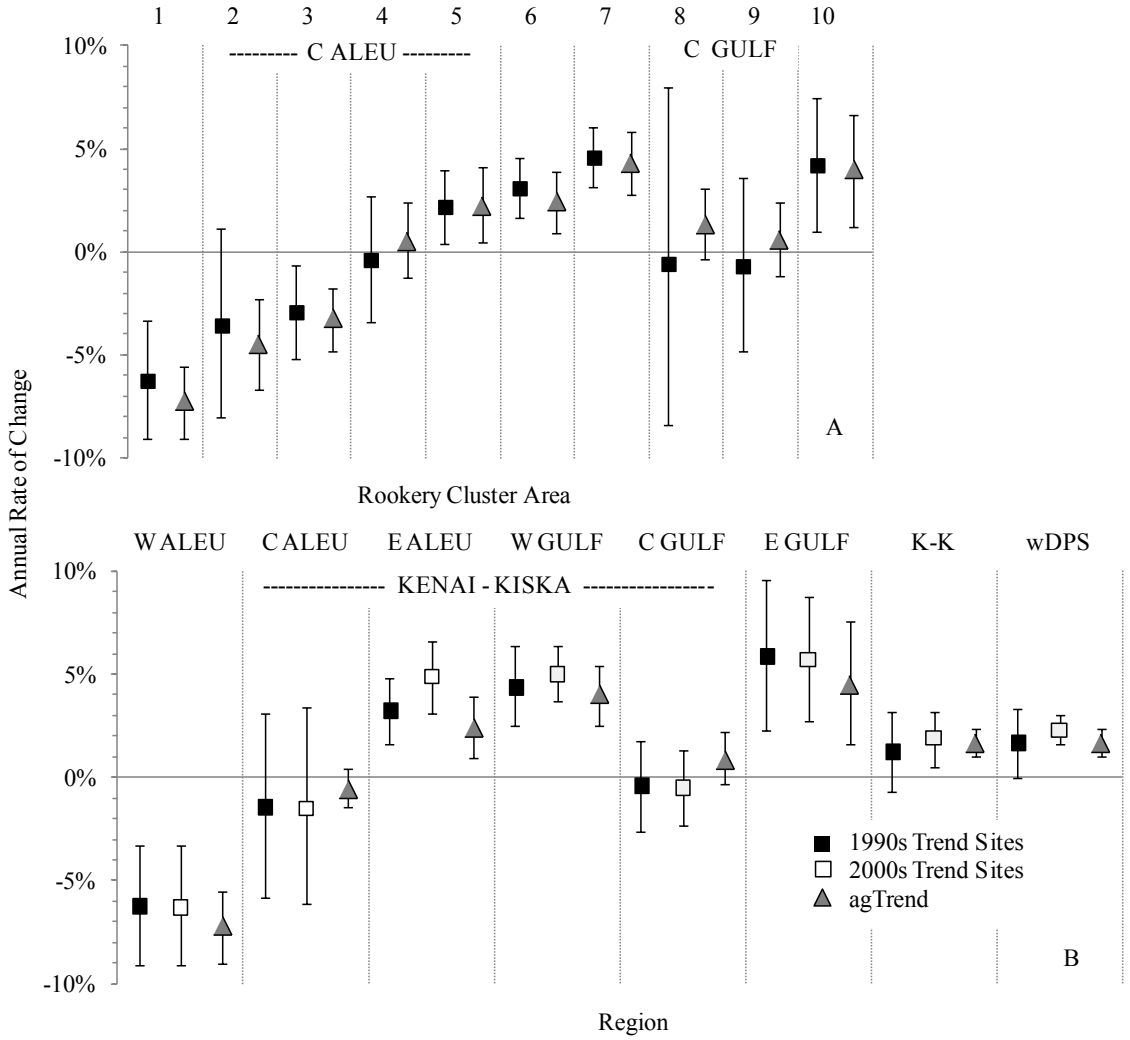

Figure 14. — Annual rates of change (±95% confidence or credible interval; see Table 11) in non-pup counts in the 2000s by rookery cluster area (A; RCA) and region (B) plotted from west to east (left to right). Trends were estimated using counts at 1990s and 2000s trend sites, and with the agTrend method. K-K = Kenai-Kiska area; wDPS = western distinct population segment in Alaska. Data and time periods for each RCA and region for trend site trend estimates are listed in Table 11; agTrend estimates are for the period 2000-2012.

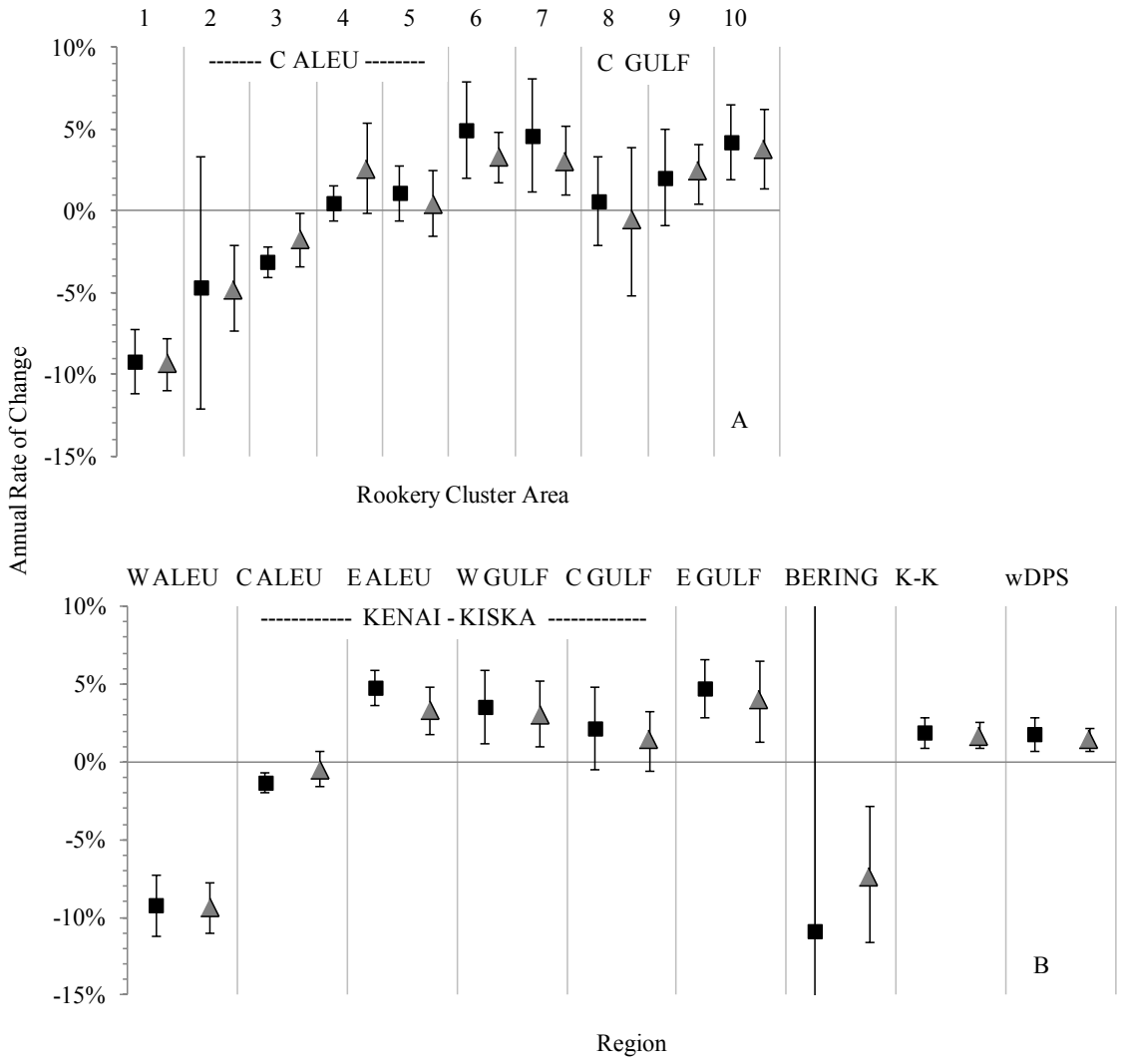

Figure 15. — Annual rates of change (±95% confidence or credible interval; see Table 11) in pup counts at trend rookeries in the 2000s by rookery cluster area (RCA; A) and region (B), plotted from west to east (left to right). K-K = Kenai-Kiska area; wDPS = western distinct population segment in Alaska. Data and time periods for each RCA and region are listed in Table 11; agTrend estimates are for the period 2000-2012.

APPENDIX A

Reconciliation of trend sites missed in the 2008 survey

All 1990s trend sites in southeast Alaska (eastern DPS) and all but 5 of the 161 1990s trend sites in the western DPS in Alaska were surveyed in 2008. Of the five missed western DPS sites, three were not surveyed from the air because of bad weather (two rookeries on Ugamak Island and a haulout located at East Cape on Amchitka Island), while two (rookeries on Chowiet and Chirikof Islands) were incompletely surveyed. For trend analyses, 2008 counts at these five sites were estimated using the following methods:

Ugamak Island -- There are two main rookery beaches located at the eastern end of Ugamak Island: North and Ugamak Bay. NMML scientists maintain a summer field camp between 1 June and 1 August each year and count animals, conduct behavior scans and record observations of permanently marked (hot-branded) sea lions on Ugamak Island as part of studies to estimate survival and reproductive rates. We compared aerial survey counts of adult and juvenile sea lions on the two rookery beaches in 2004 and 2005 with land-based counts made on the same day, and calculated the ratio of aerial to land counts. To estimate aerial survey counts in 2008 at each rookery, we multiplied land-based counts made on or about 17 June (when the aerial survey was conducted in this area) by the average aerial to land ratio at each rookery. Counts at both rookeries have been increasing since 2004.

Amchitka/East Cape -- At this site, the most recent non-pup count (from the 2006 survey; 103 non-pups) was used in 2008. Trend counts within the western portion of the C ALEU (RCA 2) have been declining since the mid-1990s (Fritz et al. 2008), and the 2006 count is near the low end of the range counted since 1996 (101-186).

Chirikof Island -- At this site, the most recent non-pup count (from the 2007 survey; 300 non-pups) was used in 2008. Counts at this rookery were relatively stable between 1996 and 2007 (range of 266-360).

Chowiet Island -- The rookery on Chowiet is a complex site composed of a beach and several coves on the main island, along with an offshore islet where the primary breeding rookery is located. Only the islet and the beach were photographed in the 2007 and 2008 surveys, while all areas were photographed in all previous surveys, including the one conducted in 2004. We used the ratio of all non-pups counted at Chowiet in 2004 (541) to those on the islet and beach (368; ratio=1.47) to estimate the total number at this rookery in both 2007 (392; estimate = 576) and 2008 (380; estimate = 559). The 2007 and 2008 estimates are within the range counted at Chowiet between 1996 and 2004 (504-592).

APPENDIX B

Appendix Table B1. -- Survival by sex and age (years) for eastern Steller sea lions born on each of four rookeries in southeast Alaska based on sightings of branded pups (Hastings et al. 2011).

	Natal Rookery			
Sex-Age	Forrester	Hazy	White Sisters	Graves Rock
Females 1	0.567	0.583	0.665	0.762
2	0.718	0.731	0.795	0.862
3	0.878	0.887	0.927	0.955
4	0.915	0.922	0.95	0.97
5	0.934	0.939	0.962	0.977
6	0.942	0.947	0.967	0.98
7	0.943	0.947	0.967	0.98
8	0.936	0.941	0.967	0.98
9	0.936	0.941	0.967	0.98
10	0.936	0.941	0.967	0.98
11	0.936	0.941	0.967	0.98
Males 1	0.523	0.54	0.624	0.729
2	0.647	0.662	0.736	0.818
3	0.816	0.829	0.887	0.93
4	0.851	0.861	0.91	0.945
5	0.866	0.875	0.919	0.951
6	0.864	0.874	0.918	0.95
7	0.847	0.858	0.907	0.943
8	0.808	0.821	0.907	0.943
9	0.808	0.821	0.907	0.943
10	0.808	0.821	0.907	0.943
11	0.808	0.821	0.907	0.943

Appendix Table B2. -- Survival by sex and age (years) for western Steller sea lions branded as pups in the eastern (E GULF) and central Gulf of Alaska regions (C GULF; Fritz et al. in review).

	Females		Males	
Age	E GULF	C GULF	E GULF	C GULF
1	0.555	0.779	0.600	0.789
2	0.913	0.757	0.670	0.692
3	0.935	0.788	0.834	0.726
4	0.950	0.938	0.913	0.871
5	0.950	0.938	0.913	0.871
6	0.950	0.938	0.913	0.871
7	0.950	0.938	0.913	0.871
8	0.950	0.938	0.913	0.871
9	0.950	0.938	0.913	0.871
10	0.950	0.938	0.913	0.871
11	0.950	0.938	0.913	0.871

Appendix Table B3. -- Movement probabilities during the breeding season by age (years) and sex of Steller sea lions branded as pups between southeast Alaska (SEAK) and the western distinct population segment [DPS; eastern (E GULF) and central Gulf of Alaska (C GULF) only]. A. Movement from SEAK to the western DPS, including separate probabilities from the two southern (Forrester and Hazy) and northern (White Sisters and Graves Rock) rookeries. B. Movement from the E GULF and C GULF to SEAK. From Jemison et al. (in review).

A. Movement from SEAK to Western DPS

	From N SEAK		From S SEAK	
Age	Female	Male	Female	Male
1	0.0187	0.0614	0	0.0871
2	0.0177	0.0778	0	0.1667
3	0.0152	0.0875	0	0.2071
4	0.0149	0.1055	0	0.2589
5	0	0.0535	0	0.1358
6	0	0.0323	0	0.0867
7	0	0.0236	0	0.0671
8	0	0.0201	0	0.0592
9	0	0.0186	0	0.0561
10	0	0.0186	0	0.0561
11	0	0.0186	0	0.0561

B. Movement from E GULF and C GULF to SEAK

	From E GULF to SEAK		From C GULF to SEAK	
Age	Female	Male	Female	Male
1	0.2624	0.1390	0.0631	0.0596
2	0.1882	0.1758	0.0537	0.0706
3	0.1781	0.2308	0.0518	0.0937
4	0.1644	0.2372	0.0425	0.0977
5	0.1230	0.1597	0.0302	0.0760
6	0.0981	0.1071	0.0225	0.0606
7	0.0831	0.0717	0.0176	0.0497
8	0.0741	0.0479	0.0145	0.0420
9	0.0687	0.0320	0.0125	0.0365
10	0.0655	0.0214	0.0113	0.0327
11	0.0655	0.0214	0.0113	0.0327

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